KNOWLEDGE
ECONOMY
SOCIETY

CONTEMPORARY TOOLS
OF ORGANIZATIONAL
RESOURCES MANAGEMENT

Edited by
Paweł Lula, Tomasz Rojek

KNOWLEDGE – ECONOMY – SOCIETY

CONTEMPORARY TOOLS OF ORGANIZATIONAL RESOURCES MANAGEMENT

CRACOW UNIVERSITY OF ECONOMICS
Faculty of Management
FOUNDATION OF THE CRACOW UNIVERSITY OF ECONOMICS

KNOWLEDGE – ECONOMY – SOCIETY

CONTEMPORARY TOOLS OF ORGANIZATIONAL RESOURCES MANAGEMENT

Edited by

Paweł Lula, Tomasz Rojek

Cracow 2014

Reviewer

Anna Wójcik-Karpacz

All papers have been prepared in English by the Authors

Table of contents

PART II

MECHANISMS AND SYSTEMS OF SHAPING HUMAN RESOURCES IN AN ORGANIZATION

PART III

IT TOOLS AND QUANTITATIVE METHODS IN CONTEMPORARY ORGANIZATIONS

Introduction

Contemporary transformations of markets, products, technologies, legal regulations or organisational culture, as well as a lot of other conditionings of business activity impose now a different approach to the problem of managing organisations, formulating their goals and strategies of operation. The processes of the constant introduction of changes create in this way a new challenge for the effectiveness of management in new conditions of enterprise activities. The growing activeness of firm owners causes an increase in the pressure put on the effectiveness of an enterprise, discussed from the point of view of the fulfilment of the owners' financial benefits, which, in the existing external and internal conditions, requires the use of adequately effective management tools and instruments. At the same time, the development and dissemination of the achievements of the new economy have created broader than before opportunities for raising the effectiveness of enterprises and implementing modern management methods within this scope.

Globalisation is one of the most significant determinants of the changes in the contemporary environment, at the same time being one of the most important processes and phenomena of our times. It brings both new opportunities and new threats because it is related to the process of expanding free market economy and democracy, and, what follows, also development,the growth of co-dependencies, integration and the abolishment of all barriers among individual countries. Moreover, it gives an opportunity to integrate the activities of entities at various levels (of enterprises, markets, sectors and economies) at the international scale. The complexity of the globalisation process proves its influence not only on large, transnational corporations, but also on the firms of Small and Medium-size Enterprise sector. The degree of the influence ofglobalisation conditions their functioning and development and determines consumer behaviours. The process runs simultaneously in many areas of life (which proves many-sidedness of globalisation) whereas all activities from various realms of activeness are performed at the same time, in various places.

The globalisation processes mentioned before are the reason for which the search for the sources of competitive advantage becomes the fundamental element of the management theory and practice. Owing to globalisation, the role of competition, treated before not as a helpful and motivating means to achieve enterprise goals but as an ideology aiming at the strive for the survival of an organisation by all means, has been transformed. Achieving competitive advantage is related to the effective use of resources and optimization of operations, looking towards the future and investing such skills in development, which an enterprise will be able to use in the future. Thus, to maintain their competitive position on the market, contemporary enterprises are forced to observe specific requirements imposed in the course of the globalisation process implementation. They should keep searching for new solutions and tools enabling to adapt their strategy to the requirements imposed by the global market, implement standards concerning the corporate social responsibility of business, apply modern technologies and IT tools and create flexible systems of labour and organisational structures.

Therefore, current economic situation forces the adjustment of enterprise behaviours to the requirements of the market economy and the complexity of the environment, its dynamics, state and

structure. Frequently, these are elements determining the effectiveness and development possibilities for every enterprise. Such adjustment should take place by introducing modern tools for managing organisational resources of various character and intensity.

To sum up, in contemporary economy enterprises must constantly verify their basic strategic assumptions, search for effective instruments ensuring the improvement of the effectiveness of operations and an increase in their capability of reacting quickly to undergoing changes (new opportunities but also new threats). The fulfilment of these conditions ensures to an enterprise the achievement of success and the establishment of its competitive position on the market.

With reference to the presented diagnosis of the contemporary market conditionings, this publication was created. It is a scientific reflection on the modern processes of managing organisations , the tools supporting these processes and instruments shaping the resources of these organisations. The book presents the scientific output of various academic centres and fits into the stream of research aiming at the search for tools and solutions ensuring efficient and effective management of organisational resources at the present stage of market development.

The entirety of the considerations presented in the contents of the publication is divided into the following three parts showing theoretical, methodological and practical aspects of the presented issues:

I.   Attributes, determinants and instruments of support for the process of managing organisations.
II. Mechanisms and systems of shaping human resources in an organisation.
III. IT tools and quantitative methods in contemporary organisations.

The considerations included in the Part One show, in accordance with its title, contemporary attributes, determinants and instruments of support for the organisational management process. Intensified activeness of the owners of enterprises functioning on the global market has caused an increase in the pressure on the economic rationality of enterprises and on their effectiveness, which is manifested in achieving financial benefits by the owners. The achievement of such benefits requires to apply effective tools and adequate instruments of enterprise management. The dissemination and constant development and improvement of the new economy have given enterprises an opportunity for broader than before use of the achievements of scientific and technical progress. Owing to them, the effectiveness of entities has grown, and owing to a change in perceiving economic processes and phenomena, new management methods and techniques are implemented, and the structures and organisational activities of enterprises are transformed.

The authors of the chapters presented in Part Two of the publication refer to the issues related to knowledge and human resources management in an organisation. Knowledge, constituting a separate resource of an enterprise, contributes to building its competitive advantage. It is connected with changes concerning the role of individual components of assets in an organisation's value creation. Knowledge – treated as skills attained by employees while learning and experiences acquired by them are a unique factor of production for an organisation, so-called intellectual factor. Nowadays, effective knowledge-based management in an enterprise causes the transformation of knowledge into a component of anorganisation's market value. It is related to the use of the role human resources perform in an organisation, and, what follows, also the human capital management policy.

   Part Three of the publication refers to the problem of using IT tools and quantitative meth-
ods in the management process. The content is related to the fact that the individual activities
evoked by globalisation are accompanied by considerable changes in generally understood com-
munication, or in the flow of information itself. The progress of technique and technology has
brought radical changes to IT technologies. The advent of the Internet enabled fast and effective
communication of recipients from all over the world. Faster and broader access to information,
and an increase in its quantity and quality is brought about by the progress of information and
IT techniques and technologies. The advancement has also enabled the growth and acceleration
of the flow of products and capitals. Therefore, new opportunities have appeared, regarding build-
ing competitive advantage which is based on knowledge-based management and in the use of IT
achievements. Thus, the heyday of information and communication infrastructure is considered
to be one of the most important factors of globalisation.

   This book has a character of a theoretical and cognitive, as well as methodological study-
whose aim is the presentation and systematization of the scientific and practical output concern-
ing selected content areas, discussion and critical assessment of this output, as well as the pres-
entation of own thoughts and proposals on the analyzed issues and problems[1]. Handing over
the discussed work to the Readers, we express our belief that the publication in the presented
formulation is fully justified, both for theoretical and cognitive, practical and educational reasons.
It can constitute a reference point for new reflections, research, disputes, analyses and critical
discussion over the presented problems. The involvement of a large group of Authors enabled
showing the discussed issues in a broad and many-sided way. As the scientific editors of this
study, we would like to thank cordially all the Authors for accepting our invitation to co-create
the publication and share the findings of their research with the Readers.

Paweł Lula, Tomasz Rojek

---

[1]   This work inscribes into the series of publications under the common title *Knowledge – Economy – Society*,
which constitute one of the effects of many years' cooperation between the academic environment of the Fac-
ulty of Management at the Cracow University of Economics and the employees and students of other faculties
of the University, representatives of different Polish academic circles, as well as representatives of foreign
academic circles. See: *Knowledge – Economy – Society. Challenges of the Contemporary World*, Edited by
R. Oczkowska, B. Mikuła, Faculty of Management of the Cracow University of Economics – Foundation
of the Cracow University of Economics, Cracow 2011; *Knowledge – Economy – Society. Dilemmas of the Con-
temporary Management*, Edited by A. Malina, R. Oczkowska, T. Rojek, Faculty of Management of the Cracow
University of Economics – Foundation of the Cracow University of Economics, Cracow 2012; *Knowledge
– Economy – Society. Transfer of Knowledge in the Contemporary Economy*, Edited by P. Lula, B. Mikuła,
A. Jaki, Faculty of Management of the Cracow University of Economics – Foundation of the Cracow Univer-
sity of Economics, Cracow 2012; *Knowledge – Economy – Society. Global and Regional Challenges of the 21st
Century Economy*, Edited by P. Lula, B. Mikuła, A. Jaki, Faculty of Management of the Cracow University
of Economics – Foundation of the Cracow University of Economics, Cracow 2013; *Knowledge – Economy –
Society. Challenges of the Contemporary Management*, Edited by A. Malina, R. Oczkowska, T. Rojek, Faculty
of Management of the Cracow University of Economics – Foundation of the Cracow University of Economics,
Cracow 2013 and *Knowledge – Economy – Society. Dilemmas of the Economic Resources Management*, Edited
by R. Oczkowska, G. Śmigielska, Faculty of Management of the Cracow University of Economics – Founda-
tion of the Cracow University of Economics, Cracow 2014.

PART I

ATTRIBUTES, DETERMINANTS AND INSTRUMENTS OF SUPPORT FOR THE PROCESS OF MANAGING ORGANIZATIONS

———————————————■———————————————

Chapter **1**

Time Management in Project Management

Ewa Kozień

1. Introduction

The history of the world and of humankind is pinpointed in time. It was always very important to investigate what the time is and to find a way to measure it. Ancient civilisations, *i.e.* Mayas, Egyptians and Romans indicated three moments during a day based on sun observations and using solar calendar. Since 46 to 45 BC, Julius Caesar reformed the Roman calendar and thus the Julian calendar came into existence. Then, in 1582 Pope Gregory XII introduced the Gregorian calendar with his bull "Inter gravissimas". Since then all events in the history of humankind and the human life itself are presented within a time-frame. The notion of time became an object to be analysed by philosophers, mathematicians and physicists. When the first organizations and a scientific approach to their management appeared, a problem of time management was also taken into consideration. Processes in organizations have been analysed in time. The precursors of time management are: F.W. Taylor, H. Gantt, K. Adamiecki, Z. Rytel. The academic achievements of the above mentioned experts in management are currently used in the field of project management.

The objective of the article is to draw your attention to the problem and methods of time management in the ongoing projects.

2. The essence of time

Time is a category commonly used in different contexts of human activeness. In XIX century Ch. Lamb admitted that time is a riddle for him (Hawking, 2002, p. 31). Time is an object of interest for researchers and scientists in different fields. Mathematicians and physicists create mathematical time models. The first model of time and space has been published by I. Newton in the treatise "Principia Mathematica". He separated time and space as well as vividly presented time as a straight line, infinite in both directions. I. Newton thought that time is eternal, it means that it exists since the beginning of the world and is going to last forever (Hawking, 2002, p. 32). In 1915 a new mathematical model of time (general theory of relativity) was presented by Einstein.

Time is also an economic category and has its value. K. Adamiecki considered the time management problem in very particular way. He has shown how to act against time-wasting introducing time schedules. Z. Rytel, Polish prakseologist[1] worked out so called esograms where time factor plays very important role in actions evaluation (Martyniak, 1986, pp. 35-41, 45-51).

Time is also very important in project management. In project definition it is emphasized that project is a unique and temporary undertaking and its objective is an advantageous change determined by targets. It requires human, financial, information and material resources put in timeframe, cost and quality limitations. The established limitations aim at assuring the efficiency and cost-effectiveness of actions associated with project implementation. When defining the scope of actions associated with project implementation, three parameters creating so called project triangle: time, cost, scope, requirements (quality) play very important role (Trocki et al., 2003, p. 22), (Łada et al., 2010, p. 20).

The aim of project implementation is to implement it as soon as possible, observing the minimum cost and high quality requirement.

In order to manage project efficiently in time, the life cycle concept is used. In practice projects are divided into several project stages in order to guarantee efficient planning, monitoring and control process (PMBOK, 2000, pp. 65-81). The number of stages depends on project complexity and extensiveness. The basic model of project implementation could be expressed in four stages (Fig. 1):

Figure 1. Project life cycle
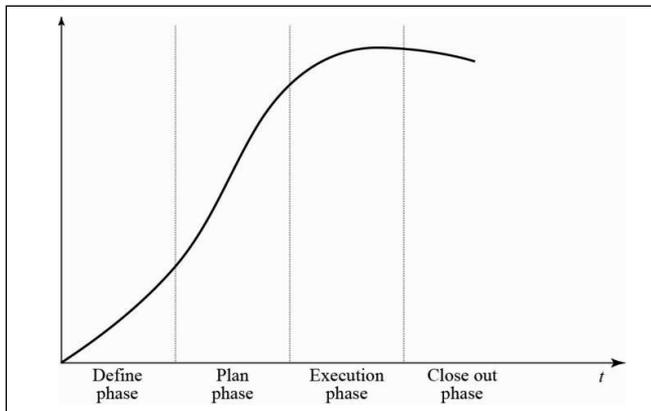
Source: own work.

1. The stage of concept when requirements of project implementation and project feasibility study procedure are established. If terms of project implementation are accepted we can go into the next stage.
2. Planning stage when detailed plan is going to be prepared and resources indispensable for project implementation to be analysed. The plan is crucial for the efficiency of future steps and therefore it needs to be: appropriate, feasible, consistent, efficient, rational, flexible, detailed and complete (Kotarbiński, 1970, pp. 160-162).

---

[1] Prakseology is about efficient actions.

3. Implementation stage when project is realized and implemented based on previously established basic plan.
4. End stage when final report is being prepared and project implementation is finished.

3. Selected methods of time management in project implementation

We need to establish start and end of each project that is going to be implemented. Project time-frame is impacted by:
- project resources limitations,
- employer's requirements,
- external determinants of a project,
- inventiveness of suggested solution,
- number of partial tasks,
- skills and experience of project manager and the entire team.

Time management in project is a process consisting of the following steps (PMBOK, 2000, pp. 65-81):
1. Identification of project tasks.
2. Establishing the sequence and connections between listed tasks.
3. Estimation of tasks duration.
4. Selection of the project time management method.
5. Monitoring and control of project implementation in time.

Task identification in project means that its scope and limitations need to be established and then a work break down structure – WBS. In order to identify partial tasks a disintegration method can be used.

Establishing the sequence and connections between listed tasks in project is important in order to prepare a realistic schedule. Connections between listed tasks are impacted by external factors and fixed relations (determined by technological processes used) and soft relations (called subjective and resulting from access to the best available solutions or using former ones in a different way). Methods facilitating visual presentation of the tasks sequence and connections are:
1. Node diagram (activity-on-mode – AON) which supports project management efficiently, in particular one of four types of dependence is used; from end to start (finish-to-start – FS) and it means that actions undertaken by next participants of project team can be done once all other works implemented by the previous team are finished. Other types of connections: from finish to finish (finish-to-finish – FF), from start to start (start-to-start – SS), from start to finish (start-to-finish – SF). Example of node diagram see on Figure 2.

Figure 2. Example of network connections diagram worked out according to sequence diagram method
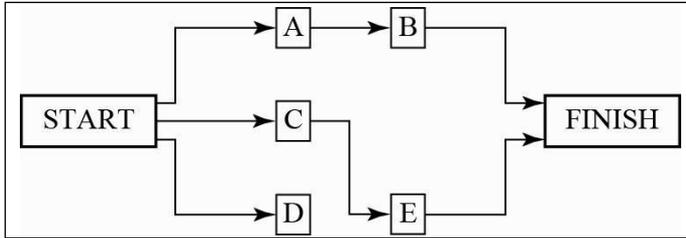
Source: own work.

2. Arrow diagram (activity-on-arrow – AOA) where only one type of connection is used; from finish to start, including ostensible actions. See Figure 3.

Figure 3. Example of network connections diagram worked out according to arrow diagram method
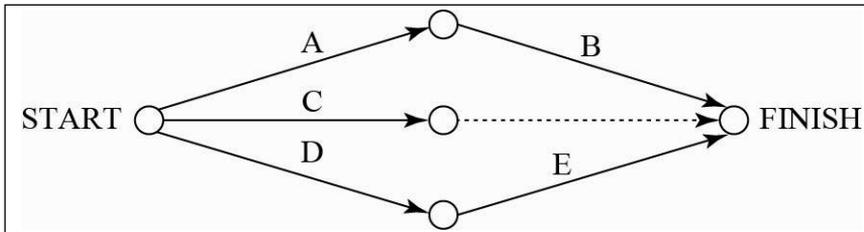
Source: own work.

Estimation of tasks duration within the scope of the project includes previously fixed requirements and limitations. Project time estimation techniques are:
- expert opinion,
- comparative estimation that is an estimation of future project activities based on real time of a similar project implemented in the past. comparative estimation is a form of expert opinion. comparative estimation is available when detailed documentation of projects realized in the past is archived by Project Supporting Offices and made available for comparative purposes in similar actions,
- quantitative methods of duration establishing (estimation of workload),
- estimation of time reserve that is important buffer in case of risk not identified so far influencing project implementation deadline.

Selection of time management method in project. Basic time management methods are (Trocki et al., 2003, pp. 163, 196):
1. Gantt chart.
2. Network techniques (*e.g.*: CPM, PERT).
3. EVM method.

K. Adamiecki and H. Gantt are pioneers in schedules creation. The scheduling technique is useful to implement two functions of management that refer to planning and control of process in time. At the beginning of XX century scheduling was used for production processes registra-

tion. Nowadays this technique is commonly used in project management. There are two dimensions on the chart:

- abscissa axis where project run is presented in a fixed time unit (days, weeks, months), determined nominal task implementation time refers to real time,
- axis of ordinates where tasks to be done within project are listed.

Gantt chart has been supplemented by system of milestones which are check points and coordination points of the project. If there are different projects and different level of complexity, the chart itself becomes transparent visualization of its run in time and is useful tool for efficient management.

Network techniques are based on graph theory. We can distinguish deterministic and stochastic networks considering the way of determination of run time for different types of projects. If time is established unambiguously (determined) we use basic network technique CPM. If time is established with a given likelihood (stochastic) we use network technique PERT, GERT.

CPM technique (Critical Path Metod) means that we need to determine time indispensable to implement each task within a project, calculation of start and finish date of each task as well as the entire project implementation time. Moreover critical activities need to be determined where time reserve is zero. Determination of critical path is very important information for project manager who knows that if critical activities are exceeded by one time unit, the implementation of the entire project will be delayed. Time for specific activity is determined based on project manager experience. CPM technique is a transparent tool used for time management.

PERT technique (Program Evaluation and Review Technique) allows to estimate duration of specific project activities. The estimated duration of activity is very subjective, it means that the manager is too optimistic or too pessimistic. Therefore duration of specific activities becomes a random variable with beta distribution (Fig. 4). For each activity we need to determine optimistic time (a), the most probable (m) and pessimistic (b) as well as so called time expected (t_e) and standard deviation for activities on critical path. PERT technique allows to obtain answer to question – what happens if project implementation time is shorter? If project implementation time is shorter, the likelihood of meeting project implementation deadline is lower unless additional resources are available, financial ones in particular. PERT technique is a tool that allows to control project implementation according to the schedule established.

Figure 4. Beta distribution of the estimated time of activity implementation
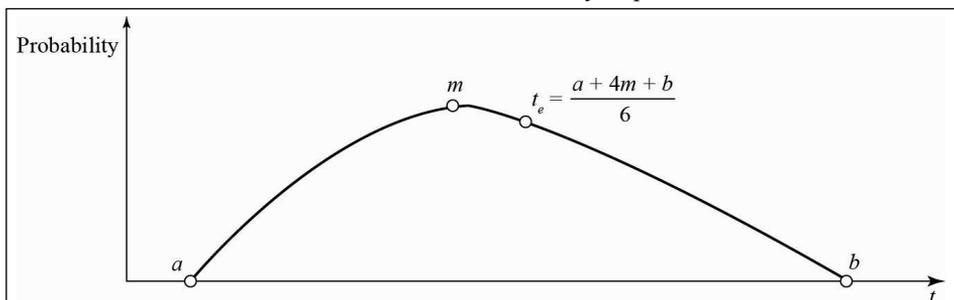
Source: own work.

Elaborated value method (EVM) is based on worked out project implementation schedule in a form of function of planned total cost of tasks in time. Project progress assessment is feasible

based on executed works real cost controlling in every single moment during the course of project implementation (Anabari, 2003, p. 62).

Monitoring and control of project implementation in time refers to schedule change control. During the process of project run monitoring, current meetings and reports are important because they facilitate problems identification. Monitoring and control process refers to basic plan included in the schedule and to correction of ongoing activities. The key element of time control in a project is analysis of planned time and real time deviations with particular reference to critical activities. Information on reasons of the above mentioned deviations during control process need to be reported and used not only in the ongoing project but they also should become a foundation for future projects experience.

4. Time management analysis based on projects implemented in practice

Research methodology consists of three stages:
1. Determining target and subject of research.
2. Gathering information.
3. Identification of time management problems in projects.

The target of research was to consider time management problem as non renewable resource. Detailed targets are:
- identification of delay reasons in ongoing projects,
- assessment of time management technique efficiency in project management.

The research consists of 62 projects realized by institutions and organizations of different size, area of activity, level of development and duration.

Research consists of projects that have been finished. The implemented projects have been different as far as their orientation, order origin, innovation level and size is concerned. Analysed projects belong to different areas: science & research, production, quality assurance, marketing, IT (creation of IT systems facilitating implementation of management functions), investment, human resources (EU Program: Human Capital), culture, sport, student life and modernization.

Standardized survey and questionnaire have been basic sources of information on projects.

Results of time management problems analysis in projects are shown in Table 1.

The projects finished on time according to fixed basic plan have been projects co-financed by EU funds, cyclical projects, sport events, projects in the field of culture. There have been some problems with meeting established deadlines in case of the remaining groups of projects. The reasons resulted from mistakes committed during risk management. It has been forgotten that it is a continuous process that requires identification at every project stage. Another reason is limitation of resources which have been underestimated in preliminary stages of a project. Some managers worked with projects for the first time and they say that they were learning by doing and learning on their own mistakes. Some of them tried to use expertise and experience of persons coordinating similar projects. It is very interesting that despite exceeding deadlines managers do not find lack of expertise and misuse of time management methods and techniques as reasons. On the other hand many managers used only a schedule when managing project. Tools like network techniques or EVM method have been used occasionally and almost exclusively in scientific projects (experiments and implementation). It turned out that Gantt chart was a basic tool for time

management in projects although not every manager knew it. Even in highly innovative projects where network techniques or EVM method have been used, the basic tool was Gantt chart.

Table 1. Time management in projects – quantitative analysis of results

		Time management in the ongoing projects (research sample of 62 projects)	No of answers	share in %
1.		Projects finished within fixed deadline	21	34%
2.		To manage time the following methods have been used:		
		• Gantt chart,	35	57%
		• network techniques (*e.g.*: CPM, PERT),	5	8%
		• EVM method,	3	5%
		• schedule.	27	44%
3.		Reasons of delay during project implementation:		
		• not estimated risk of resources limit appeared,	48	77%
		• reserves restriction,	28	45%
		• project manager lack of experience,	19	31%
		• not using the time management tools.	0	0%

Source: own work.

The author of the article focused exclusively on time management problem, but we need to emphasize that there is direct link between time and scope of the project, costs and requirements. Listed project parameters create so called project triangle (Fig. 5).

Figure 5. Project triangle
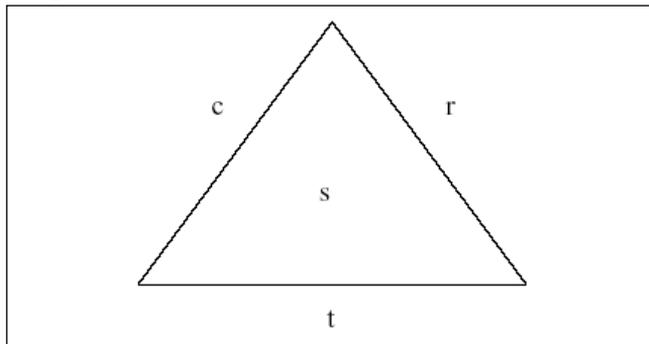
t – time
s – scope
c – costs
r – requirements
Source: own work.

Based on analysis of 62 projects it can be stated that majority of projects (66%) in concept stage has wrongly estimated project triangle parameters, and parameters have been balanced

only in planning stage. During project implementation stage some disturbances appeared causing changes resulting from:

- additional requirements of customer,
- limited availability of resources,
- new risk appeared,
- problems linked to finding key experts,
- changes in project conditions.

During finish stage, when project assessment is done, cost and time were two exceeded parameters.

5. Conclusion

Time management is one of nine areas of project management which impact establishing project time-frame. Currently there is this tendency to realize project as soon as possible. Project managers can feel unjustified time pressure resulting in mistakes and in consequence delays in project implementation.

Time is strictly linked to other project parameters, *i.e.* cost, requirements and project scope. The relations are shown in Table 2.

Table 2. Relations among project triangle parameters

Project triangle parameters			
Time	**Cost**	**Requirements**	**Scope**
shorter	increase	constant	constant/increase
shorter	increase	increase	constant/increase
longer	increase	constant	constant/increase
longer	increase	increase	constant/increase

Source: own work.

We need to establish optimal project implementation time, and to do so we need reliable information on indispensable resources as well as time management techniques should become more popular due to some academic programs and trainings in the field of project management.

Bibliography

1. Anabari F.T. (2003), Earned Value Project Managament. Method and Extensions, *Project Management Journal*, December.
2. Hawking S. (2002), *Wszechświat w skorupce orzecha*, Poznań, Zysk i S-ka.
3. Łada M., Kozarkiewicz A. (2010), *Zarządzanie wartością projektu*, Warszawa, Wydawnictwo C.H. Beck.
4. Martyniak Z. (1986), *Organizacja i zarządzanie 50 problemów teorii i praktyki*, Warszawa, Książka i Wiedza.
5. *A Guide to the Project Management Body of Knowledge (PMBOK® Guide)* (2000), Newtown Square, Pennsylvania USA, Project Management Institute.
6. Trocki M., Grucza B., Ogonek K. (2003), *Zarządzanie projektami*, Warszawa PWE.

Chapter *2*

The Factor Space of Trust in the Formation of Purchasing Behaviors

Grażyna Plichta

1. Introduction

In today's market, decision-making that involves consumer purchasing behaviors, apart from purely economic factors, also includes an important role of trust. The consideration of social and ethical aspects between parties to transactions is related to the role of the social capital, that builds public trust and helps create better environments to operate in, which is associated with risks. Trust is a component of the benefits that can be achieved by the parties to the exchange and is often referred to as "a critical success factor in most business relationships". The relationship between the parties to the transaction that is based on trust and mutual commitment determines the reduction of transaction costs.

This paper describes the role and the importance of trust and its influence on purchasing behaviors. It was assumed that the impact of trust on shaping the behaviors and decisions in the market depends on the specific demographics of consumers. In order to determine the factor space of trust, a factorial analysis was used. Reduction of the number of variables and their orthogonalization allowed analyzing the examined the phenomenon from the point of view of new categories, which have become the main factors extracted. The verification of the assumptions was performed on the basis of empirical data analysis (*i.e.* based on the results of the pilot surveys) acquired in the area of the Malopolskie and Podkarpackie Provinces of Poland.

2. The importance of trust in social relationships

In economic sciences, and in particular in the management science, an increasingly important role is played by psychological and social factors. The development of economic concepts emphasizing the importance of behavioral factors is undoubtedly linked with an increase of the role of social capital. According to Francis Fukuyama, social capital has a significant impact on the economy, which the society is able to create. It refers to the social relationships between individuals, employees, groups, organizations, communities, or regions which serve as a resource of achieving positive results.

Social capital builds public confidence and as a result, as already mentioned, it contributes to a significant reduction in transaction costs. It also facilitates agreements, affects confidence in the public and private institutions such as banks, insurance companies, pension and investment funds. Building social trust also helps to create a better environment to take actions that involve risk, *e.g.* concerning decisions about different types of investments. As shown by the results of research conducted in this area, public confidence in Poland is definitely too low. According to CBOS[1] Poles declare significant trust only towards immediate family members. Poles generally are not very open and are characterized by caution. Research shows that 72% of respondents favor caution in dealing with other people rather than the excessive openness. The highest trust is exhibited in relationships with parents, children or spouses (80% of respondents definitely trust them). Regarding unrelated individuals, 34% of Poles declare that they trust strangers who they come into contact with every day: only 17% of respondents definitely trust their neighbors, while 30% said they trusted them only a little. Approximately 46% of respondents do not trust strangers – including 7% said definitely not. Poles are also distrustful towards their coworkers (more than half of the respondents, *i.e.* 57%, tend not to trust each other on the professional level). Although in the past few years the number of Poles declaring that "trusting others pays" has been growing, 42% of the respondents believed that trust in business partners usually ends badly. A slightly smaller number of respondents, 34%, believed the contrary that trust in business partners generally pays off. A CBOS survey results show that the level of trust in the so-called institutional sphere depends on the material status of the respondents.

A specified level of social capital builds public trust and determines trust construed as an advantage that can be achieved by the parties to an exchange. Trust is associated with specific actions and the resulting in anxiety regarding the honesty of the counterparty. Its existence in organizations is often seen through the prism of benefits such as:

- reduction of transaction costs,
- impact on coordination within the organization,
- motivating decision-making,
- creative thinking,
- encouragement to participate in transactions,
- promoting exchange of information,
- support for the existence of markets,
- increasing the company's ability to survive in a crisis,
- building networks and social cohesion,
- building a civic culture (Grudzewski et al., 2007, p. 31).

The rich literature on the diversity of approaches and interpretations of trust leads to rooting this concept in the ground of specific theoretical assumptions. Based on the analysis of the literature in this field, the issues related to transactional and relational context of the occurrence of trust are seen to stand out. This applies mainly to interpersonal relationships, although in practice this points to the existence of many relationships with objects, abstract concepts or organizations. According to Hardin, the existence of trust is conditional on what the benefits of an exchange are, but most importantly, those benefits are accepted and treated "as their own" by both parties (Hardin, 2009, p. 26). This suggests a relationship between the degree of acceptance of the interest

---

[1] *Zaufanie społeczne*, the message of CBOS; The study was conducted on 7-13 January 2010 on a 1,052 representative random sample of adult Poles, Warsaw, March 2010.

of the other parties, and a degree of trust towards them. This is similar to the condition "first best" equilibrium by Pareto in which one party cannot improve its position at the expense of the other.

According to D. Harrison, L.L. Cummings and N.L. Chervany, trust is formed based on the interaction of five forces that can be described in five dimensions: personality, calculation, institutional, perceptual and knowledge-based (Harrison et al., 1998). The above approaches and conditions of the existence of trust are referenced and developed in the New Institutional Economics (NIE), particularly in the transaction cost theory, the agency theory and the theory of property rights. Firstly, an exchange takes effect if the benefits outweigh the losses, and secondly, there are alternative ways of its implementation. The choice of parties to the exchange is made on the basis of a comparative analysis of transaction costs. This means that the abandonment of the exchange does not mean a lack of confidence (indifference) or even distrust (negative value), but the fact that the benefits (in this case, confirmed by trust) were greater than in the case of the existing partner. This approach is analogous to the selection based on ordinal utility. Trust exists between specific individuals; it is the result of free choice, *i.e.* no one can be forced to trust.

3. Trust in shaping purchasing behaviors in a local market

Trust has a significant impact on shaping attitudes and behaviors. The impact of trust on shaping behaviors and decisions in the market is dependent on the specific demographics of consumers. The verification of the assumptions was performed on the basis of the results of the pilot surveys performed in the area of the Malopolskie and Podkarpackie Provinces of Poland. The objective of the procedure (in-depth pilot survey) was to verify the importance of the essential dimensions of trust and to identify the most important statements/dimensions, and thus define them as significant and affecting the behavior of the respondents in the specified market decisions. The selection of respondents was intentional. Respondents from two provinces, *i.e.* Malopolskie and Podkarpackie, were deliberately chosen. In principle, the numbers of women and men were equal and amounted to 40 persons of each gender from Malopolskie and 40 people from Podkarpackie, in two age groups – up to 35 years old and above 35 years old[2]. Within the specific characteristics of the units of the population, the interviewers themselves decided on the selection of respondents with specific control characteristics to receive the sets of surveys. The structure of the study population is shown in Table 1.

As a result of the pilot study a significant amount of data was acquired. When deciding on the method of analysis their significant correlation was included, thus factor analysis was considered. The method has been useful in many areas of research in the market, including studies of attitudes, preferences and behaviors, *i.e.*, wherever we are dealing with a large collection of data and there is a need for their reduction. It should be emphasized that especial justification of this method is applicable if the researcher wants the set of variables to reduce closely correlated to a smaller number of uncorrelated factors. Additional rationale justifying the desirability of its use is the fact that it can be used to present the variables in the new factors. These factors provide a significant part of the information contained in the original variables and at the same time, each of them brings new substantive content. Thus, in addition to reducing the amount of variables

---

[2]   In the initial stage of the study it was established that a larger number of respondents, *i.e.* 100 people in each province (*i.e.* Malopolskie and Podkarpackie) should be included. However, the resulting constraints and objective obstacles made it necessary to restrict the number of respondents to 80 people in each of the provinces (a total of 160 respondents were examined).

describing the problem, the method allows for the analysis of the studied phenomenon from the point of view of new dimensions, which are the main factors.

Table 1. The structure of the study population according to sex and age

Province	Respondent sex	Respondent age (up to 35)	Respondent age (over 35)	Total (by row)
Malopolskie	Female	20	20	40
	Male	20	20	40
	Total (Male + Female)	40	40	80
Podkarpackie	Female	20	20	40
	Male	20	20	40
	Total (Male + Female)	40	40	80
Total (according to column)		80	80	160

Source: own work.

The main objective of the presented research results in the development of the pilot study was to obtain information and, consequently, provide knowledge about the importance of trust when deciding on the market. In particular – to identify and distinguish situations in which trust is particularly important for the consumer. The measurement of empirical phenomena of nature such or similar as in this study is usually carried out using a Likert scale, which is a series of statements to which the subject responds by checking a position on a continuum from "definitely not" or "strongly disagree" to "definitely yes" or "strongly agree". The study respondents spoke regarding statements relating to trust. The answers were given on a 5-point intensity scale. It was assumed that the scale had the status of a metric scale. At the same time, it was assumed that the respondents were to reveal opinions on the subject and their statements were their actual attitudes, which was expressed by indicating the correct position on the scale. The list containing a list of statements, together with ones adopted and used in the rest of the article with their appropriate designations is given in Table 2.

Table 2. Statements in Likert-style scale adopted for the study of trust

Adopted symbols	Full statement
Trust 1	Trust is essential when buying goods and services in a situation of uncertainty and risk.
Trust 2	In the case of transactions marked with risk, trust (*e.g.* between partners to transactions) plays a crucial role.
Trust 3	Trust towards a company is irrelevant if there is a high probability of achieving profit (*e.g.* financial) or an objective.
Trust 4	Trust towards a company and its image does not matter if, as a result of a transaction, the profit is a significant financial benefit.
Trust 5	The choice of purchasing goods and services is affected by the qualifications of the staff.

Trust 6	Lack of trust in relation to the location of acquisition of goods and services does not affect the decision to buy, if the goods and services are offered at a relatively low price.
Trust 7	Professionalism of activities and honoring commitments by the partner to the transaction has an impact on its conclusion.
Trust 8	The reputation of the partner to the transaction has a direct impact on the transaction.

Source: own work.

In order to obtain information on the most important areas where trust has an impact on the decisions, the collected data were analyzed according to the successive stages of factor analysis (Mynarski (ed.), 1992, pp. 162-171; Gatnar, 2004, pp. 11-17; Churchill, 2002, pp. 805-826; Gatnar, Walesiak, 2004, pp. 186-245; Sagan, 2004, pp. 172-187). Thanks to this method, it is possible to obtain certain regularity in the analyzed area where considerable quantities of variables are available. In the data analysis, a factor analysis module available in STATISTICA was used. Method of extracting factors was principal component analysis. Eigenvalues obtained for subsequent components are shown in Table 3.

Table 3. Eigenvalues obtained for the following principal components

Next number of principal component	Eigenvalue	Total variation percentage	Accumulated eigenvalue	Accumulated percentage
1	2.0934	26.17	2.0934	26.17
2	1.6732	20.92	3.7666	47.09
3	1.2000	15.00	4.9666	62.09
4	0.8550	10.69	5.8216	72.77
5	0.8365	10.46	6.6582	83.23
6	0.5916	7.39	7.2497	90.62
7	0.4365	5.46	7.6863	96.08
8	0.3137	3.92	8.0000	100.00

Source: own work.

In the factor analysis, including principal component analysis, the number of factors that should be adopted for substantive analysis is determined using several methods. The most commonly used are methods are: Kaiser-Guttman rule (WLB), the method of "eigenvalue greater than unity" and scree test proposed by Cattell.

The scree graph presented in Figure 1 was prepared in such a way that the horizontal axis specified consecutive factors, while the vertical axis showed the obtained eigenvalues. The number of factors taken for further analysis should be designated by visible breaking points of the curve, which start the next "screes", *i.e.* at the time of the separation factor, the graph should suddenly change its shape, and after a sharp "jump" it should turn into a "scree" (Sagan, 2004, pp. 180-181). However, it often happens that the graph of factor loadings is ambiguous. In this case, the visualized result of the analysis does not allow firm conclusions, therefore implying a lack of a clearly marked scree. In a situation where the screen test does not reveal an evident final number of factors, one utilizes a method of "eigenvalue > 1". As a result of its use for further

analysis, three factors were identified that explain a total of 62.08% of the variance of the whole set of output variables (Tab. 4).

Figure 1. Cattell scree test
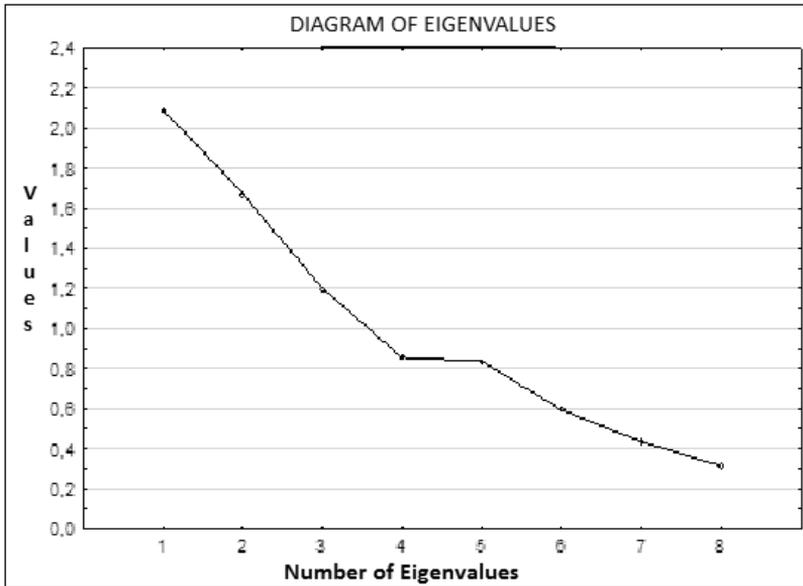
Source: own work.

Table 4. Eigenvalues obtained for the following principal components adopted for the analysis

Next number of principal component	Eigenvalue	Total variation percentage	Accumulated eigenvalue	Accumulated percentage
1	2.0934	26.17	2.0934	26.17
2	1.6732	20.92	3.7666	47.09
3	1.2000	15.00	4.9666	62.09

Source: own work.

The analysis shows that the eight input variables were reduced to 3 dimensions, explaining a total of 62.09% of the total variance. The eigenvalue of the first component is 2.0934. This component explains 26.17% of the variance of the input. All the eigenvalues are greater than 1, which confirms the performance of the abovementioned Kaiser rule. The correctness of the decision of adoption of three factors/components for further analysis is confirmed the graph in Figure 1.

In order to obtain a relatively simple structure of factors, one enabling a substantive interpretation the Varimax rotation (normalized) was used. It allows one to simplify the structure by minimizing the number of variables needed to explain a given factor. It is one of the most frequently used rotation methods, which involves such transformation of factor loadings in space

dimensions that the correlations of some factors are very high, while the other are close to zero. The matrix of the rotation of factor loadings is shown in Table 5.

Table 5. The matrix of factor loadings after Varimax normalized rotation (loads greater than 0.6000 in bold)

Variable	Factor 1	Factor 2	Factor 3
Trust 1	**0.8259**	-0.1886	0.0238
Trust 2	**0.7093**	0.1308	0.1565
Trust 3	0.0487	**0.8974**	-0.0814
Trust 4	-0.0145	**0.8428**	-0.0179
Trust 5	0.0720	0.1100	**0.8229**
Trust 6	-0.4676	0.4131	0.1528
Trust 7	0.0946	-0.1597	**0.7449**
Trust 8	**0.6833**	0.0668	0.1033
Except.	1.8876	1.7811	1.2980
Share	0.2359	0.2226	0.1622

Source: own work.

Relations between the variables in the axes systems providing new synthetic variables/factors are represented by scatter plots (Fig. 2, 3, 4). Those sets of primary variables that most correlated with the factor are marked.

Figure 2. Scree diagram for factors 1, 2
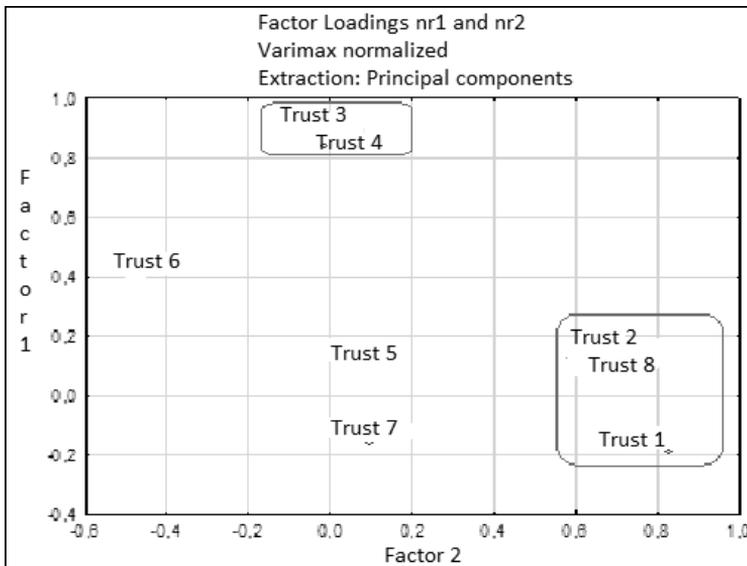
Source: own work.

Figure 3. Scree diagram for factors 1, 3
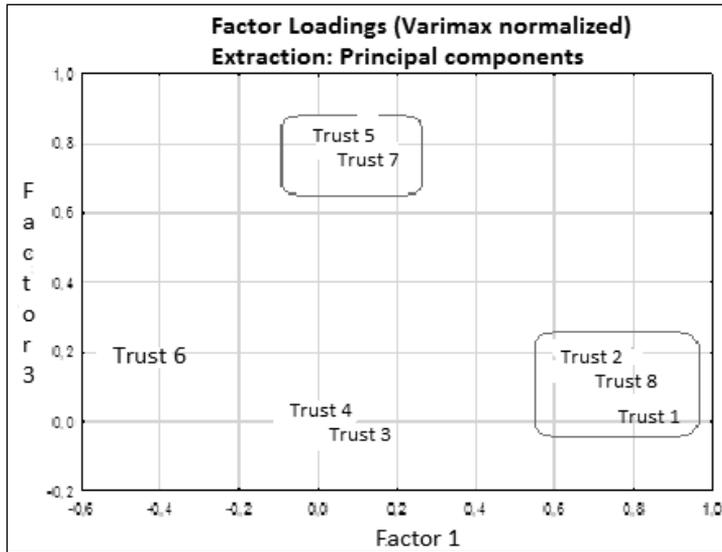
Source: own work.

Figure 4. Scree diagram for factors 2, 3
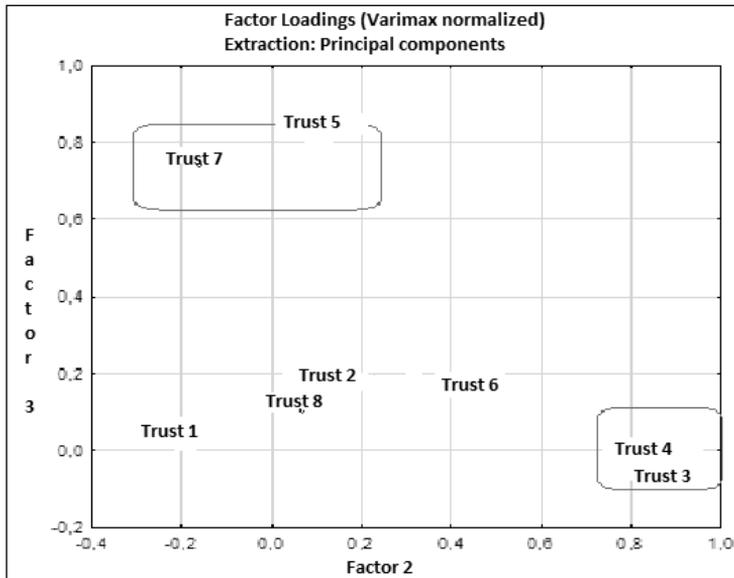
Source: own work.

Taking into account the results shown in Table 5 and Figures 2, 3, 4 the following conclusions can be drawn:
1. The first and the most important factor is associated primarily with the variables: Trust 1, Trust 2 and Trust 8:
   - Trust is essential when buying goods and services in a situation of uncertainty and risk.
   - In the case of transactions marked with risk, trust (*e.g.* between partners to transactions) plays a crucial role.
   - The reputation of the partner to the transaction has a direct impact on the transaction.
2. The second factor was provided by the variables Trust 3 and Trust 4:
   - Trust towards a company and its image does not matter if, as a result of a transaction, the profit is a significant financial benefit.
   - Trust towards a company and its image does not matter if, as a result of a transaction, the profit is a significant financial benefit.
3. The specifics of the third factor are determined by Trust 5 and Trust 7:
   - The choice of purchasing goods and services is affected by the qualifications of the staff.
   - Professionalism of activities and honoring commitments by the partner to the transaction has an impact on its conclusion.

The variable Trust 6 (*Lack of trust in relation to the location of acquisition of goods and services does not affect the decision to buy, if the goods and services are offered at a relatively low price*) was not included in any of the factors. The analysis of the contents of this statement reveals that it does not fit into any of the aspects of the semantic scope of the factors mentioned above, as it focuses, on the one hand, on the location of the transaction, and on the other hand, on a low price. This variable may be the future foundation of another dimension of the scale of trust.

As representatives of the various factors that describe the aspect of trust the following primary variables that had the highest factor loadings were selected. They allowed assigning names corresponding to their specificity and thus:
- A representative of the first factor determined its name as "Trust is essential when buying goods and services in a situation of uncertainty and risk".
- A representative of the second factor decided on calling it "Trust and possible financial profits".
- A representative of the third factor suggested the name "Qualifications and professionalism vs. trust towards a transaction". Accordingly, brief definitions were adopted for each factor, and so the first factor was identified as **"Risk"**, the second one as **"Financial profit"**, and the third one as **"Professionalism"**.

In order to confirm the assumptions of orthogonality of the new variables/factors, a hierarchical analysis procedure was used, thus allowing for the possibility that the extracted factors are correlated. The correlations between non-orthogonal factors are shown in Table 6. In addition, Tables 7 and 8 show an expanded matrix of factor loadings (Tab. 7) along with primary and secondary factor loadings (Tab. 8).

Table 6. The correlations between oblique factors

Next factor	Factor 1	Factor 2	Factor 3
Factor 1	1.0000	-0.1317	0.1568
Factor 2	-0.1317	1.0000	-0.0860
Factor 3	0.1568	-0.0860	1.0000

Source: own work.

Table 7. Extended matrix of factor loadings (loads greater than 0.6000 in bold)

Factors	Correlations of the groups of variables; (oblique factors) with secondary (S) and primary (P) factors		
	Agglomerate (1)	Agglomerate (2)	Agglomerate (3)
S (1)	0.406385	-0.315717	0.370507
P (1)	**0.913702**	0.000000	0.000000
P (2)	0.000000	**0.948853**	0.000000
P (3)	0.000000	0.000000	**0.928830**

Source: own work.

Table 8. Secondary and primary factor loadings (loads greater than 0.6000 in bold)

Variable	Factor			
	Secondary – 1	Primary – 1	Primary – 2	Primary – 3
Trust 1	0.3625	**0.7532**	-0.1331	-0.0420
Trust 2	0.2756	**0.6538**	0.1732	0.1063
Trust 3	-0.2560	0.0991	**0.8589**	-0.0357
Trust 4	-0.2432	0.0334	**0.8062**	0.0255
Trust 5	0.2671	0.0187	0.1508	**0.7746**
Trust 6	-0.2348	-0.4208	0.3773	0.1952
Trust 7	0.3240	0.0301	-0.1105	**0.6865**
Trust 8	0.2661	**0.6297**	0.1077	0.0548

Source: own work.

The very low values of correlation coefficients between the factors (Tab. 6) confirm the fact of orthogonality of the factors obtained. The quite low correlation factor between all three of the secondary clusters (Tab. 7), and the low factor load obtained for the secondary medium and the lack of variables that may explicitly distinguish the factor (Tab. 8) also evidence this fact.

4. Conclusion

Trust is one of the most important elements of the social capital. This has a significant impact on the development of each company and within the wider economic development. Research shows that companies that are characterized by high levels of social trust do better on the market, are more flexible and achieve their planned financial results. However, one must remember that building trust in any organization is a process that should be implemented on many levels.

In accordance with the adopted objective of this study which was an attempt to show the factor space of trust, a pilot study was conducted in two provinces of southern Poland – Malopolskie and Podkarpackie. The basis of this kind of space was a complex Likert type scale. Three dimensions/aspects of trust were distinguished: trust in a situation of uncertainty and risk ("Risk"), trust in achieving financial benefits at the time of a transaction ("Financial profit") and trust towards location of a transaction related to professional approach ("Professionalism"). To sum up, one can carefully conclude that the undertaken attempt to build the factor space can be considered suc-

cessful, although the position six on the output scale suggests that the conceptual framework did not include all dimensions of trust, which will require future consideration of research conducted on a larger sample.

Bibliography

1. Churchill G.A. (2002), *Badania marketingowe. Podstawy metodologiczne*, Warszawa, Wydawnictwo Naukowe PWN.
2. Gatnar E., Walesiak M. (2004), *Metody statystycznej analizy wielowymiarowej w badaniach marketingowych*, Wrocław, Wydawnictwo Akademii Ekonomicznej im. Oskara Langego we Wrocławiu.
3. Grudzewski W.M., Hejduk I.K., Sankowska A., Wańtuchowicz M. (2007), *Zarządzanie zaufaniem w organizacjach wirtualnych*, Warszawa, Wydawnictwo Difin.
4. Hardin R. (2009), *Zaufanie*, Warszawa, Wydawnictwo Sic! S.C.
5. Harrison D., McKnight D., Cummings L.L., Chervany N.L. (1998), Trust. Formation in New Organizational Relationship, *Academy of Management Review*, No. 3.
6. Mynarski S. (ed.) (1992), *Badania przestrzenne rynku i konsumpcji. Przewodnik metodyczny*, Warszawa, PWE.
7. Sagan A. (2004), *Badania marketingowe. Podstawowe kierunki*, Kraków, Wydawnictwo AE w Krakowie.

Reliability of Acting as the Basic Indicator of the High Managerial Capability

Małgorzata Adamska-Chudzińska

1. Introduction

Continuous changeability and an increase in complexity of conditions, in which contemporary enterprises operate, imply emergence of managerial situations that are psychologically hard and mainly characterized with actions taken in circumstances of uncertainty and risk (Bartkowiak, 2009). In such a case, violation of balance between the state of professional capability of the manager and requirements that are imposed on him occurs. Increasing difficulties (changeability, novelty, higher complexity, lack of data, conditions, *etc.*) cause mental discomfort and hinder or prevent effective realization of the management function. In situations of uncertainty and risk, perceived as especially disadvantageous for maintaining the efficiency in action, the probability of effective management is decreasing in a directly proportional manner towards the level of difficulty. At the same time, the way of dealing with such situations decides on possibilities of taking control over the hampering factors, and on returning the past professional capability. Psychologically difficult situations of uncertainty and risk become a field, where capability of the manager – regarding reliability, *i.e.* to regulate professional actions in a way that makes it able to maintain efficient functioning despite disadvantageous circumstances – is revealed (or not). The capability of reliability is a positive, preventive answer for difficulties that appear during the course of action (Ratajczak, 1988; Bartkowiak, 2008, pp. 515-518). It conditions the actions that correspond to current organizational problems.

The capability of reliability presented by managers in situations with elevated level of difficulty determines the possibilities of survival and development of the enterprise within the demanding global market to high extent. The article focuses on deliberations that refer to the level, to which the reliability capability of managers may pose a determinant of a new management paradigm. Psychologically difficult situations and actions will be characterized and classified in the context of reasons that hinder the managerial tasks. The will be an assumption taken that the possibility for reliable action constitutes the basic indicator of the high and long-term managerial capability.

2. Difficult situations as factors distorting managerial capability

Basic criteria for classification of psychologically difficult situations is to point out roots of factors, which hinder maintenance of operating fluency. It is crucial to take a closer look at three of such sources (Terelak, 1995).

- *difficult situations in life*, connected with dissatisfaction of basic existential needs,
- *difficult tasks* which include problematic situations, mainly with cognitive and decisive character (also situations of overwork and straitened),
- *difficult social situations*, which result from unfavorable social relations and effects of such, as well as contradictions of interests or necessity of functioning based on unaccepted social norms (also situations which threaten some precious human values, for example: authorizations, social position, good name or opinions).

It should be noticed that difficult situations which occur during conducting manager's functions and within functioning system: human-management are mainly about two out of three sources: conducting difficult tasks and its realization in difficult social situations. Although, one should not ignore influence of difficult situations in manager's life on his/her activity. Despite the fact that their sources may not be directly connected with work environment, then these can also become a reason for loosing present ability and efficient management.

Because of circumstances which occur in relation: state of work capability of manager-expected results, psychologically difficult managements may be qualified within two main groups (Ratajczak, 1988, pp. 262-264; Lazarus, Folkman, 1984; Heszen-Niejodek, Ratajczak, 2000, p. 14):

- *situations caused by decreasing optimal abilities of manager*,
- *situations resulting from growth of formal surrounding expectations*.

Situations of the first type are about such system of parameters in which there is a violation (decrease) of optimal state of manager's work ability[1]. These may be caused by number of factors which should include:

1. *Psychological factors* which are mainly connected with decrease of level in manager's cognitive functions which include, among others, drop in attention focus, lower memory space, limited noticing ability, limited thinking, changes in motivational and emotional processes. Usually these are a consequence of tiredness, discouragement or stress. These appear together with decrease in motivation level, decrease in self-assessment, growth in fear level (losing a feeling of safety), losing a feeling of social acceptance, decrease in stress resistance which significantly affects managing ability. These factors may occur also as a result of quantity and quality work excess which were included in the second group of difficult situations which are characterized.

2. *Physiological factors*, which are a result of general disturbances in organism functioning and occur in a form of health problems.

3. *Pharmacological factors* which are consequences of medicines' poisonings, toxic substances, gases and as results of addictions and stimulant use. Pharmacological factors may cause

---

[1] Meaning of terms: "manager's capability" and "manager's ability" were similar in this work. Despite the fact that the first one stronger accents aspects of personality and their influence on actions results, then in such case of classification of difficult management situations interchangeable use of two terms is justified by the fact that both of them focus on values of total resources which are accessible for a particular manager. Analogy which was used here also results from limited scope of use in reference books of manager's work ability term in understanding which was accepted in this work.

temporarily decrease of manager's capability but also may firmly decrease his/her work capability.

4. *Environmental factors* which include both material conditions, as well as social relations in operating environment. These may include difficult management conditions underground or in wide open space, above water or under the water, in the air or on heights. Negative influence for effective management is also about social events which are not directly connected with realization of managing tasks, and which a manager is involved into, for example: family problems, unwanted fate occurrences or participation in a private conflict among employees.

Difficult situations of second type management, which are results of growing expectations formed by work surrounding, include:

1. *Disturbances of mode and realization of management functions* which make previous methods of management ineffective. Such situations are connected with occurrence of new tasks as a result of, for example, company's reorganization, change in profile of actions, technological changes, legal regulations' changes, company development or decrease in company's activity. Disturbances within previous system of manager's work also occur in case of changing scope of management, growth in scope of responsibilities and growth in quality demands in work results. Source of growth of expectations may also be about new human resources management policy which included a change in leading style, growth in expectations competences, as well as often changes in employees team (Terelak, 2005, pp. 259-261; Dubrin, 1979, p. 275).

    Special separation within this group are *situations of quantity and quality work overload* because of quite often occurrence in manager's actions. Quantity overload occurs when manager takes too much extra tasks independently from main task; when operations need a lot of attention leaving behind other responsibilities; when task is realized under pressure of time or with insufficient amount of data. On the other hand, quality overload occur when surrounding' expectations appear as too high according to possibilities and abilities of manager; when actions are connected with huge responsibility; when there is a discrepancy between idealized picture of manager's activity and actual scope of conducted functions.

2. *Disturbances of information processes* which limit confidence and effectiveness of manager. Growth of insecurity in actions may be a result of either lack of knowledge or of discrepancies in information flow, such as: information chaos, contradiction of information, lack or excess of information. These situation cause a feeling of disorientation and cognitive helplessness, which hamper not only decision making but even its possible definition of action alternatives.

3. *Random events which affect organization's activity*, which carry big threats for health and life of employees. This type of events is usually difficult to predict, and occur suddenly and is unexpected. These are all failures (for example of technical equipments) and catastrophes (bumps, gas explosions, sudden atmosphere changes), as well as various events which were unknown before and which cause fear and anxieties which disturb current managing capability.

It should be noticed that between factors which decrease work ability of manager and factors causing a growth of formed expectations toward manager, there is some dependence. Drop of possibilities in conducting management functions on contemporary level, automatically draws a feeling of growing expectations. Similarly difficult tasks with a higher level of responsibility leading towards intensive exploitation of manager's potential result in a decrease of his/her optimal work ability.

All of presented situations are characterized by some dose of factors insecurity during decision making process; its essence, sense and durability. Necessity to operate in such situations

and taking responsibility for results, causes that these situations are really risky. Effectiveness in manager's work, despite occurrence of threatening factors, depends on manager's ability to take regulative actions and pointing his/her unfailing in situations of higher risk. This determines regaining of disturbed balance between realization of managing functions and actual expectations of environment within one functions.

3. Reliability as measurement of managerial capability

Reliability is one of more important characteristics of human behavior because it pictures a reflection of effective actions, especially its continuity in difficult situations. It enables maintenance of work capability, even in changed, unfavorable circumstances within work conditions.

For revealing manager's attitude of reliability, there are conditions which need to be fulfilled, such as: full adjustment to manager's functions; having an access to work which is crucial for effective realization of manager's tasks. The last one is defined within quite stable system of manager-work surrounding. Characteristics of professional adaptation shows general qualities and features of manager in context of standardized requirements of professional surrounding. To smaller degree it also includes such factors influencing operations as: human states (its characteristics at particular moment) and situation changes which modify environment expectations. Analysis of manager's behavior in difficult situations cannot omit matter of changeability of these factors and their influence on course and results. Work effectiveness of manager in new situations or untypical, as well as effect of decrease of one own capability is disturbed cause a loss of balance between actual abilities and current obligations of operating situation. This state disturbs previous adaptation and hampers further capability in manager's job.

System of disturbed relations between manager's abilities and necessities of situation, becomes a place which can reveal reliability of dealing as a positive answer for changing elements in surrounding or inside states of manager. Successful dealing with such psychologically difficult situation will be an example of manager's reliability. On the other hand, reliability to regain disturbed balance in varied conditions, will be a indication of helplessness and existence of limitations in work capability.

For understanding of essence of reliability it is crucial to include extra effort in a form of regulations activity – creative adaptation for changing situations; quick mobilization of one own energy which is necessary to conduct new tasks by manager from changing organization situation, not only consistent with previous accepted patterns of behavior (Ratajczak, 1988, p. 243; Tokarski, 1998, p. 98). High level of activation of regulations in behavior mechanisms causes that in situations of higher level of responsibility, manager is able to mobilize for correct tasks fulfillment which needs a specific actions (Lipka, 2005, p. 74). This specific energy which reveals in psychologically difficult situations, points out that characteristics of such type of behavior cannot be viewed only through criteria of fulfillment or not of standard scope in manager's work; making or not making mistakes within one own management activity.

Explanation of this matter needs distinguishing between two types of mistakes for (Ratajczak, 1988, pp. 238-239):

- *mistakes of individual actions* which are about incorrect fulfillment of own task in standard situations, independently from the way of other elements functioning of system organization;

- *mistakes of cooperation with others* which are about such fulfillment of own tasks which takes a decrease of functioning level of part or total system of organization, in this case a mistake may be even a fully correct fulfillment of own task.

From the above distinction of mistakes arises a fact that correct operating without taking into consideration other's actions, cannot be treated as a factor of reliability. If growth in number of mistakes in typical situations proves fallibility of manager's actions, then reduction of these does not make him/her infallible. Every participant of operating situation must have an awareness of correlation of own and others actions. This awareness is a base for shaping mutual expectations and taking responsibility for its fulfillment. Reliability of manager depends on actual dimension of situation in which one acts and resulting from its actual expectations and its accurate reading and fulfillment according to company interest.

Interpretation of terms fallibility and reliability points out that these are not simple contradictions such as : "is" or "is not". If, from a psychological point, different from mathematical and technical, it would be stated that reliability is "X" then reliability may not only be " – X", but may also appear in its other forms, for example: "Y", "Z", *etc*. Term of manager's reliability is connected with already mentioned functional dependence of all elements within organization systems and its mutual affect.

4. Conclusion

Complexity of tasks and changing situation in which organization functions, places manager in a situation of high expectations in undisturbed effectiveness despite changes which occur in factors. For its characterization it is not enough to have a knowledge of quantity and types of made mistakes, although it may be useful in prevention from such situations in the future. Maintenance of high effectiveness of manager, despite factors which are favorable for mistakes, it forces manager to become infallible, which means: not only not making mistakes, but also fulfillment of necessities noticed by him/her while changing context of organization situation.

The posture of the reliability manifests itself in taking the additional effort in the form of control activities – of creative adaptation to changing situations; of fast mobilization of the own energy essential to perform new tasks read out by the manager from the changing context of a situation of the work, rather than only behaviours in accordance with previously acquired standards. The highest level of stimulating adjustment mechanisms of behaving causes, that in situations about the increased degree of the responsibility the manager is able to focus himself for the correct execution of tasks, of requiring peculiar action. This ability is conditioning effective solving complex organizational problems, and because of that keeping the high-efficiency of the management and providing effective functioning for the organization on the market. In this sense for reliable reacting to problems turning up both in the inner environment of the organization, and in surrounding him to constitute the ability of managers perhaps important component of the new paradigm of the management. The possibility of taking by the manager such specific tasks is connected with the appearance of factors inducing him for searching untypical forms activities (their characteristics will be a subject of the consecutive article under the title: Determinants of Managerial Capability in Circumstances of Uncertainty and Risk).

Bibliography

1. Armstrong M. (2007), *Human Resource Management*, Cracow, Oficyna a Wolters Kluwer Business.
2. Bartkowiak G. (2008), Psychologiczne i społeczne konsekwencje zmian w kontrakcie psychologicznym między pracodawcą a pracownikiem (na przykładzie przedsiębiorstw polskich) [in:] *Kompetencje a sukces zarządzania organizacją*, (eds.) S.A. Witkowski, T. Listwan, Warszawa, Difin.
3. Bartkowiak G. (2009), *Człowiek w pracy. Od stresu do sukcesu w organizacji*, Warszawa, PWE.
4. Dubrin A.J. (1979), *The Practice of Managerial Psychology*, Warsaw, PWN.
5. Heszen-Niejodek I. (2000), Stres i radzenie sobie – główne kontrowersje [in:] *Człowiek w sytuacji stresu. Problemy teoretyczne i metodologiczne*, (eds.) I. Heszen-Niejodek, Z. Ratajczak, Katowice, Wyd. UŚ.
6. Katz D., Kahn R.L. (1979), *The Social Psychology of Organizations*, Warsaw, Wydawnictwo Naukowe PWN.
7. Lazarus R.S., Folkman S. (1984), *Stress, Appraisal and Coping*, New York, Springer.
8. Lipka A. (2005), *W stronę kwalitologii zasobów ludzkich*, Warszawa, Difin.
9. Lipka A. (2002), *Ryzyko personalne. Szanse i zagrożenia zarządzania zasobami ludzkimi*, Warszawa, Wydawnictwo Poltext.
10. *Psychologia pracy i organizacji* (2003), (ed.) N. Chmiel, Gdańsk, Gdańskie Wydawnictwo Psychologiczne.
11. Ratajczak Z. (1988), *Niezawodność człowieka w pracy*, Warszawa, PWN.
12. Terelak J.E. (2005), *Psychologia organizacji i zarządzania*, Warszawa, Difin.
13. Terelak J.F. (1995), *Stres psychologiczny*, Bydgoszcz, Oficyna Wydawnicza Branta.
14. Tokarski S. (1998), *Kierowanie ludźmi*, Koszalin, Wydawnictwa Uczelniane Bałtyckiej Wyższej Szkoły Humanistycznej.
15. Tomaszewski T., Kozielecki J., Reykowski J., Frączek A., Kofta M. (1982), Struktura i mechanizmy regulacyjne czynności człowieka [in:] *Psychologia*, (ed.) T. Tomaszewski, Warsaw, PWN.

Chapter 4

Process Risk and the Risk Identification in an Enterprise

Jacek Pera

1. Introduction

Process management is based on numerous economic priorities.

It consists of a systematic evaluation of effects and constant improvement of processes by introducing innovations when the achieved results diverge from the assumed.

This results in a better internal communication in the company and more complete exchange of information. Another important factor in the process management is the creation of a map of processes that exist in the enterprise.

Modern enterprise management is based on a process risk management. A consequence of a complex risk management is a necessity to conduct an independent, centralized inspection. Every company should draw a transparent map of its processes: main (strategic) and auxiliary (complementary).

Every enterprise, that wants to build a long-term competitive advantage and manage the available intellectual capital in an optimal way, ought to build an organizational culture based on the process management.

Process management concentrates on a transfer of strategic goals of a given enterprise to business processes' individual goals, reduction of business activity costs while improving the rendered services. It gives a guaranty that all participants of a given process head towards the achievement of the same and previously defined goal without time, cost and intellectual losses. A diligent description, illustration and "measurement" of the actual state of the organization should constitute a priority task for every manager whose intention is to optimize activities that he is responsible for. A critically important element of the process management is a risk management system that is inseparably connected to it. The system must also be defined, continuously monitored and requires the implementation of necessary actions that aim at reducing or eliminating the risk.

The aim of the study is to present factors that assess the process risk.

The aim of the study has been achieved by elaborating on the following issues:
1. Key aspects of the process approach.
2. Process approach vs. risk.

2. Key aspects of the process approach

An interaction with a company's strategy is one of the key factors of the process approach. Concentration on the processes should take place as part of an intended strategic concept. It is strategy that determines company's goals. Managing through processes is to improve their achievement. It seems that a very essence of this way of management, that is, that every consecutive action undertaken in the process should add a value to the effects of previous actions and provide the desired values to clients, crates favourable conditions for strategy of every company. Process as: "a set of internal actions of a company conducted in order to provide a client with a specific service or product and as: a specific organization of activities in time and space with a well specified data and results, and a clearly defined entrance and exit even facilitates the focusing on the final value". After all a company exists on the market as long as its clients are satisfied with its products and services that fulfil their needs. This relation between a company and demand is obvious. The process approach does not change this relation. It influences the way an enterprise carries out its plans. Its aim is to facilitate it and cause an increase of effectiveness by reducing processes of broadly and generally understood process of providing client with a desired product (or service).

Processes have to be subordinated to achieving the enterprise's goals. Their effectiveness is assessed from the angle of achieving the enterprise's goals and their contribution in it. This is mainly realized through (Chodorowski, 2009, pp. 70-71):

- Determination of milestones for the business activity that can be found at the end of business processes (rationalization of activity) and subsequent configuration of these goals with main goals, as well as with the mission of the institution;
- Appropriate allocation of founds and subsequently a method to reduce costs in those processes (business budgeting); simplifying this issue – making some kind of evaluation and consequently improving efficiency of individual processes;
- Making decisions on the basis of processes (operational management) and presenting this issue more broadly: managing on the basis of so called business lines that can include groups of processes or separate processes;
- Review of the organizational structure of an institution and in particular an analysisof the leading staff resources in possession and others from the point of viewof involvement in various processes (an analogous analysis may also be made for other kinds of resources in the institution) and also "elimination of barriers between departments (cells) and development of their cooperation";
- Quality analysis of previously introduced internal procedures, mainly from the point of view of their eventual negative influence on the course of a given process;
- Description of posts concerning jurisdiction and procedures or standards of customer service on the basis of the worked out posts and subsequently testing on the basis of such model, *e.g.*, employees competence development, customers satisfaction, *etc.*;
- Facilitating complex computerization of an institution, *i.e.*, to some extent an attempt to apply information technology applications to individual processes. In additionin this place an aspect of drawing up business continuity plans (BCP), as part ofa given application, is essentially important in order to, in case of disruptions or breaks in operating of this institution, minimize disruptions in the functioning of business processes supported by this applications;

- Introducing mechanisms of control as part of the processes (construction of the overall internal control system) with simultaneously placing these mechanisms in individual procedures and internal regulations connected with processes, and in other words: building an overall and specific internal control system in the institution that is based on processes;
- System-based method of the internal audit topics planning in such a way that these topics include parts or the whole of individual processes with taking into consideration the frequency of conducting such audits as part of separate processes or their parts.

However, the processes should also have their own goals defined that as a rule referto one of the three: a goal of an organization, clients' requirements/expectationsor *benchmarking* – comparing to the best in separate spheres of business activity. In this way processes realizations are combined with some higher values for an enterprise, each of which conditions the enterprise's success or may lead to it.

Importance of the organizational structure is highlighted when elaborating on process management. Some people even claim that process refocusing is possible as if in another order, after the organizational changes are made. Firstly, an organizational structure must be adjusted, then one must focus on the processes. The structure must be flattened from the very assumption. It must be organized, have an established hierarchy and still remain transparent. If abilities and functions of an enterprise allow, issues concerning the limitation/reduction of the number of levels and cells must be rethought and an effective information management system must be created. The responsibility and the right to make decisions, in an area one is responsible for, might go hand in hand.

The responsibility for a process must not remain on the company management staff – any employee of the company may be appointed (Malec, 2004, p. 399 and subsequent). Disregard of a post one has in the company, this person has to bear in mind three dimensions of the process, for which she is responsible: organizational, financial and substantive.The enterprise internal regulations will regulate the scope of duties, but some standard tasks may be expected. Supervision over the appropriate course of a process and informing about possible differences and disruptions, usually in the form of reports, will certainly fall into this. Usually a person who is appointed responsible for a process – is a specialist in a given field, so that she could control from the substance matter perspective. A person who does not have an engineering degree will not be able to professionally and responsibly control a process, *e.g.*, install sanitary installations. Budget monitoring and managing a team appointed fora given task is also a part of responsibility for the process. The function of coordination is by all means applied here (Bachnik, 2007, p. 163).

The realization of processes is possible due to carrying out a few stages (Czakon, 2004, p. 379). Firstly, processes must be well defined and designed. Identification of the processes may be carried out with a use of different methods, depending on the choice of systematic or situational approach. The first case embraces classical models, including the value chain and the process classification model. The second case concerns mapping (*process mapping*), which means the use of knowledge and terminology characteristic for a specific enterprise. Big Picture is one form of *mapping* (Barczak, Kozina, 2004, p. 165) that presents elements of separate processes together with marking of the mutual relations in the form of a picture.

Figure 1. A project of the process improvement
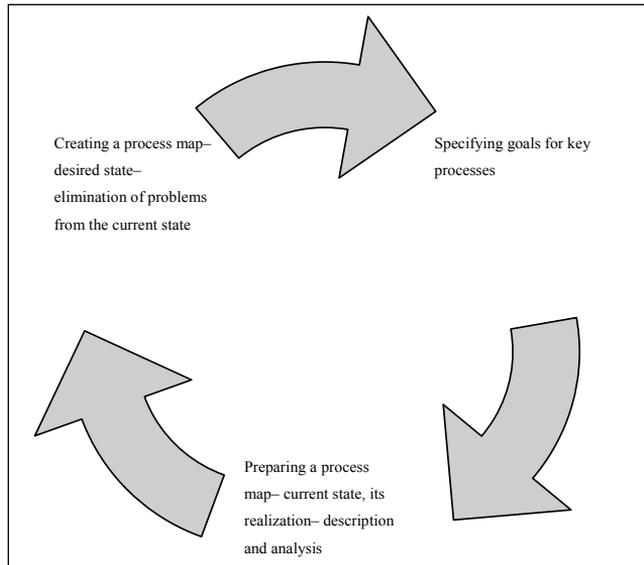
Source: own elaboration on the basis of Bachnik, 2007, p. 165.

Management that focuses on processes is an enterprise organizational system that is difficult for introducing. A very identification of the enterprise processes creates problems, not mentioning the allocation of competences and making changes in the organizational culture. Transfer of burden from previously 'cultivated' functions and resources to processes requires a change of attitude, both of the managing staff and lower levels employees. It is not only an understanding of what means the process managing and how it will influencethe scope of competences of every employee that is at stake, but also the acceptance of this approach. Therefore, a greater chance of success when introducing process managing can be ensured by previously created orientation towards the processes that prepare a companyand its employees for changes. To achieve this, it is vital to (Muszyńska, 2004, p. 373):
- identify and describe (map) processes,
- instil into all employees a conviction of their importance,
- introduce processes' meters,
- pass to processes managing.

Processes managing is not limited only to a single type of enterprise. Practice shows that it can be used in various enterprises without regard for the applied division criterion. Neither the size of an enterprise, nor the profile of its business activity nor legaland proprietary form do not constitute any obstacle to apply the process approach. Marketing companies, insurance companies, logistic organizations, public administration institutions are the examples of companies that introduced process managing and where it performed well (Bachnik, 2004, p. 167).

3. Process approach and a risk

Regardless of its naming convention and classification, process risk is always connected with an element of uncertainty in the future. A risk – according to A. Schmoll – may be seen as a danger that exists on a few independent planes, *i.e.*, (Chodorowski, 2009, p. 81):

- erroneous settlements and decisions,
- failure of action,
- negative deviation from a goal.

In the process managing – a risk is assessed on the level of a given activity as part of a sub-process (process).

At the same time there can be an approach that a risk will be assessed on the level of a process (one level of risk will concern a few activities in the process). Every institution, depending on the process map that was created and its own abilities, decides on what level of this map and with what degree of details the risk assessments should be made.

Introducing a process directive in a company it must be borne in mind that the seven risks, that always accompany this process, must be eliminated. These are situations that inevitably lead to mistakes and failure of the applied processes improvement strategy (Rummler, Brache, 2000, p. 166 and subsequent):

1. Processes improvement were not connected with strategy.
2. Inappropriate employees are engaged in the improvement process and they are engaged in an inappropriate way (this especially concerns the management staff).
3. Teams that improve processes do not have a clearly defined mission of their activity and they are not made responsible for its performance.
4. The managing staff finds that, unless the whole present organization of work is changed (*reengineering* will not be made), substantive results will not be achieved.
5. Individuals who design a new process are not aware of how it will influence those engaged in its realization.
6. The organization is more focused on designing than implementing.
7. The team did not prepare measurement system and other tools necessary to constantly improve the process.

Operational risk plays a vital role in the process managing. Therefore, erroneously operating assets constitute a starting point for operational risk occurrence as a result of, *e.g.*, their inappropriate managing (this in particular concerns people) or the occurrence of unforeseen events in the form of failure and incidents (this mainly concerns IT and security systems). An opinion that, in particular, an employee is the most important potential source of this risk is reinforcing. This leads to process disruption and lose of the enterprise's assets.

Every institution that creates a process map must decide what risk categorization it will make, together with their potential hierarchy. Practice shows that, most often, at least two categories of risks are distinguished, *i.e.*, operational and financial (and/or market). The operational risk, that is the most important risk from the point of view of the process approach, can be divided into, *e.g.*, subcategories of risks connected with (Chodorowski, 2009, p. 83):

- personnel or human resources employees risk,
- technological (IT) and/or security risk,
- risk management on intermediate levels (excluding the Management Board that is most often concerned with strategic risk).

An appropriate construction of the risk map is a very essential issue of the process approach. Its construction – and later interpretation – definitely influences a given process;it also defines what risks and their number will finally determine the process. In order to appropriately identify the process risk – and consequently mitigated it, a good risk map, that is strictly dedicated for a given process, must be created. It must be borne in mind that a well operating process map and risk management system that is based on this map require introducing a uniform naming convention in the institution. As part of this a number of terms that concern an issue of risk management processes must be defined. It must be stressed that terms must be understood and applied in the same way in the whole institution.

To correctly identify the process risk, the following elements must be createdand prepared:

- a map of set processes (and activities included in the individual processes), togetherwith their appropriate hierarchy (*e.g.*, mega processes, processes, subprocesses, activities);
- risk categories that are subject to evaluation, moreover individual risk categories must be assessed prior the use of control mechanisms and other means that restrict them (so called inherent risk level) and after these means have been used (so called residual risk level);
- risk assessment scale (*e.g.*, a good scale is a four-grade scale);
- specification and standardization of risk restriction means (including control mechanisms that are included in those means), together with an assessment of their functioning, *i.e.*, actual ability to lower a given risk;
- a list of KEY Risk Indicators – KRI, together with a database that includes their systematic appraisals;
- keeping records of the internal control results and internal audit results for the purpose ofthe risk assessment;
- the assessment and monitoring of the level of introducing the recommendations and orders formulated as a result of the performed internal audits and internal controls, for the purpose of the risk assessment;
- keeping records on incidents and loses (including financial incidents) for the purpose ofthe risk assessment, together with a defined categorization of gravity of incidents of non-financial character;
- rules (including frequencies) of reporting about a risk (together with a possibility to reportin an instantaneous mode in the event, when such circumstances occur, *e.g.*, emerging ofa risk unacceptable by "local" cell management, where a given process takes place (Chodorowski, 2009, pp. 89-90).

Figure 2.
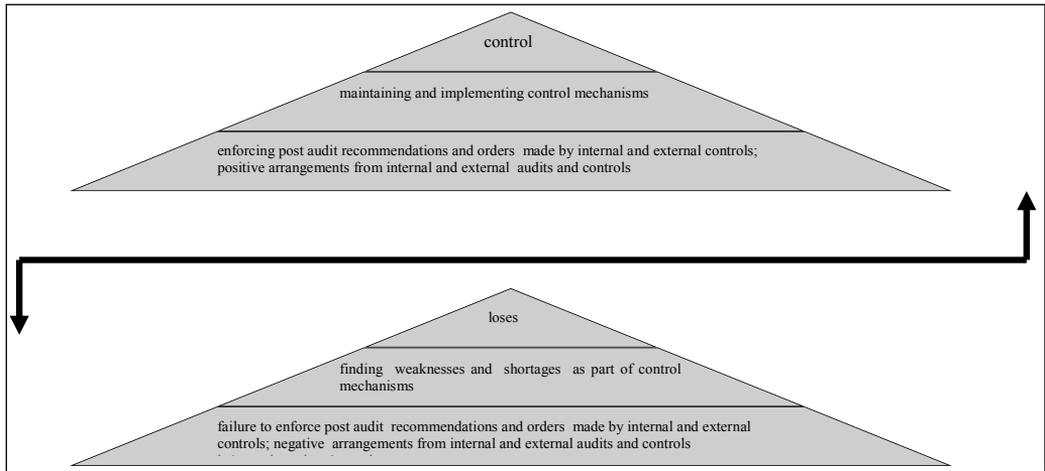
Source: own elaboration on the basis of Chodorowski, 2009, p. 91.

Actions presented in Figure 2 must be based on individual processes, because it is in their scope where one should make reassessment of risks levels.

As a part of a well-constructed process map, created KRI base, measured processes' risks and applied means that mitigate the risk (control mechanisms)and the reporting system, the executive officers will discern "places" (activities) in an institution that are subject to the greatest risks.

Having possessed this knowledge, they will be able to competently manage these risks, mainly by an attempt to limit them to the extent the institution is able to (including directing the financial means to the application of a new or reinforcing already operating risk mitigation centres).

It must be stressed that the aforementioned sensitive "places" will usually have place as a part of some activities included in business processes. The sensitivity of these places can, *e.g.*, result in an occurrence of a substantive number of incidents concerning a given activity of a given process. In this case one must strive to strengthen mechanisms of control in order to prevent those incidents and at the same time mitigate the risk.

From the point of view of managing the continuity of separate IT applications connected with those processes, the identification of critical business processes is also extremely vital. A substantive risk mitigation in relation to those processes will be achieved after so called business continuity plans (BCP) have been drawn and tested. The role of these plans is to minimize disruptions effects that can occur in the operation of an application that is connected with a given process. An immediate activation of business continuity plans should, as a rule, lead to this, that the institution activity included in a given process should be restored forthwith. It can be stated that BCP can be seen as a kind of a strong and at the same time, complex mechanism of control that substantively mitigates a risk in a given processand at the same time prevents disruptions in the operation of IT applications thatare connected with this process.

As a part of the processes' analysis one must strive to find peoplewho are "irreplaceable" from the point of view of the course of these processes. After all,it can happen that a given activity is performed by a single employee who has a unique knowledge and experience. In the event of an illness or leave, and what is worse, in casethat this employee leaves the institution, this will

also result in a disruption of the courseof the process. A personal risk involving this employee should be (before the aforementioned events occur) diagnosed as unacceptable. An appropriate mechanism of control in this scope should be a previous employment and adequate training of an employee who isthe replacement.

A lot of other examples of various aspects of management can be given on the basis of the created process map. However, from the point of view of the risk management, the most important result of such map should be the development of so called institution risk profile, *i.e.*, presentation in which processes the risks are the highest and what kind they are. The KRI's role in this situation cannot also be overestimated, because the observed highest and lowest values of indicators in time can, at the same time, indicate this profile. The risk profile should facilitate the managing of the institution and in particular "sensitize" the executive staff to the key processes from the point of view of the risks that occur (including, *e.g.*, aspect of the above mentioned examples).

Business processes can be modelled and in the substance matter optimized through appropriate IT programs and not only from the point of view of risk (personnel or other), but also by means of other important criteria, *e.g.*, such as efficiency or costs. The optimization of a process, in accordance with this or another criterion, should lead to the liquidation of imperfections and shortages in it. This can, for example, be an elimination from many activities included in the unnecessary activities process, decrease in the use of resources or adding an essential decision making level as a missing mechanism of control *etc*. Thus, an effective modelling processes can lead to, *e.g.*, shortening the time of task fulfilment, reduction of its costs and in particular reduction of a risk by optimizing mechanisms of control.

Modelling the processes that already exist can also lead to the anticipation of some negative events that can have place in the future (failures, bottlenecks in task performance), in other words, allow to avoid risk materialization. Sometimes, it happens that a very process is risky to a great extent and the control mechanisms so much ineffective that the only solution that leads to the effective mitigation of a risk is a fundamental remodelling of the process. However, on the other hand, it must be borne in mind that a process must be modelled only, when this is necessary and not, *e.g.*, out of a sheer pleasure, without any benefit for the institution. An effect of an excessive modelling can simply be some kind ofa form of destabilization of a company, *i.e.* even an increase of risk. Generally, in a dynamic management of an institution the processes modelling, including the point of viewof mitigating the risk, is a very helpful tool (Chodorowski, 2009, pp. 92-93).

4. Conclusion

The more close inspection of processes rather than resources is connected witha necessity of competitive struggle and ceaseless pursuit of long-lasting competitive advantages. The combination of processes together with an ability to stay on a dynamically developing and changing market was noticed, for the first time, by Gold-Bernstein who found process managing a condition to meet market pressure. This convention of perceiving this way of thinking has remained until present. Contrasting the process approach with a classic resources oriented approach aims at making evident the advantages of the first approach inthe aspect of winning a better bargaining position of an enterprise by effective and successful managing, focused on processes.

It is difficult to tell how many companies, whether registered or active on the market, apply methods or tools of the process managing. It seems that even in the case of makinga survey con-

cerning this issue, pollsters might have faced difficulties with answers.Most managers use their own model of management that is based on theories they are familiar with. Namely, this is a blend of different ideas and own experience. It is difficult to ascribe the introduced solutions or proposed procedures to individual methodologies. I believe, thatin practice, nobody is interested in it. The most important issue is the effectiveness ofthe proposed method of management. What counts is the final effect. Probably for this reason the process approach is popularized and used to some extent, possibly even unconsciously (Bachnik, 2004, p. 167).

Bibliography

1. Bachnik K. (2007), Podejście procesowe – sposób na sukces, czy nowinka teoretyczna?, *Studia i Prace Kolegium Zarządzania i Finansów*, No. 80, Warszawa, Oficyna Wydawnicza SGH.
5. Barczak A., Kozina A. (2004), Analiza procesowa w jednostkach administracji publicznej [in:] *Podejście procesowe w zarządzaniu*, (eds.) M. Romanowska, M. Trocki, T. I i II, Warszawa, Oficyna Wydawnicza SGH.
6. Chodorowski L. (2009), Rola podejścia procesowego w ograniczaniu ryzyka, *Ekonomia*, No. 23, Warszawa, Wydział Nauk Ekonomicznych Uniwersytetu Warszawskiego.
7. Czakon W. (2004), Zarządzanie łańcuchem wartości na przykładzie przedsiębiorstwa budowlano-montażowego [in:] *Podejście procesowe w zarządzaniu*, (eds.) M. Romanowska, M. Trocki, Warszawa, Oficyna Wydawnicza SGH.
8. Malec J. (2004), Wdrożenie zarządzania procesowego w przedsiębiorstwie komunikacyjnym [in:] *Podejście procesowe w zarządzaniu*, (eds.) M. Romanowska, M. Trocki, Warszawa, Oficyna Wydawnicza SGH.
9. Muszyńska R. (2004), Wdrożenie procesowego zarządzania oraz Zintegrowanego Systemu Informatycznego w ZE PAK S.A. [in:] *Podejście procesowe w zarządzaniu*, (eds.) M. Romanowska, M. Trocki, T. I i II, Warszawa, Oficyna Wydawnicza SGH.
10. Rummler G., Brache A. (2000), *Podnoszenie efektywności organizacji*, Warszawa, PWE.

Chapter **5**

CSR in the Context of (Un)Favourable Aspects[1]

Katarzyna Hys

1. Introduction

As a concept of management, Corporate Social Responsibility (CSR) has become a permanent part of the contemporary business terminology. From transnational corporations to SMEs, activities being implemented in accordance with the idea of CSR can be identified in every environment. From the entrepreneur's viewpoint, it is important to gain a knowledge of (dis)advantages, opportunities and threats connected with the use of CSR in the internal-external environment.

The aim of this work is to analyse the concept of CSR in the context of consequences of the (non-)use of its ideology in a modern organisation. It is assumed that the concept of corporate social responsibility was introduced to salons of science in the 1930s and 1940s primarily by: A.A. Berle (1932, pp. 1049-1074), E.M. Dodd (1932, pp. 1145-1163), G.E. Sokolsky (1937, pp. 38-44), H.R. Bowen (1953) and M. Heald (1957, pp. 375-384), whose works became largely renowned in subsequent years. And the ideas proclaimed in them became the basis for academic considerations that have been continued on a global scale until today.

According to Lantos (2001, pp. 595-630), there are three approaches to CSR, *i.e.* ethical, altruistic and strategic approaches. The ethical dimension of the concept of CSR is an indication of the attitude of moral responsibility of the enterprise for its business activity. This means that entrepreneurs take measures to prevent any damages that may be a consequence of their activities. The altruistic approach to CSR is a reflection of philanthropic behaviours that are undertaken within the organisation, even if that would require personal or organisational property to be sacrificed – however, they are carried out in accordance with transcendental needs. And the strategic (Lantos, 2002, pp. 205-230) approach to CSR occurs when the principles and ideas of CSR are implemented in a natural manner in the context of care of the good of the society and constitute certain business duties as a part of strategic business aims being implemented within the organisation. CSR is perceived here as a fundamental element of the organisational culture.

Being perceived in the aforementioned categories, corporate social responsibility has become the object of an academic debate. Since the first descriptions concerning the essence of CSR, the concept has met both with voices of understanding and support and with opinions express-

---

ing doubt and criticism. In the literature of the subject many grounds have been identified that may become a basis for (dis)advantages of functioning of CSR within the organisation. In one of the concepts the following aspects being a consequence of the (non-) use of CSR in the enterprise are listed (Bartkowiak, 2011, pp. 22-25):

- moral & ethical aspects,
- financial & economic benefits,
- civilisational benefits, including social and ecological benefits,
- relations between stakeholders in the macro- and microenvironment.

The presented classification will be a basis for reflections on the contemporary perception of the issue of CSR, which will be conducted according to the sequence presented below.

2. The analysis of the idea of CSR in the context of moral & ethical aspects

When analysing the concept of CSR in the context of moral & ethical aspects, we must refer to models being promoted by religions of the world and the broadly understood ethics in comprehensive terms. It is contents of teachings of the Church that shape human attitudes in most of the cases; these attitudes are conveyed and practiced by humans to the extent that they have been assimilated and established. The next factor is the social and political situation that provokes reactions and tendencies to behaviours conforming to the model. When observing the level of advancement in the use of elements of CSR in economies, we can observe a specific situation: the higher the standard of living in a society (community), the stronger the tendency to philanthropic and ethical activities and responsible business. And, on the contrary, the poorer societies (communities) are, the more they concentrate on their own survival, and the issue of social responsibility in a broader context occupies a more distant place on the priority list.

Other connotations are brought by an analysis of religious literature. It seems that the most developed and advanced content with regard to the creation of abundance of management in the context of social responsibility is represented by Catholicism. The teaching of this Church continuously accompanies and follows technological, economic, social, cultural or political changes in the broad spectrum of impacts and in the multidimensional context of human work. As regards other religions (Karczewski, 2012, p. 412), "they are in the process of creation of social teaching and references to science within its framework".

Participating actively in economic life, Christians of various sections can refer to the *common ethical tradition* that has been developed for centuries (Karczewski, 2012, p. 413) "from Jesus Christ, through teaching by Fathers of the Church, Protestant ethics, social philosophy of the Orthodox Church and of the Catholic Church, to the personalistic approach. It is reflected in numerous documents of the Teaching Office of the Church, popes' encyclicals, opinions of the Second Vatican Council or enunciations of individual Bishops" (Grzegorzewska-Ramocka, 2005, p. 47). Heritage is contained in the Gospels, where people, having been created on God's image and after God's likeness, become continuers of the creation of the world through participation in the creation of abundance. The imperative of Christianity – the supreme truth of brotherly love – is treated as a starting point. In practice, this means that any kind of business activity being undertaken by people must conform to God's major commandment (NIV, Mt 22, 39): "you shall love your neighbour as yourself". In this context, social responsibility becomes particularly significant,

because it is treated as a specific string of associations: effectiveness-economicality-ethicalness (3E). Activities being undertaken, irrespective of the party participating in the exchange, are to be just and responsible. In accordance with the principle of the common good, which means that "they encompass a sum of such conditions of social life in which people can achieve their own perfection more fully and quickly" (Jan XXIII, Pacem in terries). It is because "today… the real common good is based primarily on the respect for rights and obligations of the human being" (Jan XXIII, Mater et Magistra).

Many Catholic texts refer to responsibility, including social responsibility, which encompasses the entire humanity, irrespective of borders existing in the geographical sense. The business context in the category of responsibility for decisions being taken considers the heritage of humanity, *i.e.* mutual love in source terms.

Thus, we can conclude that both modern and historical religious texts contain many direct and indirect references to the concept of corporate social responsibility. CSR fits harmoniously into the principles of love, respect and dignity of each human being, irrespective of other circumstances.

The analysis of the idea of CSR in the context of moral & ethical aspects that was carried out here with particular regard to contribution of the teaching of the Church is only an elementary overview of knowledge on that subject. A more profound analysis was carried out and will be published in thematic materials.

3. The analysis of the idea of CSR in the context of financial & economic (dis)advantages

The analysis of the concept of CSR from the entrepreneur's viewpoint has a different character. In this case, the (non-)implementation of the concept within the framework of the organisation depends on disclosed and defined advantages that are usually of financial and economic nature.

Source texts refers to a number of specific motives that cause policymakers to engage in the defining of policies and the implementation of the tasks of CSR in the organisation. However, depending on the context of the analysis, each reason can have bipolar implications. Among elementary factors affecting decisions on the (non-)use of the concept of CSR in the organisation it is necessary to mention, among others (www.odpowiedzialnybiznes.eu):

1. Creation and maintenance of the reputation of the company in the minds of both present and potential customers (Brand Desire, 2012). In other words, the creation of the goodwill of the company, which – in spite of having an immaterial form – is reflected mainly in actual figures in the balance-sheet of the company (*e.g.* in the case of Coca-Cola, intangible values account for 70% of the balance-sheet, where 80% is represented by the brand of the company, www.observatoire-immateriel.com; G. Chadwick states that "85% of consumers think that the companies proving the implementation of responsible business practices are more valuable, whereas more than half of European consumers state that they are ready to pay more for environmentally responsible products" (Chadwick, 2005).

2. Risk management – entrepreneurs try to work out mechanisms of risk control and stimulation as a part of risk management. The implementation of the concept of CSR with a view to its use for propaganda purposes may become a sort of safety valve for companies. This refers to the situations whose development can be forecasted and where the perception of the organisation's activities can be created through stimulators such as the media in a manner favourable to the enterprise (*e.g.*

referring to opinions of "independent organisations", which are, in fact, completely dependent on the supervising body, the implementation of charity projects, where the main intention is to win favourable publicity for the organisation in respect of marketing). What is meant here, is the attainment of ideological leadership, based on the relative creation of the perception of reality with a tendency to the interpretation of facts in a manner pointing out the favourable aspects of the investment and concealing its negative ones (the "choice of the lesser evil").

3. The competitiveness of the market and positioning (impact alleys) – the promotion of the company on the market as a socially responsible enterprise meets with a very favourable response from the society. In addition, the enterprise can reinforce this effect by making business mergers with CSR in the background, *i.e.* diffusion of brands that have a recognised position on the market. As a result of such merger, the favourable aura spreads out like an umbrella to other products of this company. At the same time, it is a method for reinforcing one's own brand on the market and for controlling niche markets.

4. Relations with investors – this situation is connected with the reputation of the company. The more favourable the perception of the given organisation on the market and the more trust it wins on the market as a responsible enterprise in various respects, the more strongly investors follow the attitude of trust, which results in their increased openness and tendency to make investments. Investors feel comfortable with safe investments, because the market position of the company provides a reinforced guarantee of the investment.

5. Operational effectiveness of the organisation – the implementation of the CSR policy in the organisation is expressed in certain economic values through introduction of reasonable savings on every level of the organisation. The introduction of the principles of CSR, which are otherwise ideologically similar to Japanese ideas of waste reduction, helps to reduce operating costs of business activity (*e.g.* emission of wastes, energy, liquidation of activities that generate redundant costs or unfavourably engage the resources of the organisation while stimulating more effective work).

6. Relations with customers – consumers are one of the primary groups of stakeholders towards whom enterprises are socially responsible. Being increasingly more educated and aware of their rights, customers express increasingly higher requirements towards organisations. Nevertheless, their interests are still violated, which is confirmed by results of inspections by institutions such as the State Trade Inspectorate or the Office of Competition and Consumer Protection. It is, therefore, in the interest of the enterprise to maintain a good reputation among customers, and pro-CSR activities are an ideal platform for the maintenance and growth of relevant influences on the market. Elementary principles of CSR include taking care of interests of all (internal and external) stakeholders.

7. The introduction of CSR affects the evaluation of the level of employees' satisfaction with their work. Employees want to feel that they work in an organisation that acts transparently in accordance with the provisions of law and recognised moral and ethical standards and takes common interests of employees and the organisation into consideration. This includes, among others, issues like equality and non-discrimination, equal rights of women and men, protection and respect of employees' rights, protection of employees' privacy and personal data or the freedom of association. However, it is necessary to notice that the defining of standards of work makes sense at the moment when specific standards are applied on a common scale, irrespective of the geographic location of the plant. If standards are applied selectively, they indicate only a high level of hypocrisy and a high standard of dishonesty.

The indicated reasons of policymakers' interest in the implementation of the CSR policy in the framework of the organisation can be interpreted both favourably and negatively, depending on real motives that stimulate entrepreneurs to act. From the global viewpoint, activities undertaken only as a consequence of determination of economic and financial advantages can be evaluated as typical PR activities that are undertaken only with a view to obtaining benefits in the future. This is fundamentally inconsistent with the ideology of CSR and is a sign of profound hypocrisy. On the other hand, the same activities undertaken by the organisation, but evaluated from the viewpoint of an individual who received support at the given moment, can be evaluated very favourably, and the populistic context (if there was any) is completely irrelevant to such individual. Thus, the evaluation of undertaken activities is a question of room for interpretation.

It seems, however, that the understanding of the idea of social responsibility requires a deeper psychological, emotional and spiritual effort to be made. And this requires both time and maturity.

4. The analysis of the idea of CSR in the context of civilizational (dis)advantages

The comprehensive and general context of the use of the concept of CSR requires looking at civilizational (dis)advantages from a certain perspective. The concept of CSR can and should be a source of impulses for the development of economies if aspects encompassing the interests of all stakeholders are taken into consideration in decisions being made. The aforementioned development will be the result of mutual efforts and will be carried out without disturbing the natural environment and without harmful social consequences – both on a local scale and on a global scale. This leads to one essential question: since this is so simple in ideological terms, why is it so difficult to implement this?

In order to restrict the declarative character of such definition of the essence of social responsibility, it is necessary to support in a general manner the ideas of development of (self-) awareness and maturity of policymakers at each level of public and private administration so that their ideological development could penetrate to dependent levels and would have a chance to move from the strategic level to the operational level.

5. The analysis of the idea of CSR in the context of relations between stakeholders

The issue of relations with stakeholders is considered in management science from the moment of the definition of the concept of the external and internal environment. At that moment, all stakeholders being in interaction with the enterprise were revealed. It is worth recalling the classic definition of E. Freeman (1984, p. 46), according to which "the stakeholder is each person or group that can exert an influence on the given organisation or is influenced by this organisation". The essence of this definition is the indication of the lack of stability within groups of stakeholders. This means in practice that, depending on circumstances, the number and type of stakeholders may change from time to time. It is worth noting that the concept of CSR puts special emphasis on the fulfilment of mutually beneficial relations in the exchange process. Thus, it happens from time to time that the exchanging parties win benefits simultaneously in accordance with the "win-win" principle. Enterprises obtain profits and societies feel in a reciprocated manner the benefits resulting from the interactions undertaken.

6. The analysis of the issue

In the context of the above, there is a clear impression that the concept of CSR appears as a concept of a dual nature. Everything depends on the maturity and awareness of participation in the creation of the new order of the world based on values of social responsibility for one's own activities in the context of impacts on all stakeholders.

In the literature of the subject, we can come across both supporters (Cramer, 2005, pp. 255-266; Carroll, Shabana, 2010, pp. 85-105; Kang et al., 2010, pp. 72-82) and ardent opponents (Maloni, Brown, 2006, pp. 35-52; Jenkins, 2004, pp. 23-34; Sparkes, Cowton, 2004, pp. 45-57; Sanders, 2012, pp. 157-177) of this concept. It is impossible not to refer to Friedman Milton, a classic author in this field. In 1970, he published an article (Friedman, 1970) in which he expressed the view that the corporation as a legal person has no social obligations except profit and that the appropriation of the money of an enterprise for socially useful purposes is a form of taxation of shareholders and customers and means the usurpation of rights to decide on the method of spending revenues. And later he writes (Friedman, 1993, pp. 127-128): "there is only one kind of social responsibility on the part of the business world – to make use of its own resources and to undertake activity in order to increase its own profits as long as this complies with the rules of the game… and to accept free competition without tricks or frauds", leaving the solution of social problems to governmental institutions and persons engaged in this matter.

It seems that the decision on the implementation and the CSR policy must be conscious, autonomous and voluntary. It is necessary to consider the consequences of its implementation (or failure to implement it) in a(n) (un)favourable context in each possible space. Within the meaning of the organisation, the implementation of CSR's activities can:

1. In a favourable sense:
   - influence the development of the organisational culture based on the principles of CSR that will constitute value for all interested parties,
   - work out standards and practices that contribute in a measurable way to the responsible joint management of resources with benefits to all stakeholders,
   - enable businesses to make more effective use of resources of the organisation,
2. In an unfavourable sense:
   - launch mechanisms of the use of the CSR methodology as a typical PR strategy for the purpose of obtaining social support for the presence on world markets, thereby helping to maintain the competitive edge by manipulating information,
   - use the concept of CSR as a platform for the creation of a politically correct image conforming to the standards of social expectations via media (however, it sometimes happens that corporations promoting the significance of CSR abuse employees' rights at the same time by employing children or using other harmful business practices for the benefit of the natural environment),
   - use the ideas of CSR as a subtle tool for reaching consumers by reinforcing the image of identification with their needs and promoting the image of active participation with regard to measures that prevent and adjust unfavourable activities of business entities.

The analysis of texts regarding the use of the concept of corporate social responsibility raises doubts as to the real nature of its use. There is a concern that the idea of CSR is accompanied by policymakers' underlying motives that constitute one of the possibilities of shifting the centre

of gravity of the real problem and using CSR as a smokescreen. The following facts, among others, give rise to concern:

- the first strategies concerning CSR (*e.g.* the dialogue with non-governmental organisations, codes of conduct, social reports) were designed and developed to a large extent by PR companies such as: Burson-Marsteller, E. Bruce Harrison Hill and Knowlton, Corporate Watch, 2002; Rowell, 1996; Stauber, Rampton, 1995),
- in their declarations and conducts, companies seem to act in a specifically selective manner (*e.g.* by presenting their "good practices", they refer to a carefully selected fragment of their activity so as to point out its higher-than-average condition, or compare their "good practices" (that are bad practices) with the worst results in the industry, which results in their inappropriate practices being presented as the best ones in the industry (*e.g.* reduction of emissions is not an elimination of emission of pollutants, the reduction of the accident rate is not an elimination of the accident rate, *etc*).

7. Conclusion

The consideration of CSR in the context of (un)favourable aspects is dominated by topics of a bipolar nature. One of the inherent features of CSR is the fact that, "as in the case of an iceberg, most of CSR activities are invisible, and the relation between stakeholders is aimed at reflecting a 'win-win' situation" (Miller, 2003)*.* How do CSR activities of the organisation appear in this context? Is it only an illusion? Are there any environments in which the reflection of the idea of social responsibility is feasible in its fullest sense?

It seems that until now societies have not reached the level of development that would allow CSR policies to develop on a full scale. In the first place, there must be a transformation of values aimed at commitment to bearing genuine responsibility for decisions being made in the context of any possible consequences that may appear. We cannot rule out the possibility that there are policymakers who undertake an effort to transform their organisation and transfer the rules of its operation to a higher level of the organisational culture out of altruistic and transcendental motives. At the same time, we cannot exclude the possibility that policymakers declaring active engagement in one of the CSR areas conduct the worst industry practices in another area, and CSR is only a camouflage for inappropriate practices. As long as transparent and unified standards[2] of defining and evaluation of socially responsible activities are not determined in an independent manner, any activity in this field will arouse frequent controversies. The lack of a precise definition will open a gate for manipulation and pursuing of a disorientation policy, which contradicts the idea of CSR by nature.

Bibliography

1. Bartkowiak G. (2011), *Społeczna odpowiedzialność biznesu w aspekcie teoretycznymi empirycznym*, Warszawa, Centrum Doradztwa Informacji Difin.
2. Berle A.A. (1931), Corporate Power as Power in Trust, *Harvard Law Review*, 44(7).
3. Bowen H.R. (1953), *Social Responsibilities of the Businessman*, New York, Harper and Row.

---

2   It must be noted that the PN ISO 26000:2012 standard is voluntary.

4. Corporate Watch 'Corporate Profile: Hill and Knowlton', 2002, http://www.corporatewatch.org.uk/?lid=377 [12.08.2013].
5. Dodd E.M. (1932), For Whom are Corporate Managers?, *Harvard Law Review*, 45(7).
6. Ewangelia Mateusza, Mt 22, 39; Biblia Tysiąclecia (NIV).
7. Freeman R.E. (1984), *Strategic Management: A Stakeholders Approach*, Boston, Pitman.
8. Friedman M. (1970), The Social Responsibility of Business is to Increase its Profit, *The New York Times Magazine*, September 13, http://www.colorado.edu/studentgroups/libertarians/issues/friedman-soc-resp-business.html [02.09.2013].
9. Friedman M. (1993), *Kapitalizm i wolność*, Warszawa, Centrum A. Smitha i "Rzeczpospolita".
10. Grzegorzewska-Ramocka E. (2005), *Koncepcja społecznej odpowiedzialności przedsiębiorstwa w marketingu społecznym*, *Monografie. Studia. Rozprawy 49*, Kielce, Wydawnictwo Politechniki Świętokrzyskiej.
11. Heald M. (1957), Management's Responsibility to Society: The Growth of an Idea, *The Business History Review*, 31(4).
12. Heald M. (1960), *The Social Responsibilities of Business: Company and Community, 1900-1960*, Cleveland, Ohio, Case Western Reserve University Press.
13. Karczewski L. (2012), Religia i biznes [in:] *Biznes, etyka, odpowiedzialność*, (ed.) W. Gasparski, Warszawa, Wydawnictwa Profesjonalne PWN.
14. Lantos G.P. (2001), The Boundaries of Strategic Corporate Social Responsibility, *Journal of Consumer Marketing*, 18(2).
15. Lantos G.P. (2002), The Ethicality of Altruistic Corporate Social Responsibility, *Journal of Consumer Marketing*, 19(3).
16. Miller D. (2003), *Unspinning the Globe*, Red Pepper.
17. *PN-ISO 26000:2012, Wytyczne dotyczące społecznej odpowiedzialności*.
18. Rowell A. (1996), *Green Backlash: Global Subversion of the Environment Movement*, Routledge.
19. Sokolsky G.E. (1937), The Bewilderment of Business: Does Business Have a Social Responsibility beyond the Mere Production of Honest Goods at Fair Prices? Two Men Reveal their Points of View, *Nation's Business (pre-1986)*, 25(9).
20. Stauber J., Rampton S. (1995), *Toxic Sludge Is Good for You!: Lies, Damn Lies and the Public Relations Industry*, Common Courage Press.
21. Chadwick G., Profit with a Conscience, *Independent*, http://www.independent.co.uk/environment/profit-with-a-conscience-529298.html [21.03.2005].
22. Jan XXIII, *Pacem in terris*, in 1963-04-11, wwnonpossumus.pl/encykliki/Jan _XXIII/pacem_in_terris [21.03.2005].
23. Jan XXIII, *Mater et Magistra in 1961-05-15*, http://wwwnonpossumus.pl/encykliki/Jan _XXIII/mater_et_magistra [02.08.2012].
24. *Raport: Brand Desire 2012 - The Most Desirable Brand in the World*, http://www.clear-ideas.com/our-thinking/microsites/brand-desire-2012 [26.09.2013].
25. http://www.odpowiedzialnybiznes.eu/39/Korzysci_dla_biznesu/ [02.09.2013].
26. http://www.observatoireimmateriel.com/index.php?option=com_content&view=article&id=1284&Itemid=49&lang=en [01.08.2013].

Chapter **6**

Customer Relationship Management (CRM) as a Source of Competitive Advantage

Magdalena Jajko

1. Introduction

Competitive advantage of an enterprise can be defined as the process of achieving a main position towards a major number of competitors. It results from the ability to offer a product to a client or services fulfilling its expectations in such a way that it is better than from the competitor. Nowadays we can observe the market is changing. That is why the ability to establish and maintain contacts with clients became a factor that enables to strengthen the position on a market (Kwiecień, Żak, 2013). The capital included in the relation with clients gives rational advantages to the organizations. It creates new ideas and creative solutions concerning new products and services. Moreover it also improves current products. It can be stated that clients became partners in the organization. In order to gain knowledge about client`s preferences, needs, expectations and problems enterprises need to gather useful information about customers. Only then they are able to fulfill their expectations I a complex way. The knowledge about client is treated as one of the most important resource of the organization. It has to be accurately systematize and available for all the interested as only then it will be appropriately used. Processing and analyzing the knowledge about clients became easier through implementation the concept of customer relationship management (CRM).

2. Knowledge as an enterprise resource

In contemporary economy the importance of knowledge is still increasing. Knowledge is defined as a "fourth production element" just next to the traditional production factors such as work, soil and an initial capital. I. Nonaka and H. Takeuchi acknowledged that knowledge is becoming the only production factor which decides about company`s competitiveness. It is a knowledge that gives the organizations chances to survive on a global market (Kłak, 2010, p. 35). The organization ability to create knowledge depends on its ability within the field of consolidation and conversion of information that derives from a different sources. According to the theory of organizational learning knowledge is created and spread in the organization in a four-staged process

consisting of: socialization, externalization, combination and internalization (Chan, Khodakarami, 2014, p. 27). Socialization is taking place through common time spending among the group of people or in a specific environment where coworkers are able to exchange their experience between each other. It results in creating a new "tacit knowledge". It is claimed to be a highly personal and unstructured that is why it is difficult to verbalize and forward to other people. Tacit knowledge is created collectively by common experience acquired during task accomplishing, participation in a new work process or using new technologies. Externalization is the articulation of a tacit knowledge into an explicit knowledge. It is clearly defined and systematized and that is why easier to be shared. At the stage of the combination an integration of a formal knowledge can be observed. It derives from a different sources in order to create the resources of a new knowledge. The main aim of the internalization is a conversion of an explicit knowledge into a tacit knowledge. The situation is taking place through the employees individual learning. The sources of a formal knowledge are documents, data base, books, organizational schemes and different kinds of a stored information (Mikuła, 2006, pp. 151-153).

Extremely crucial resource to every organization is a customer knowledge. Customer knowledge can be classified into three categories. The first one is knowledge for customers. These are the resources of information provided to customers by the organization concerning the products and services offered. Second category is knowledge about the client. This kind of knowledge includes basic information about customer's origin, preferences and shopping motivation. Third category is knowledge from the customer. It can be obtained by the organization by means of interactions: "client – organization". Information provided in this kind of approach concerns the way customer see the products and services offered by the company. The knowledge about the client and the knowledge coming from them constitutes the resource that is indispensable for the further development of a lot of internal processes like creating new products or improvement in customer service. Processing, collecting and analyzing the customer knowledge becomes easier through the deployment of customer relationship management concept in the organization (Chan, Khodakarami, 2014, p. 29).

3. Customer Relationship Management (CRM)

There can be a different definitions and interpretations of the term CRM fund in the literature. As stated by B. Thompson CRM is the process of managing the relations with clients and partners. It is a strategy that introduces changes in work organizations and processes. According to the author, technology comprises only the support to the strategy which is definitely the most important. CRM is the entirety of organization actions taken in order to create and maintain permanent relations with customer. It is supported by information technology tools with the purpose of creating a loyal group clients. CRM indicates the following elements:

- client and market understanding (gathering the knowledge about clients and markets which allow appropriate choice on target market),
- development of a product offer,
- communication with a market (acquiring a client and sell implementation),
- customer care (Banasik, Beliczyński, 2003, p. 9).

The implementation of CRM philosophy brings a lot of advantages to organizations. There can be the following benefits distinguished:

- improved ability to target profitable customers;
- integrated offerings across channels;
- improved sales force efficiency and effectiveness;
- individualized marketing messages;
- customized products and services;
- improved customer service efficiency and effectiveness;
- improved pricing (Jones, Richards, 2008, p. 123).

Improved ability to target profitable customers

One of the CRM aims is to build permanent relations with clients. The target of the organization is to improve the client interaction and enhance its values. It is the company that has to choose the relations with utmost values. The significance of the client relation can be evaluated through its profitability. That is the difference between the revenues derived from a given client relation and its costs in a specific period of time. What should be kept in mind is the fact that the customer profitability analysis are conducted in a longer time duration. It sometimes happens the employees draw a false conclusion based on the analysis concerning only one year. Organizations resign from unprofitable clients in favor of those who has lower acquired costs. Even though the formers could have been more profitable in a longer period of time (Lehtinen, Storbacka, 2001, pp. 29-30).

Integrated offerings across channels

Enterprises use a different distributional channels (Internet, personal sell) by which communication with client can be chaotic. Unfair treatment of a client and gradual degradation of his/her loyalty can be caused by such a faulty communication. CRM system helps to streamline the communication between particular channels of distribution (ex. information given by the client while making an order via the Internet can be used by the sellers at the time of a direct contact with customer).

Improved sales force efficiency and effectiveness

Lately, new technology solutions became an important factor streamlining the work of a sales departments. The proper use of a SFA (Sales Force Technology) enables efficiency growth and sellers effectiveness. It becomes easier to gain new clients and enlarge shopping frequency of the present customers thanks to the information flow ex. Warehouse orders or sale prediction.

Individualized marketing messages

Organizations move away from mass marketing. They rather concentrate on customers and not on their own products. CRM system gives the opportunity to personalize the contact with a client and helps to make persistent relation with him. They also support the creation of a brand awareness.

Customized products and services

CRM system provides an information about the needs and client expectations. As a consequence companies are able to prepare offers for personalized products and services and address them to a proper client.

Improved customer service efficiency and effectiveness

Customer service departments are crucial source of information about clients. The purpose of CRM system is to ensure support for personnel of these branches by providing them an easy access to knowledge resources owned by a company. This kind of knowledge gives the opportunity to complex and fast problem solving. As a result the quality of service is highly granted by the customer.

Improved pricing

Efforts to improve pricing effectiveness have focused on understanding costs and ensuring that costs are covered in pricing decisions. CRM technology aids in the allocation of costs to individual consumers and reduces the need to average costs across large groups of customers. CRM systems support better pricing decisions making by increasing a marketer's ability to understand customers' needs and to adjust prices accordingly (Jones, Richards, 2008, pp. 126-128).

4. CRM Informational systems

From the technology perspective, CRM system enables contact with client, provides services, collects, stores and analysis of the data. There can be three categories of CRM system distinguished:

- operational CRM systems,
- analytical CRM systems,
- collaborative CRM systems.

The purpose of operational CRM systems is to automtize internal organization processes In order to improve its efficiency and effectiveness. Additionally, the solutions concerning a support and customer care can be included into this category. (*e.g.* call centers) as well as automation (*e.g.* point of sell systems) and marketing operation automation. Analytical CRM systems enable better behavior, understanding and individual client's needs. This category incorporates various analytical tools such as data mining, data warehouses and online analytical processing (OLAP). Collaborative CRM systems manage and integrate communication channels and customer interaction touch points. To this category we can include: customer portals, e-mail, company websites and web conferencing (Chan, Khodakarami, 2014, p. 30).

In enterprises where CRM system is used there can be the following improvements expected:

- client base organization – client data registration, crucial from the organization point of view *e.g.* contact details, organization structure, business type, trade conditions, potential;
- contacts management – registration and exchange of a data concerning the contacts with clients. It comes from the sales representatives, call centers, telemarketers;
- management of the client account – taking care of order history, purchase, supplies, payments, turnovers;
- implementation of standards, systems and procedures – introduction of a standard characteristic for a company ex. standard sequence of actions or reporting systems;
- portfolio – central distribution among the system users of the actual price list, catalogues, technical documentation, product specifics, literature and offer templates;
- campaign management – creating a contact lists for the mailing and telemarketing purposes. Planning and reporting efficiency analysis and campaign costs;

- data synchronization – ability to work effectively for unlimited number of a system users, the access to the actual online data;
- analysis – compilation of statistics concerning the product activity, campaign, region, individual work place, client or the whole organization;
- integration with different systems – possibility to export and import the data and communication with different systems that support the management;
- e-CRM – integration of the internet communication channel and distribution from CRM, WWW service personalization (Dembińska-Cyran et al., 2004, pp. 363-364).

It should be remembered that it is not only enough to buy CRM software in order to claim that CRM is implemented in organization. This system requires the change in the organization functioning philosophy. There should be all the employees involved to the process of marketing, sell and client contact. However, the use of a proper software, computer equipment and the Internet use can definitely facilitate CRM implementation aims (Banasik, Beliczyński, 2003, p. 12).

5. Complaint management system as an element of customer care techniques

A lot European companies work on a mature and diminish markets where getting a new clients is extremely difficult and expensive. Thus, it is more profitable to keep a current clients and enhancing their purchase frequency (Ruyter de, Brack, 1993, p. 153). Customer relation is not an easy task as despite conducting quality controls it is not possibile to avoid mistakes and errors. An efficient element that helps maintain a high level of client's satisfaction is a complaint management system that works properly. It is an element of a customer care technique. Customer care is the activity of looking after customers, and helping them with any complaints or problems.

Complaint management can be defined as a process of information dissemination in organization for the purpose of identification and adjustment of the client dissatisfaction. Complaint management is a set of strategies targeted to reconstruct client`s satisfaction and organization`s reliability. Customers are dissatisfied from the products or services when they not meet their expectations. Appropriate identification of the dissatisfaction causes is indispensable in order to rebuild a proper policy of client reliance. Having analyzed the results of launching a defective product on a market it should be pointed that the customer loss results in diffusing an unfavorable opinion about the brand and products. As a consequence of using electronical channels, negative opinions about the product and service are able to reach a huge number of potential customers. Clients who complaint provide the chance for the organization to restore its confidence. Information they give refers to the deficiencies observed that give the opportunity to eliminate some system errors in organization (Filip, 2013, pp. 271-275).

The first stage in creating a complaint management system is planning. At this phase it needs to be specified what is the purpose of the organization and what would be the best way to achieve it. Normally, organization set two main goals to complaint managing system which are: to reconstruct and rebuild client's satisfaction and to provide necessary data in order to prevent customer`s dissatisfaction in the future. At this stage there should be necessary resources provided to conduct complaint activity *e.g.* software, computer equipment, telecommunications and office space. After completing the first stage there should be a data collected. It should include an information about the name and the type of a product, location and the date of a purchase, rea-

sons for a complaint and guarantee period. What is more, it is necessary to collect the data that allows communication with client (address, telephone number, preferred communication channel). The next step is to process the data collected at the earlier stage. Complaints are classified and analyzed. Especially important stage of this process is to pass the information to two main groups of stakeholders: management of the company and the clients. The data collected while the complaint analysis can be used in a lot of departments like: marketing, development and research, legal department. People management concerns mainly the action connected with recruitment, training and motivation of employees who work on complaints. Managing the resources refers to designing, introducing and maintaining modern information systems and telecommunication. It makes the work more effective to the people collecting the complaints. System controls is about comparing the initial goals with the achieved ones. If the goals established at the beginning are not achieved, organization should introduce proper corrective actions. By analyzing different parameters like: the average time to consider complaints, maintaining quality or behavioral standards, organization can examine the results of complaint management system use. Companies should also examine if the information provided by the system are used in appropriate way (Ruyter de, Brack, 1993, pp. 155-157).

An efficient complaint management system is extremely useful instrument in building a customer satisfaction. It is crucial not to treat a complaint as another problem to be solved, but as a present given to the organization by a loyal client. Complaints constitute a very valuable information about client's needs and the perception of the product and services offered on a market. It is necessary to elaborate appropriate approach to complaint problem on the basis of which there can be a complaint management system created.

6. Conclusion

CRM is a business strategy that concentrates the company`s actions on the growth of the satisfaction and client loyalty. Those goals can be achieved through a better understanding of a client`s characteristics and buying patterns. An offer prepared with accordance to the customer`s requirements and proper information provided when contacting the client also helps to achieve it. Contemporary markets are characterized by a high level of variability. That is why a prompt reaction, collecting information about trends, creating a stable relationship with customers and conducting proper price policy are necessary elements of the organizations that allow to achieve competitive advantage. Contemporary marketing activities of the company cannot concentrate only on a period of time preceding the purchase. Customer interest should be as equal before as after making a purchase. Only this kind of approach allows to build long-term partnership with customers and that is the content of CRM system.

Bibliography

1. Banasik A., Beliczyński J. (2003), *Zarządzanie relacjami z klientami. Aplikacje systemu CRM*, Kraków, Wydawnictwo Akademii Ekonomicznej w Krakowie.
2. Chan Y.E., Khodakarami F. (2014), Exploring the Role of customer Relationship Management (CRM) Systems in Customer Knowledge Creation, *Information & Management*, Vol. 51.

3. Dembińska-Cyran J., Hołub-Iwan J., Perenc J. (2004), *Zarządzanie relacjami z klientem*, Warszawa, Difin.
4. Filip A. (2013), Complaint Management: A Customer Satisfaction Learning Process, *Procedia – Social and Behavioral Sciences*, Vol. 93.
5. Jones E., Richards K.A. (2008), Customer Relationship Management: Finding Value Drivers, *Industrial Marketing Management*, Vol. 37.
6. Kłak M. (2010), *Zarządzanie wiedzą we współczesnym przedsiębiorstwie*, Kielce, Wydawnictwo Wyższej Szkoły Ekonomii i Prawa im. prof. Edwarda Lipińskiego w Kielcach.
7. Kwiecień A., Żak K. (2013), Relacje z klientami w tworzeniu przewagi konkurencyjnej przedsiębiorstwa, *Zarządzanie i finanse* 4/3, Gdańsk, http://zif.wzr.pl/pim/2013_4_3_18.pdf [23.05.2014].
8. Lehtinen J.R., Storbacka K. (2001), *Sztuka budowania trwałych związków z klientem*, Kraków, Oficyna Ekonomiczna.
9. Mikuła B. (2006), *Organizacje oparte na wiedzy*, Kraków, Wydawnictwo Akademii Ekonomicznej w Krakowie.
10. Ruyter de J.C., Brack A. (1993), European Legal Developments in Product Safety and Liability: The Role of Customer Complaint Management as a Defensive Marketing Tool, *International Journal of Research in Marketing*, Vol. 10.

Chapter **7**

The Design Principles of Enterprises' Organizational Systems in View of Results of the Conducted Researches[1]

Małgorzata Tyrańska

1. Introductory remarks

The operation of enterprises changes with the increasing complexity of their operating conditions. Besides simple repetitive actions – unique actions, called complex undertakings or projects, are becoming more important. These actions require a different approach to management. This approach is termed as project management (Trocki, 2003, p. 11). Nowadays, knowledge of the principles of project management is an essential element of the expertise of management specialists, including management staff.

The purpose of using design principles is the realization of complex undertakings in compliance with adopted assessment criteria, for instance efficiency, effectiveness. Contemporary design is governed by the provisions of law, including financial and accounting regulations, international and trade standards, as well as project management methodologies, procedures for the application of the methods. Examples may include: the safety rules described in the EU Directives, international technical standards issued by ISO, construction law, labour law, company law, environmental regulations, tax and accounting regulations, and rules developed by international organizations, for example Project Management Institute (PMI), International Project Management Association (IPMA).

The design principles of enterprises' organizational systems might be also recognized as customarily accepted ways of actions, characteristic for a particular enterprise.

The purpose of the article is the identification of the design principles of organizational systems applied by management staff in the surveyed enterprises.

In order to achieve pursued objective, on the basis of the analyzed literature was provided an overview of the design principles of organizational systems. Subsequently, the surveyed enterprises were characterized. An essential part of the article devoted to the analysis of design principles used in organizational systems of the surveyed enterprises. The article concludes with

an overview of usability of identified design principles of organizational systems within the context of universal principles proposed by the research team.

2. The overview of design principles of organizational systems

Designing enterprises' organizational systems faces many problems whose solution should be based on certain principles, respected by all project implementers. Commonly, the principle is understood as a thesis, which contains the law governing a particular process. The principle also specifies standards of conduct deemed to be applicable in the implementation of the particular process. In turn, the design principles are general guidelines that shape both systems thinking (a kind of philosophy of design and management), as well as practical action in economic reality (Stabryła, 2006, p. 217). Below are the following examples of design principles, which have general and universal character, subordinated to the idea of a systemic approach (Tab. 1).

Table 1. Design principles according to different authors

Cz. Bąbiński	M. Czerska	A. Stabryła
1. The principle of knowledge of need	1. The principle of knowledge of project need	1. The principle of purposefulness
2. The principle of the necessary certainty of project	2. The principle of realizability	2. The principle of strategic thinking
3. The principle of realizability	3. The principle of flexibility	3. The principle of classification
4. The principle of the unity of structure and form	4. The principle of optimality of project	4. The principle of complementarity
5. The principle of flexibility	5. The principle of methodological rationality	5. The principle of system approach
6. The principle of equal uses system components up	6. The principle of economy in design	6. The principle of regularity
7. The principle of the leading role of synthesis	7. The principle of comprehensive balancing the value of a project	7. The principle of situational approach
8. The principle of optimality		8. The principle of using designers' inventions
9. The principle of objectives hierarchy and a complex balancing of values.		9. The principle of feasibility
10. The principle of economy design information		10. The principle of control

Source: own elaboration based on: Bąbiński, 1972, pp. 301-302; Czerska, 1996, p. 38; Stabryła, 2006, pp. 218-219.

The analysis of examples of design principles classification allows pick out three following principles that each of the given authors considered as necessary for the proper performance of the design process. Therefore, to the canons of design should be included rules: purposefulness, flexibility (situational approach) and realizability (feasibility).

The principle of purposefulness indicates that there should be described intentions, what we want to achieve, determined overall objective of the project, developed objectives' classifier, and anticipated results of indicated aspects (technical, production, economic, social). In turn, adher-

ence to the principle of flexibility comes down to such forming relationships between the product design and the environment, in order to express the mutual compatibility of these parties, respecting the adaptive formula relative to situational performance requirements both in terms of technical, exploitation, environmental, as well as market-based and cultural. The aim of the principle of flexibility is to achieve a "design compromise" as a context of the product design. Whereas, the principle of realizability emphasizes adherence to the practical opportunity of project realization both in terms of technical performances, as well as organizational, financial security of the project and the acceptable level of risk of the project (Stabryła, 2006, pp. 218-219).

Contemporary design is also governed by international rules, developed, inter alia, by Project Management Institute (Tab. 2).

Table 2. The principles of project management according to Project Management Institute

Year	Name	Meaning
2008	*PMBOK Guide*	The best known of PMI standards containing a set of guidelines and best practices concerning project management
2008	*The Standard for Program Management*	Relating to projects program management
2008	*The Standard for Portfolio Management*	Relating to projects portfolio management
2008	*OPM3 Knowledge Foundation*	Compendium discussing the subject of project maturity of organization
2006	*Practice Standard for Work Breakdown Structures*	Standard of creating a division-work standard in project
2007	*Practice Standard for Scheduling*	Standard of creating the project schedule
2007	*Project Manager Competency Development Framework*	Standard describing the competencies of the project manager
2007	*Practice Standard for Project Configuration Management*	Configuration project management
2005	*Practice Standard for Earned Value Management*	Standard describing the method of tracking the progress of work
2007	*Construction Extension to the PMBOK Guide*	Implementation standard of projects in the construction sector
2007	*Government Extension to the PMBOK Guide*	Implementation standard of projects in the government sector

Source: own elaboration based on http://www.pmi.org.pl.

Over the last decade, standards for project management have become increasingly comparable in terms of structure and content. Despite many differences at the detailed level, project management standards comprise (Ahlemann, Teuteberg, Vogelsang, 2009, p. 293):
1. Terminology: one of the most fundamental tasks of project management standards is to harmonize project management terminology, allowing practitioners to communicate without (major) friction.
2. Functions: project management standards typically contain a functional decomposition of project management. This may be in the form of so-called knowledge areas or simply by presenting an outline that structures the field of project management in terms of its main tasks, such as resource management or cost management.

3. Process descriptions: a functional decomposition of project tasks does not usually contain information about the meaningful sequence in which project management tasks should be carried out. Such a sequence is provided by process descriptions that frequently also define which inputs are necessary for certain process steps and what their outputs are.
4. Organizational models: a growing number of standards contain organizational models for executing projects for instance, organizational units such as project offices are introduced and project committees are defined.

The presented design principles are recommendations that underline the basis for research methodologies, detailed methods and techniques being applied in design practice. These examples of the general, universal and institutional design principles can be then elaborated on the specific principles to the designed organizational system, for example, the logistics system, crisis management system, motivation system.

3. The research assumptions

The researches assumed that designing enterprises' organizational systems is the process of decision-making, in which methodological approaches of designers – both management staff and hired external experts (consultants) – play an important role[2]. On the one hand, in forming organizational systems people take part, mainly management staff and external experts (organizational consultants). Relatively permanent dispositions of entities participating in the design of the organization can be described on the basis of analysis of adopting attitudes towards general heuristic procedures, including conducted assessments of usability strategies, principles and methods of design. On the other hand, the design of the organization is conditioned by the situational factors, among which a significant role play not only environmental factors (customers, suppliers, collaborators, competitors) but also the size of the organization, the object of the activity, used technologies, and above all, a strategy considered as a fundamental framegenic factor.

The design process was the subject of researches conducted in 2012 by a team of the Department of Project Management in Warsaw School of Economics under the Prof. M. Trocki. In particular, the aim of the researches was the analysis and critical assessment of concepts, solutions and experiences from the scope of projects' assessment leading to the creation of the comprehensive and coherent concept of the assessment of projects (Trocki, Juchniewicz (eds.), 2013, p. 7).

In turn, in foreign literature are presented results of the researches, the subject of which was the assessment made by 2,339 specialists in the scope of using in practice tools and techniques which are appropriate for project management (Besner, Hobbs, 2012, pp. 24-46). The aim of the following researches was identification of factors determining the effectiveness of project management (Yen-Lin, 2010, pp. 60-70). Results of other researches contribute to the theoretical development of project management in the field of organizational changes (Aubry, Müller, Hobbs, Blomquist, 2010, pp. 766-778). In the literature, are also presented results of empirical researches about applying principles of project management in German and Swiss enterprises. Results of these researches were compiled basing on statements made by 234 participants in an online survey conducted in 2006. As a result of researches, established that principles are rarely

---

[2] The researches were conducted from November 2012 to March 2013 by the team of the Department of Process Management in Cracow University of Economics under the Prof. A. Stabryła.

used in project management in German and Swiss enterprises. In fact, they are usually modified before the application (Ahlemann, Teuteberg, Vogelsang, 2009, pp. 292-303).

In conducted researches made use of a questionnaire addressed to senior managers of management in the surveyed enterprises. The questionnaire contained a set of questions concerning, inter alia, the size and objects of the enterprise, and questions identifying principles being used for the design of enterprises' organizational systems.

The scope of the researches includes the identification of principles being used in the surveyed enterprises: identifying and defining organizational problem, searching for new organizational solutions, determining the amount of considered operational options and the assessment of their usability, and establishing the characteristics of the proposed organizational systems (Tab. 3).

Table 3. The scope of conducted analyses

| **Specification** |
|---|
| 1. The basis for the effective identification of an organizational problem:
 • intuition
 • logic |
| 2. The way of defining the organizational problem:
 • detailed
 • general |
| 3. The way of searching for new organizational solutions:
 • spontaneous
 • ordered |
| 4. Number of considered options of organizational solutions:
 • up to 3
 • more than 3 |
| 5. The assessment criteria of organizational solutions:
 • general
 • detailed |
| 6. The approach to the application of methods in the design of organizational systems:
 • using a smaller amount of more complex methods
 • using a larger amount of more specific methods |
| 7. Utility assessment of methods applying in the design of organizational systems:
 • unambiguity of the obtained solutions
 • simplicity of guidelines and working procedures
 • low time and labour input
 • originality of the obtained solutions
 • flexibility and possibility of modification |
| 8. The most desirable feature of organizational systems:
 • flexibility
 • stability |

Source: own elaboration.

The results of the conducted analysis are presented below.

4. The characteristic of the surveyed enterprises

The surveyed enterprises divided into three groups according to their size. There was distinguished small-sized enterprises employing between 10-49 employees, medium-sized where the employment is between 50-249 employees and large ones with the employment higher than 249 people. Among the surveyed enterprises dominated small-sized enterprises, which comprised 42.13% of all surveyed enterprises. In turn, medium-sized enterprises constituted 26.85%, and large ones 31.02% of all surveyed enterprises. Additionally, within each highlighted category the enterprises were divided due to the nature of its core business into: production, trade and service (Fig. 1).

Figure 1. The structure of the surveyed enterprises
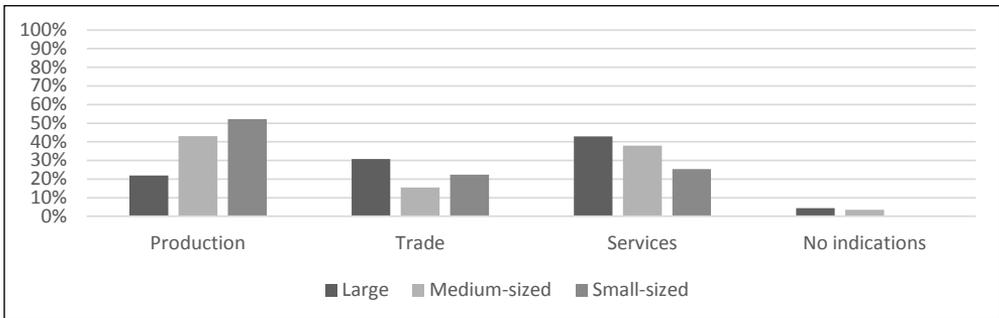
Source: results of conducted researches.

Among small-sized enterprises dominating type of activity is service. Such a kind of activity conducts 42.86% of all small-sized enterprises. 30.77% of small-sized enterprises are engaged in trade activity. In turn, 21.97% are small manufacturing enterprises. 43.10% of medium enterprises are engaged in production, and 37.93% of them in services. Whereas, 15.52% of medium enterprises are engaged in trade activity. The core business of about half of large enterprises is production (52.24%). About a quarter of large enterprises provide services (25.37%), and the other are engaged in trade (22.39%).

5. Identification of the design principles of organizational systems in the surveyed enterprises

The conducted analyses indicate that in the majority of the surveyed enterprises regardless of size and type of conducted activities, the management staff follows logic in the identification of an organizational problem (Fig. 2). In smaller extent, intuition of managers is used. In particular, the logic is the basis of an effective identification of an organizational problem in about 19% of small manufacturing enterprises, 23% of small trading enterprises and 34% of small service enterprises. In medium-sized enterprises, about 35% of management staff of manufacturing enterprises direct by logic, 14% of managers of trading enterprises and 33% of managers of service enterprises. In about 46% of large manufacturing enterprises and 42% of trade and service enterprises, the management staff uses logic as an effective approach to identify an organizational problem.

Figure 2. The basis for the effective identification of an organizational problem by type of enterprises
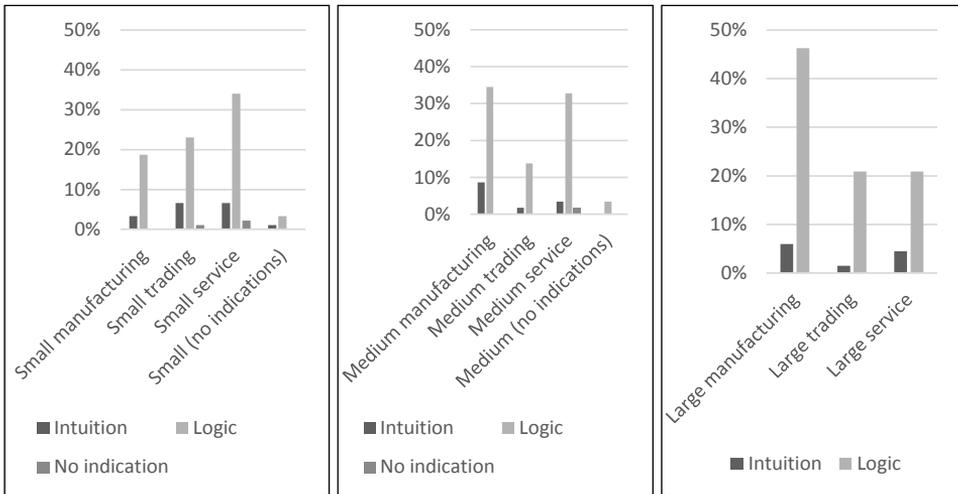
Source: results of conducted researches.

Conducted researches indicated that in the vast majority of the surveyed enterprises the management staff precisely defines the organizational problem (Fig. 3).

Figure 3. The way of defining the organizational problem due to the type of enterprises
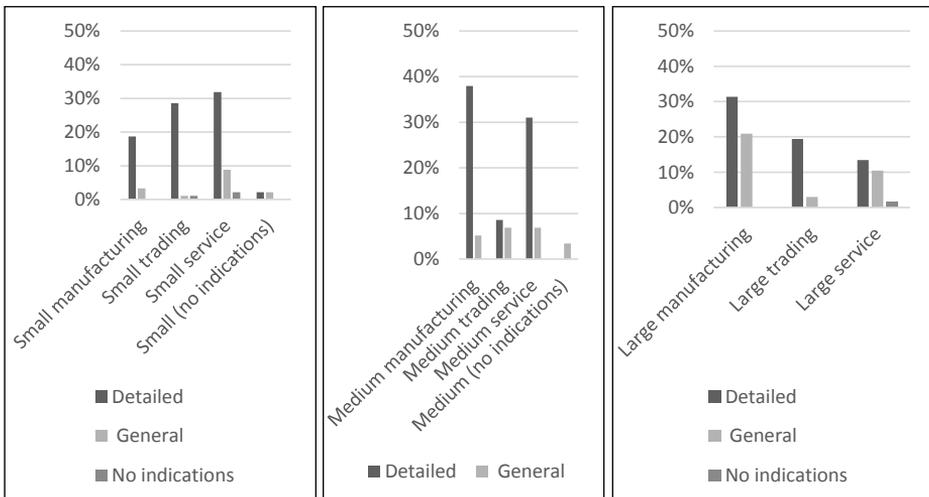
Source: results of conducted researches.

The precise diagnosis of the problem precedes the design process in about 81% of small-sized enterprises, 78% of medium-sized enterprises and 64% of large enterprises. In particular, approximately 19% of managers of small manufacturing enterprises, 29% of managers of trad-

ing enterprises and 32% of managers of small service enterprises precisely define the organizational problem. In medium-sized enterprises, such an approach is used by about 38% of managers of manufacturing enterprises, 9% of trading enterprises and 31% of service enterprises. Of the total surveyed large enterprises, in approximately 31% of manufacturing enterprises, 19% of trading ones and 13% of service ones, the management staff precisely define the organizational problem.

The analysis of the data showed that in the majority of the surveyed enterprises, regardless of size and type of activity, the management staff in an ordered way comes to searching for new organizational solutions (Fig. 4).
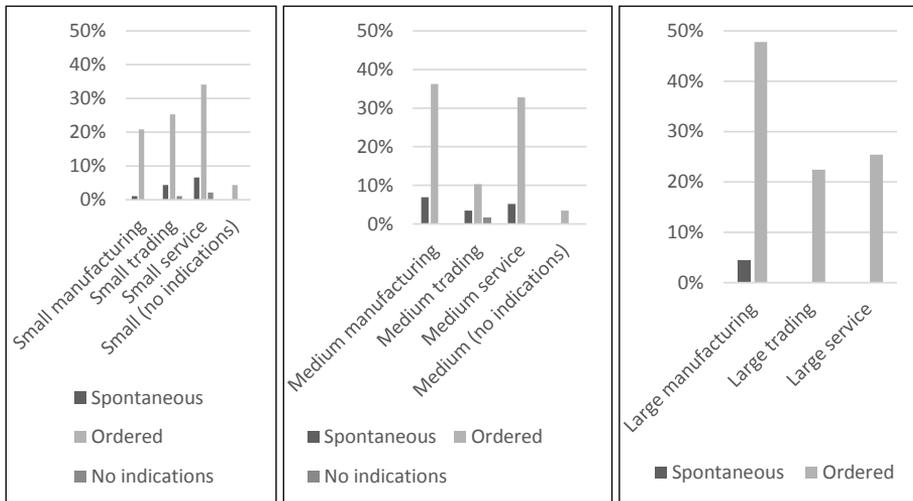
Figure 4. The way of searching for new organizational solutions due to the type of enterprises

Source: results of conducted researches.

Such a method is appropriate for about 85% of small enterprises, 83% of medium-sized enterprises and 96% of large enterprises. In particular, systematic way of searching for new organizational solutions occurs in about 21% of small manufacturing enterprises, 25% of small trading enterprises and 34% of small service enterprises. Among medium-sized enterprises, about 36% of manufacturing ones, 10% of trading ones and 33% of service ones in an ordered way is searching for new organizational solutions. In turn, in large enterprises such an approach of searching for new organizational solutions is practised by approximately 48% of managers of manufacturing enterprises, 22% of trading ones and 25% of service ones.

From conducted researches result that the vast majority of management staff in the surveyed enterprises, regardless of their size and type of activity, consider up to 3 variants of solutions in the design of organizational systems. The other managers take into account more than 3 variants. In particular, the consideration of a maximum three variants of organizational solutions is used by about 79% of managers of small-sized enterprises, 91% of managers of medium-sized enterprises and 82% of managers in large surveyed enterprises (Fig. 5).

Figure 5. The amount of considered options of organizational solutions due to the type of enterprises
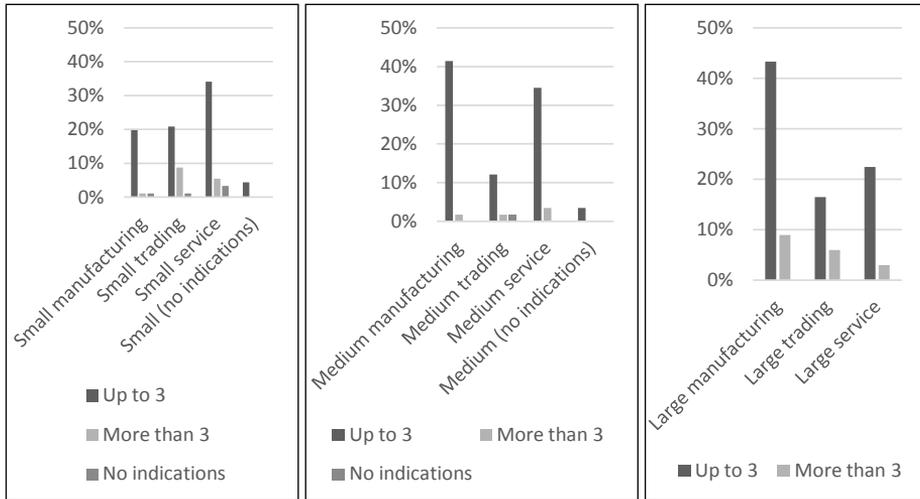
Source: results of conducted researches.

Among the management staff of small-sized enterprises maximum of 3 variants of organizational solutions develop managers of approximately 40% of manufacturing and trading enterprises and 34% of managers of service enterprises. This principle is used by about 53% of managers in the medium-sized surveyed manufacturing and trading enterprises and 35% of managers from medium-sized service enterprises. In favour of the development of maximum of 3 variants of organizational solutions is approximately 43% of managers from large surveyed manufacturing enterprises, and approximately 40% of managers of large trading and service enterprises.

In the majority of investigated management staff indicated that detailed criteria for assessing organizational solutions are applied (Fig. 6). This principle respects approximately 75% of managers of small-sized enterprises, 91% of managers of medium-sized enterprises and 79% of managers of large enterprises. In particular, the detailed assessing criteria of organizational solutions are used in about 14% of small manufacturing enterprises, 24% of small trading enterprises and 33% of small service enterprises. In medium-sized enterprises on the basis of detailed assessing criteria the variants of organizational solutions are assessed by 72% of managers of manufacturing and service enterprises and 16% of managers of trading enterprises. In turn, approximately 42% of large manufacturing enterprises, 18% of trading enterprises and 19% of service enterprises managers also prefer applying the detailed assessing criteria of organizational solutions.

Figure 6. The assessment criteria of organizational solutions due to the type of enterprises
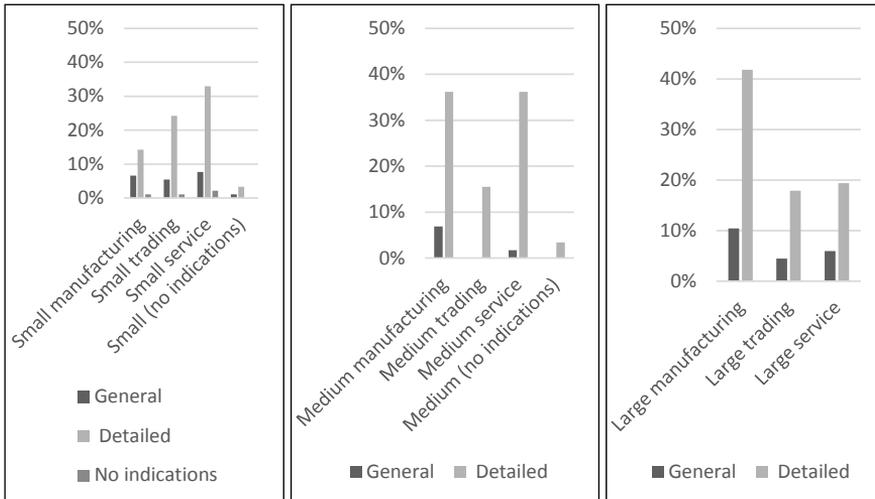
Source: results of conducted researches.

Results of conducted analyses show that in the surveyed enterprises the smaller amount of more complex methods applied in the design of organizational systems (Fig. 7). This principle is applied by approximately 77% of managers in surveyed small enterprises, 85% of managers of medium-sized enterprises and 81% of managers of large enterprises. In particular, 41% of managers working in small manufacturing and trading enterprises and 32% of managers from small service enterprises opted for this principle. In turn, approximately 36% of the management staff from medium-sized manufacturing enterprises, 14% from trading enterprises and 31% from service ones use in the design of organizational systems the smaller amount of more complex methods. Subsequently, in about 45% of large manufacturing enterprises and 45% of large trading and service enterprises managers prefer the analyzed principle.

The management staff of the surveyed enterprises indicated that making a choice of design methods of organizational systems takes into account first, these methods which will ensure simplicity of guidelines and working procedures, second, flexibility and possibility of modification, third, unambiguity of the obtained solutions, fourth, low time and labour input, fifth, originality of the obtained solutions (Fig. 8).

Figure 7. The design methods of organizational systems according to the type of enterprises
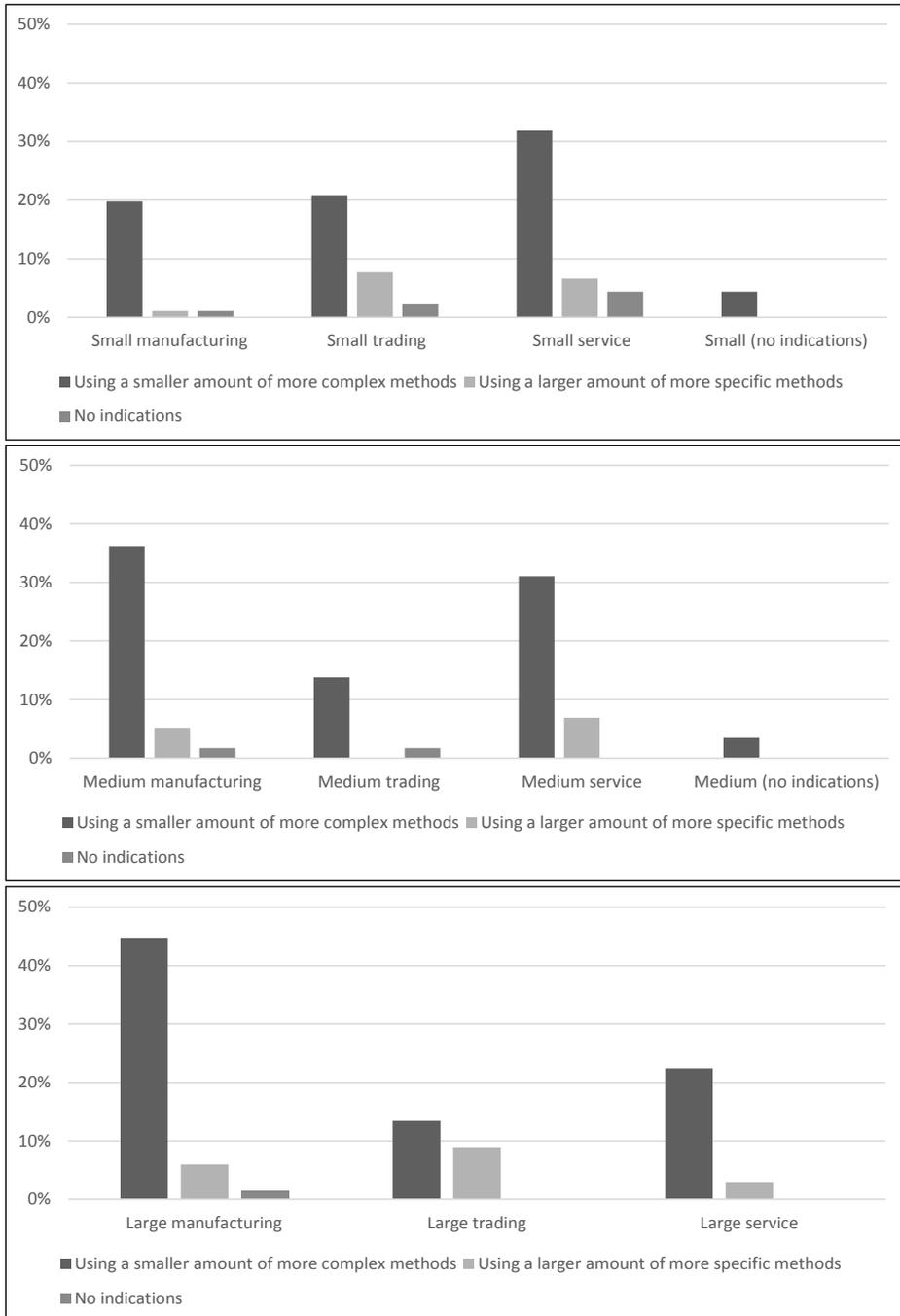
Source: results of conducted researches.

Figure 8. Rank features of methods applying in the design of organizational systems in the surveyed enterprises
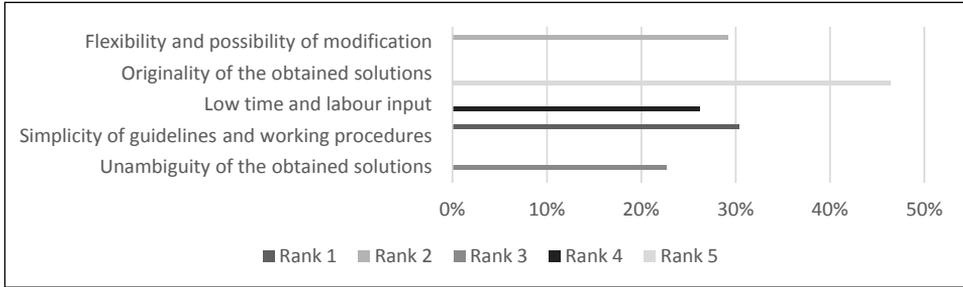
Source: results of conducted researches.

Figure 9. The most desirable features of organizational systems according to the type of enterprises
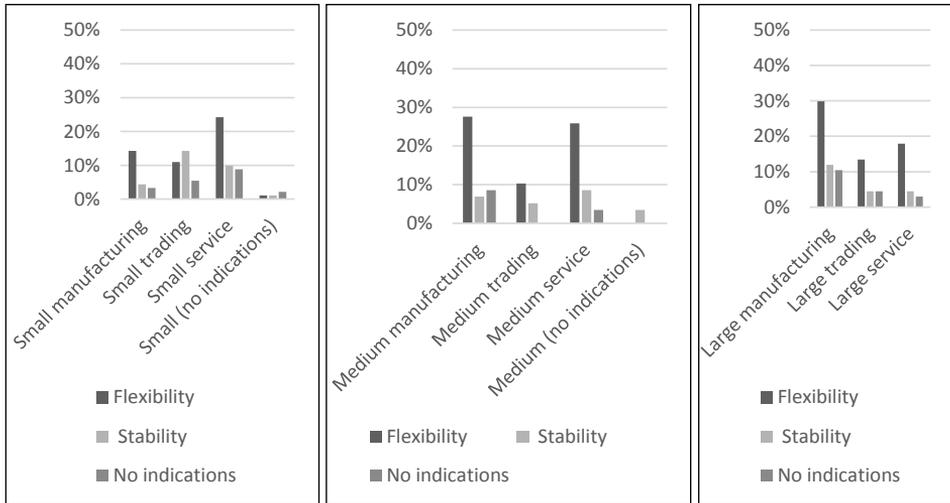
Source: results of conducted researches.

Results of conducted analyses indicate that more than half of the management staff of the surveyed enterprises prefer the design of a flexible organizational systems (Fig. 9). The application of this principle in design indicated approximately 51% of managers of small enterprises 64% of managers of medium-sized enterprises and 61% of managers of large enterprises. In particular, in favour of flexibility of organizational systems was approximately 14% of managers of small manufacturing enterprises, 11% of managers of trading enterprises, and 24% of managers of small service enterprises. In medium-sized enterprises this rule apply about 28% of managers of manufacturing enterprises, 10% of trading ones, and 26% of service ones. In turn, in large surveyed enterprises this principle is applied by approximately 30% of managers of manufacturing enterprises and 31% of trading and service ones.

6. Conclusion

Synthetic results of the analyzes are shown in Table 4. In majority of the companies, regardless of their size and type of business activity, the management staff applies the following principles of the design of organizational systems:
- directing by the logic in identifying an organizational problem,
- detailed defining of an organizational problem,
- an ordered searching for new organizational solutions,
- considering in the design of organizational systems up to 3 variants of solutions,
- applying detailed assessing criteria of organizational solutions,
- using smaller amount of more complex methods,
- providing flexibility of designed organizational systems.

Table 4. Synthetic results of the conducted analyzes

Principles	Specification	Results of the research
1. The basis for the effective identification of an organizational problem	Intuition	14.81%
	Logic	83.33%
	No indications	1.86%
2. The way of defining the organizational problem	Detailed	75.00%
	General	23.15%
	No indications	1.85%
3. The way of searching for new organizational solutions	Spontaneous	10.65%
	Ordered	87.50%
	No indications	1.85%
4. Number of considered options of organizational solutions	Up to 3	83.33%
	More than 3	13.89%
	No indications	2.78%
5. The assessment criteria of organizational solutions	General	17.59%
	Deatiled	80.55%
	No indications	1.86%
6. The approach to the application of methods in the design of organizational systems	Using a smaller amount of more complex methods	80.09%
	Using a larger amount of more specific methods	15.28%
	No indications	4.63%
7. The most desirable feature of organizational systems	Flexibility	57.41%
	Stability	25.46%
	No indications	17.43%

Source: own elaboration.

In the context of the development of enterprises and the economy, worrying are the conservative attitudes of management staff of the surveyed enterprises that emerged during the research. For example, there may be mentioned: indicating by surveyed managers on ordered, not on spon-

taneous way of searching for a new operational solutions, choosing simple methods of design of organizational systems, and not those that will ensure originality of obtained solutions. Conservative attitudes of managers may constitute one of the innovative barriers of enterprises. This problem may constitute an interesting research perspective.

Bibliography

1. Ahlemann F., Teuteberg F., Vogelsang K. (2009), Project Management Standards – Diffusion and Application in Germany and Switzerland, *International Journal of Project Management*, Vol. 27, Iss. 3.
2. Aubry M., Müller R., Hobbs B., Blomquist T. (2010), Project Management Offices in Transition, *International Journal of Project Management*, Vol. 28, Iss. 8.
3. Bąbiński Cz. (1972), *Elementy nauki o projektowaniu*, Warszawa, WNT.
4. Besner C., Hobbs B. (2012), An Empirical Identification of Project Management Toolsets and a Comparison Among Project Types, *Project Management Journal*, Vol. 43, Iss. 5.
5. Czerska M. (1996), *Organizacja przedsiębiorstw. Metodologia zmian organizacyjnych*, Gdańsk, Wydawnictwo Uniwersytetu Gdańskiego.
6. Stabryła A. (2006), *Zarządzanie projektami ekonomicznymi i organizacyjnymi*, Warszawa, WN PWN.
7. *Standardy zarządzania projektami według PMI*, http://www.pmi.org.pl [15.05.2014].
8. Trocki M., Grucza B., Ogonek K. (2003), *Zarządzanie projektami*, Warszawa, PWE.
9. Trocki M., Juchniewicz M. (eds.) (2013), *Ocena projektów – koncepcje i* metody, Warszawa, Oficyna Wydawnicza Szkoły Głównej Handlowej w Warszawie.
10. Yen-Lin K. (2010), The Driving Forces For Design Project Effectiveness, *Journal of Computer Information Systems*, Vol. 50, Iss. 2.

Chapter **8**

The Evolution of Information Management Systems in the Aspect of Development Corporate Governance Rules at the Example of Capital Group Listed on Stock Exchange in Warsaw

Marta Wolska

1. Introduction

Business activities of enterprises, especially those which are bigger and more important for national or global economy have been an object of interests of governments, various institutions and organization for years since proper performance of enterprises sector has a big influence on many aspects of our lives.

Over the years, with different results, attempts have been taken to introduce regulations connected with business activity of companies listened on the stock exchange. Their aim was to create corporate governance rules both from the point of view of economic competitiveness and creation of economic growth as well as other factors such as growth of size and expansion of private capital, globalization of financial markets and also corporate abuses and scandals (Jeżak, 2010, p. 12).

In Poland the Code of Commercial Companies, regulations regarding capital market and Accounting Act constitute the main law regulations. The subject of Corporate Governance wasn't raised until after transformation reforms. Hence, in spite of a lot of initiatives taken, Polish experience isn't so big in comparison to other economies.

Effective management and processes monitoring which take place in companies and this way, indirectly fulfilling the rules of corporate governance is possible through complete information delivered by efficient and well-designed information systems.

2. Corporate Governance experience in Poland

Subject of corporate governance defined as a collection of rules addressed to supervisory bodies, managers, shareholders as well as relating to widely understood management of company

defined by Warsaw Stock Exange[1] dates their development back to transformations reform. In Table 1 below the important events in implementation of Best Practice of Warsaw Stock Exchange (WSE) Listed Companies in Poland after 90 years are shown.

Table 1. Important facts in the evolution of Best Practice of WSE in Poland

Period	Significant events	Description
since 1989	Political reforms in Poland	Processes of companies transformation
1991-94	Establishment of Stock Exchange in Warsaw /WSE	1991 founding act of the Warsaw Stock Exchange signed. Privatization stage
1994-97	Development of Polish Capital Market. Further privatizations	Establishment National Depository for Securities. External development of enterprises
since 1998	Further development of WSE	Stage of restructuring Polish enterprises
2002	First Best Practices of WSE Listed Companies 2002	Polish Best Practice of WSE Listed Companies was worked out by Best Practice Committee
2005	Best Practices of WSE 2005	Amendment to Best Practice of WSE
2007	Best Practices of WSE Listed Companies 2007	Amendment 2 to Best Practice of WSE. Starting the internet service www.gpwinfosfera.pl
2008	Creation of cooperation team to implement Best Practice in Poland	WSE established group of education partners to develop Best Practice. Education partnership WSE
2009	Changes of Code of Commercial Companies and other legal regulations concern companies listened on WSE	Changes in directions of adopting Polish law to European Union directives connected with improvement of Corporate Governance in companies in the European Union
2010	WSE shares newly listed on the exchange	Further development of WSE
2011-13	Next amendments to Code of Best Practice	In 2011 and 2012 WSE approved of the next amendments. Since 2013 the new "Code of Best Practice" has been in force

Source: own work according to http://www.corp-gov.gpw.pl and Aluchna, 2010, p. 283; Czerniawski, 2011, p. 305.

In Poland the concept of Corporate Governance, which was previously associated with owner supervision (Mesjasz, 2011, p. 19), was broadened and is defined as authority structure in enterprise by the agency of which goals, budget and monitoring methods of results are set (Jeżak, 2010, p. 10). In wider, meaning it is a system consisting, on the one hand of external mechanisms and on the other hand of internal regulations and procedures, whose aim is to ensure proper and effective activities of companies listened on Stock Exchange and to solve or at least mitigate conflicts of interest between shareholders and other stakeholders in company (Oplustil, 2009, p. 2) – Figure 1.

---

1   According to http://www.corp-gov.gpw.pl.

Figure 1. Corporate Governance
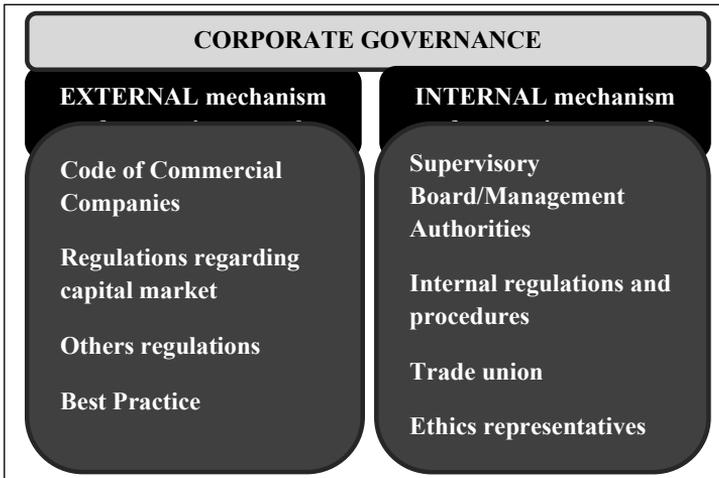
Source: own work according to Jeżak, 2010, p. 10; Oplustil, 2009, p. 2.

Set rules and related duties require the companies in Poland to change their own organization and create systems which are able to provide information needed by shareholders and other stakeholders and to conform to changes in the surroundings.

Amended practices being in force since 2013 recommend performing transparent and effective information policy both with the use of traditional methods, modern technologies and the latest communication tools ensuring speed, safety and effective access to information (website according to investor relations model, suitable communication with investors and analysts).

In addition to information arising from national law, Management Boards shall provide information reports and statements defined by Best Practice.

Since 2006 it is noted that the role of Supervisory Board has gradually increased in supervisory process in Poland, whose participants according to rules III 1 Code of Best Practice for WSE Listed Companies should: once a year prepare and present to the Ordinary General Meeting a brief assessment of the company's standing including an evaluation of the internal control system and the significant risk management system and review and present opinions on issues subject to resolutions of the General Meeting.

Furthermore, the European Union Commission recommendations of 15.02.2005 say that within Supervisory Boards there should be competent audit, strategy, development or organization and management Committees.

Observing transformation process in Poland over the last 10 years it is noted that big changes have taken place in Polish corporation regarding both implementation of modern management trends and adopting IT systems to handling modernized management processes. Costs of these changes were large because they required a lot of money and changing mentality in organization, as it was shown at an example of an analyzed company.

3. The evolution of information systems in the context of shaping effective information policy illustrated by the case of one of capital groups listed at Warsaw Stock Exchange

A presented capital group with 5 thousand employees is organized as a concern type group, where a parent company conducts a supervision over strategic activities of its several subsidiaries and at the same time runs operational activities themselves. The cooperation between subsidiaries resembles concentric order (Romanowska, 2011, p. 150), it means all subsidiaries work for parents company. The Capital Group comprises and has defined strategies and key strategic goals, however, the main priority of the Group is to maximize the value for shareholders.

The decisions to introduce complex computerization of management, production and sales processes had been taken before the company was listed. In 2004 the system my.SAP got under way and encompassed the fundamental areas of company management: production, finance, controlling, sales, investment and overhaul management and storage. In 2005 the company was listed on Warsaw Stock Exchange.

Over the last 10 years substantial changes regarding company and information management both in a parent company and in subsidiaries have taken place. On the basis of the data collected from the company, the most important implementation processes in the years 2004-2014 are synthetically presented below.

2004 process management along with a portal to publish internal regulations and procedures is in operation. The implemented Integrated Management System encompasses quality management as well as environmental and health and safety management. Regular audits inside the organization are held. Moreover, there is also management financial reporting based on the existing provisions, and an internal audit unit subject to the Chief Executive Officer. Implementing SAP system in a parent company. Adjusting accounting system to International Financial Reporting Standards.

2005 construction of investor's relations system. A procedure regarding collection of information for the needs of stock exchange reporting is issued. Reporting according to International Financial Reporting Standards (IFRS).

2006 construction of controlling system and management information, extension of the scope of information, change to a planning system, consolidation of financial forecasts according to IFRS, harmonization of internal and external accounting. The implementation of multiannual planning. The extension of the competences of the Supervisory Board – appointing Supervisory Board Committees – Audit, Strategy, Organization and Management Committee. Centralization and extension of audit unit in a capital group.

2007 works on standardization of reporting systems in subsidiaries and implementation of SAP system in the whole group. Implementation of budgeting and cost monitoring of SAP SEM/BPS. Quarterly cost analysis.

2008 centralization of controlling and management information system in a parent company of the Capital Group. Start-up of an internal controlling portal (Microsoft SharePoint platform) to collect and archive management information from the Capital Group. Reduction of the period of monthly reporting of management information. Further adjustment to the recommendations of Best Practice for listed companies.

2009 implementation of Cost Efficiency Programme. Implementation of annual planning in all subsidiaries after each quarter. Introduction of analytical monthly cost reporting with the indication for savings and clarifying deviations.

2010 implementation of central contract register, documentation management SAP DMS. Implementation of quarterly rewards – quarterly bonus based on execution of quarterly targets.

2011 introduction of more detailed rules for monitoring the execution of strategic goals and corporate risk management system. Extending financial controlling tasks with monitoring the execution of strategic goals, and connecting multiannual financial forecasts with this process. Extending the functionality of Microsoft SharePoint portal with archiving the documentation regarding meetings of the Management Board, Supervisory Boards and analyses related to the decisions taken.

2012 start-up of a platform to monitor identified risks as well as an ongoing update of the risks jeopardizing the targets[2]. Appointing a Committee to monitor the execution of Strategies and Corporate Risk Management. Taking a decision to implement ETRM system *(Energy Trading and Risk Management)* – in the course of implementation. Appointing a Committee on Trading and Price Risk Management.

2013 implementation of project management system. Start-up of an internal portal Enterprise Project Management **(**EPM) to manage and monitor the execution of investment projects.

2014 start-up of human capital management system SAP HCM**,** portal HR (staff data, electronic work cards, leaves, training, working time, and so on).

This chronologically presented improvement process in particular areas and information management systems implemented over the last 10 years show how much has been done and how the organization has changed. Nevertheless, these are not all the implementation processes. Computerization of processes encompassed most operational areas, such as central database about group's customers (CRM), electronic reservation of conference rooms, electronic portal to manage a car fleet, a portal to place orders in advertising materials storage and many others. It is also worth noting that in terms of adjusting the organization, for a few years tasks under CSR business social responsibility have been underway. Since 2013 the Code of Ethics has been in force.

To sum up, over the last few years the main focus, in terms of management, has been placed on strengthening cost efficiency. Besides, corporate risk management has been implemented and the process of planning and monitoring the execution of investment projects has been improved. Modified management processes and implemented tools contributed to the reduction of information delivery time, however, handling the whole process involves significant human resources. Moreover, analysing the expenditure on maintenance and development of IT systems over the last few years it should be noted that those sums are substantial amounting to 20-30 million a year, depending on projects or system modification.

---

[2] Corporate Risk Management system was implemented according to – Enterprise Risk Management – Integrated Framework, The Committee of Sponsoring Organizations of the Tradeway Commission – COSO 2004, Polski Instytut Kontroli Wewnętrznej, 2007, Warszawa, WEMA.

4. Flexibility and effectiveness of information systems against new trends in management

As it was shown at the example, the process of changes in Poland and adjustment to international standards constitute a huge challenge both for companies and workforce; it takes time and quite a substantial financial investment to implement them.

The analyzed capital group is an organization which implemented SAP system and where management is based on functional structure in which costs are monitored according to their place of origin relevant to organizational units. At the same time, IT system enables to allocate costs to products, product groups, distribution channels.

As Kaplan and Norton proved in their research, the organization may be classified as an enterprise in which more than 16 weeks are spent on preparing annual budget (Świderska, 2010, p. 507). It also takes many weeks to prepare a consolidated forecast on a multiannual basis.

In order to combine the process of monitoring of strategic goals execution with annual planning, in 2012 controlling structures undertook the tasks related to monitoring of strategy execution. Last year the preparation of a cumulative base of projects executed in a capital group got underway as well as controllers for project management were appointed in all business segments. All of these are subject to financial planning and monitoring.

The implementation process was long and led to establishing a centralized organization. It was influenced by: senior executives' management style, economic slowdown in 2009 and raising cost awareness amongst the staff due to the necessity to pay off banks' liabilities.

Amongst many advantages of the implemented solutions there is an increase in a number of reports prepared on time. However, despite improving the quality of a planning process there are still deviations from planned results, which is impacted by a high price volatility in an analyzed sector. Cost planning and aggregation of information lead to a situation in which costs are not attributed to processes or tasks assigned to employees for particular quarters according to a motivational system. Monthly results are published in the internal portal. However, due to confidentiality of lots of information, access to it is limited, in particular in other non-financial areas. The manner of allocation of financial means often results in making corrections by the controlling department of the parent company, which in this type of organization may sometimes have discretionary character of division of means among particular members of organization (*e.g.* access to knowledge, budget for training, additional posts). Despite established mechanisms, in reality there is often dilution of responsibilities, as illustrated by functioning of internal decision-making committees. Time-consuming nature of described actions entails the necessity to engage more than 200 people, who work on planning, cost management, preparing external and management information, process, risk and project management, let alone the people accountable for financial statements and IT services.

Criticisms of budgeting processes can be found in many literature data. A key drawback is that a budget cannot be questioned. It is approved by Supervisory Boards and often becomes a historic rather than dynamic budget. A traditional structure of budget categories does not allow to identify necessary measures as it focuses on their financial results (Karmańska, 2006, p. 427).

Nowadays, more and more people opt for a new approach to management present *e.g.* in concepts Beyond Budgeting or Agile Project Management. They involve simplification of processes, quick adjustment to a situation in the surroundings and to customer's needs through decentralization of enterprise management. The concept Beyond Budgeting, promoted by Jeremy Hope and

Robin Fraser, says that management without budgets is not only possible, but even necessary. The examples of implementation thereof can be found in various sectors all over the world, *i.e.* Statoil Oil & Gas in Noway, Handelsbanken Sweden, or Toyota in Japan[3]. Beyond Budgeting does not promote resignation from planning, control and reporting, but it leads to a deeper insight into the essence of enterprise management. The aims of the concept are not only short-term benefits arising from streamlining the decision-making process, but foremost long-term effects arising from a more radical approach of managers and their bigger responsibility. Other benefits include: better aligning of strategic goals with risk, aligning of strategic goals with operational planning and motivational systems, benchmarking facilitation, coordination of actions and greater effectiveness. Concept implementation includes also introduction of other tools, *i.e.* Economic Value Added, Value Based Management, Activity Based Costing, Balanced Scorecard, Strategic Management Accounting, which can fully function provided that an organization is decentralized (Hammer, 2010, p. 9).

As it was mentioned before, corporate risk and project management were implemented in the capital group, but despite attempts to align them other management processes they function slightly on the side. In terms of organization and supervision over risk-related issues they are subject to Finance Division and people from process management and internal audit. A Committee for Strategies and Corporate Risk Management is designated to resolve the risk-related issues, while a Committee for Investment takes investment-related decisions. There is no separate post for a director of risk management. A similar tendency exists in many other companies where reporting threat-related information is subject to Chief Financial Officer[4]. In American literature more frequent is a division into a Board level risk Committee headed by a risk manager and a workshop level team dealing with implementation and reporting of risks which are being identified on a regular basis by core business representatives (Graham, Kaye, 2006, p. 114). In the company in question, specialist software for comprehensive corporate risk management has not been implemented.

In terms of project management big changes have taken place, *e.g.* harmonizing the process of taking investment-related decisions, improving the process of project execution and implementing IT tools. At the moment the biggest progress can be observed in improving the management of the scope, time and costs of the projects.

Summing up, in the analyzed organization there are attempts aimed at further integration of management processes. Despite establishing various types of Committees consisting of directors from different areas, integrating measures does not function well enough at an operational level as well as teamwork is poorly developed, which results from the management style and centralization of a decision-making process.

Observation of changing trends worldwide brings us to the conclusion that the simplification of processes, reduction of bureaucracy and authorizing and empowering employees as well as focus on teamwork, as it is promoted in the concept Beyond Budgeting could contribute to better understanding of strategies, goals, and framework of organization's activities by the employees. It could also bring significant benefits for all the parties, including shareholders and provide more flexibility in the processes of delivering and using information. Based on a presented example of a strongly centralized organization which uses budgeting as one of the most crucial elements

---

[3]   According to http://www.bbrt.org/beyond-budgeting/bb-bbo.html.

[4]   According to research *Zarządzanie ryzykiem i ubezpieczeniami w firmach w Polsce* (2009), AON Polska, p. 27.

of an enterprise management system and bearing in mind weaknesses of this solution presented in literature as well as revolutionary proposals of resigning from budgeting (Beyond Budgeting), one may pose a question if changes in the analyzed capital group or any similar structures in Poland where hierarchical management style is prevailing are possible and if so, when.

5. Conclusion

Information is one of the most important decisive factors affecting economic interests of investors, allowing to reduce risk of losses incurred, and information obligations are treated as a guarantee of governance at a capital market (Szymański, Kocemba, 2013, p. 20).

Today's organizations have to adjust to changing conditions, and changes implemented in some organizations force changes in other. These processes take time and financial resources. Implementation of corporate governance principles as the main element of modern market economy has significantly improved and clarified the rules of functioning of enterprises in Poland, improved their market image and harmonized communication. As it was noted, for example more and more listed companies in Poland implemented the structures of internal audits[5].

At present, corporate governance is examined in different aspects: its impact on competitiveness, role in a process of creating values, impact on strategic management and effectiveness. More and more often, in order to improve corporate governance one can observe proposals promoting new management culture instead of legal procedures (Pozen, 2010, p. 58), or slogans promoting collaborative styles in leadership (Ibarra, Hansen, 2011, p. 73).

One should also be aware that capital market in Poland is quite young compared to other economies and it is often difficult to implement solutions which work in other geographical regions having much longer tradition in this respect. What is crucial is that Polish companies see the changes and build their information systems in a way that provides the biggest flexibility and effectiveness of management processes.

Effectiveness of corporate governance depends on cooperation on many levels, it cannot come down to devoting attention only to supervisory level (Starbuck, 2014, p. 19).

Bibliography

1. Aluchna M. (2010), *Kierunki rozwoju polskich grup kapitałowych – perspektywa międzynarodowa*, Warszawa, Szkoła Główna Handlowa.
2. *Badanie audyt wewnętrzny w polskich spółkach* (2012), Grantthornton, http://grantthornton. pl/audyt_wewnetrzny_w_polskich_spolkach_edycja_2012_0.
3. Czerniawski R. (2011), Kierunki regulacji ustawowych zakresie ładu korporacyjnego w Polsce [in:] Ład korporacyjny, (eds.) D. Dobija, I. Koładkiewicz, Warszawa, Wolters Kluwer Polska.
4. *Enterprise Risk Management – Integrated Framework, The Committee of Sponsoring Organizations of the Tradeway Commission – COSO 2004* (2007), Polski Instytut Kontroli Wewnętrznej, Warszawa, WEMA.

---

[5] According to research *Audyt wewnętrzny w polskich spółkach. Edycja 2012*, http://grantthornton.pl/audyt_ wewnetrzny_w_polskich_spolkach_edycja_2012_0.

5. Graham J., Kaye D. (2006), *A Risk Management Approach to Business Continuity Aligning Business Continuity with Corporate Governance*, Connecticut USA, Rothstein Associates Inc. Publisher Brookfield.

6. Hammer C. (2010), *Is Beyond Budgeting Peculiarly Scandinavian, and If so What Does It Entail for Its Applicability Across the Worlds?*, Institute for Research in Economics and Business Administration, SNF Report NO.13/10, Bergen 2010, www.nhh.no/.../Beyond%20 Budgeting/Hammer.pdf; http://www.law.uj.edu.pl/~kpg/index.php?option=com_content&ta sk=view&id=28&Itemid=77.

7. Ibarra H., Hansen M.T. (2011), Are You Collaborative Leader?, *Harvard Business Review*, July-August 2011.

8. Jeżak J. (2010), *Ład korporacyjny, Doświadczenia światowe oraz kierunki rozwoju*, Warszawa, C.H. Beck.

9. Karmańska A. (2006), Racjonalizacja zarządzania przedsiębiorstwem poprzez wykorzystanie budżetowania opartego na rachunku działań [in:] *Rachunkowość zarządcza i rachunek kosztów w systemie informacyjnym przedsiębiorstwa*, (ed.) A. Karmańska, Warszawa, Difin.

10. Krysik M., Świderska G.K., Warowny P. (2010), Krytyka tradycyjnego budżetowania jako narzędzia zarządzania XXI wieku [in:] *Kontroling kosztów i rachunkowość zarządcza*, (ed.) G.K. Świderska, Warszawa, Difin.

11. *Ład korporacyjny na GPW w Warszawie*, http://www.corp-gov.gpw.pl.

12. Mesjasz Cz. (2011), Ład korporacyjny. Geneza, definicje i podstawowe problemy [in:] *Ład korporacyjny*, (eds.) D. Dobija, D. Koładkiewicz, Warszawa, Wolters Kluwer Polska.

13. Oplustil K. (2009), *Skrypt – Ład korporacyjny*, Materiały do wykładu, Katedra Polityki Gospodarczej, Uniwersytet Jagielloński w Krakowie.

14. Pozen R.C. (2010), The Case for Professional Board, *Harvard Business Review*, December.

15. Romanowska M. (2011), Przekształcenia strukturalne polskich grup kapitałowych [in:] *Grupy kapitałowe w Polsce – strategie i struktury*, (ed.) M. Romanowska, Warszawa, PWE.

16. Starbuck W.H. (2014), Why Corporate Governance Deserves Serious and Creative Thought, *The Academy of Management Perspectives*, Vol. 28, No. 1, Business Source Complete, Uniwersytet Gdański, pp. 15-21, http://dx.org/10.5465/am.2013.0109.

17. Szymański R.F., Kocemba K. (2013), *Obowiązki informacyjne spółek publicznych*, Warszawa, Lexis Nexis.

18. *Zarządzanie ryzykiem i ubezpieczeniami w firmach w Polsce* (2009), AON Polska.

19. http://www.bbrt.org/beyond-budgeting/bb-bbo.html.

Chapter **9**

Using Benchmarking to Achieve Improved Process Performance in the Chemical Industry

Andrzej Brożek, Ewelina Pawłowska, Anna Wieczór

1. Introduction

This article focuses on the subject of using benchmarking as a method of improving a company. A particular attention was paid to possibilities of improving efficiency of processes in an organization with the help of benchmarking.

Benchmarking, also called "comparative analysis", is one of the fundamental concepts of quality management. This term is defined as a continuous process of comparing organizations with the best leaders in the industry (Supernat, 2005, pp. 64-65). The essence of benchmarking is to realize our own weaknesses and notice that someone else is better (Sapa, 2005, p. 37). Benchmarking is closely associated with the process of learning a company, hence this term is sometimes replaced by benchlearning (Supernat, 2005, pp. 64-65).

Benchmarking was first used in the early 80s of the twentieth century in the United States in the company Rank Xerox Co. Since the 90s we can notice the constant increase in the number of companies that have started to use this method. A pioneer in the use of benchmarking in Poland was the financial sector (Grudziewski, Hejduk, 2004, pp. 171-173). Today, however, it is used by a lot of companies operating in different sectors throughout the country.

The purpose of this article is to present the practice of benchmarking in terms of efficiency of processes in the chemical industry. At the outset, the essence, types and theoretical assumptions of benchmarking were indicated. The further part of the article presents the necessary preconditions that have to be fulfilled in order to use benchmarking in a particular enterprise. The article presents different stages of benchmarking. The last part of the article is a practical case study. It shows a company operating in the chemical sector, which uses *internal benchmarking* and *external benchmarking*.

2. Benchmarking – Theoretical assumptions

Benchmarking is a process of improving efficiency of an organization by identifying, analyzing, adapting and implementing solutions that are used in the most efficient companies in the world.

This process is one of the pillars of the learning organization and implementing total quality management (TQM). The purpose of benchmarking is a significant improvement in efficiency of a particular function in a company, a professional speciality or in a process itself (Brilman, 2002, pp. 262-263). It also allows to increase customers' satisfaction and competitive advantage, accelerate the pace of change and increase the ability to use relevant metrics in the management of the organization. Benchmarking is a very useful tool for a business management strategy since it strengthens a process of planning and helps in strategic thinking (Bogan, English, 1994, p. 242). Benchmarking is a process that is constantly evolving and changing in time. It is said that there is a frequent problem of theoretical disorder (Proulx, 2007, pp. 71-75). This problem also noted by John P. Moriarty and Clive Smallman, who claim that publications in the area of benchmarking deal mainly with practical issues rather than the ones belonging to epistemology (Moriarty, Smallman, 2009, pp. 484-486).

National literature frequently cites classification of benchmarking that can be divided into three types, namely: internal, competitive and functional. However, in addition to the above-mentioned types, two American pioneers of benchmarking mentioned another one. Nevertheless, G.J. Balm lists generic benchmarking as a fourth type (Balm, 1994, p. 24) and R.C. Camp distinguishes also horizontal benchmarking (Camp, 1989, p. 68). It should be emphasized that the difference in terminology is important only for formal reasons because in fact, both authors have exactly the same kind of the process in mind.

Internal benchmarking focuses on making comparisons of institutions or compares equivalent functions in a particular enterprise or a network of interconnected organizations. Due to easy access to empirical data, internal benchmarking allows to quickly identify internal differences and establish patterns for further proceedings. Conducting internal benchmarking is the basis for the commencement of competitive, functional and generic (horizontal) benchmarking (Czyż-Gwiazda, 2006, pp. 14-15). Competitive benchmarking is the most difficult kind of the processes discussed because competing firms protect their sample solutions. It should be underlined that units incomparable should not be compared. For example, there would be no meaningful comparison of logistic units producing the same good but on a different scale (Mertins et al., 1993, pp. 27-28). Whereas functional benchmarking relies mainly on the search for such companies from a different industry provided that the comparison depends on selected areas that have similar functions as the organization seeking patterns. It is possible to compare for example the organization of transport, internal communication or procurement processes. Functional benchmarking is considered as the most effective by many authors. What is more, generic (horizontal) benchmarking is a specific case of functional benchmarking because there are processes that run identically regardless of the industry in which the firm operates (Martyniak, 2002, pp. 58-59).

According to E.M. Porter, competitive advantage of a company takes place when the organization produces goods or provides services at a lower total cost of market competitors (Porter, 2001, p. 392). As a result of the process of integration with the European Union, Polish entrepreneurs had to adapt to operate in the new market conditions. The effect of participation in the common European market is a significant increase in competition. This situation forces the business units to take appropriate actions which will seek to obtain the competitive advantage of the company. In the view of the above mentioned argument, using new methods of management is a significant activity. The use of benchmarking is one of such tools (Kuczewska, 2007, p. 5). The next section of this paper includes further development of this theme.

3. Benchmarking in companies' practice

Benchmarking is not however a right tool for any business and it is not possible to carry out benchmarking in every situation. There are a numerous conditions that must be fulfilled in order to use benchmarking in a particular organization. The first important criterion is a structural background and a resource background. A company must have adequate financial resources, time and content-related knowledge. Team members must have relevant and high competence. Another important aspect is a cultural factor which includes values and attitudes within the organization. Benchmarking cannot be used also without the understanding and the awareness of the essence of the processes. The organization is required to have: documentation of processes, measures of their effectiveness of operation and also understanding how the processes affect the competitiveness and success of the company (Węgrzyn, 2000, pp. 100-101). If the organization meets all or at least most of these criteria, there is a very high probability that benchmarking will be successful and will be the key to achieve success by the company (Grudziewski, Hejduk, 2004, p. 181).

The process of implementation of benchmarking is a complex process since success depends on preparation and involvement on a large scale. In literature, a variety of benchmarking methods showing different stages of benchmarking can be found. However, they differ only in detail (Brilman, 2002, p. 265). For each method it is possible to distinguish five common, main stages (Grudziewski, Hejduk, 2004, p. 185). This 5-step benchmarking process is shown in a detailed way by Figure 1.

Figure 1. The process of benchmarking

Source: Grudziewski, Hejduk, 2004, p. 185.

The first step in a benchmarking process is the planning phase, which involves the selection of the process, which will be subjected to benchmarking examination. Then it is necessary to create a group to conduct benchmarking studies. The process should be understood and documented. The measures of the efficiency of the process should be determined (Grudziewski, Hejduk, 2004, p. 186).

The research phase is a moment, in which a list of criteria to be fulfilled for a benchmarking partner should be created. The next task is to identify potential partners, choose and then interact with them (Grudziewski, Hejduk, 2004, pp. 186-187).

The third stage is the observation which is preparation of appropriate questionnaires and transferring them to a benchmarking partner, in order to obtain the necessary data. Information should be collected from other sources as well, and documented. In the final stages of observation it is also very important to check and verify the collected information (Węgrzyn, 2000, pp. 128-134).

The next phase, so-called analysis phase, includes the stages of: normalization of data, identification of differences and their causes (Węgrzyn, 2000, p. 134).

The fifth step in the process of benchmarking is adaptation, which contains particularly the preparation of projects and plans and then their implementation. An important aspect is also monitoring the progress of implementation. The last step in this stage is preparing the final report of the benchmarking study (Węgrzyn, 2000, pp. 140-148).

As follows from the presented model, the benchmarking process should be planned, controlled, monitored, and if necessary, also modified (Bendell, Boulter, 2000, p. 81). This comprehensive approach is essential to implement benchmarking properly. Only in this way benchmarking can bring maximum benefit to a company and will not become only an ineffective project of quality improvement realized without any success.

4. Characteristics of Polish chemical industry

One of the most important branches of the economy in Poland, is the chemical industry. A long tradition of Polish development of chemistry resulting in innovation and consequently, an increase in production and sales, translates into the economic growth. Usually because of an extremely large number of known atoms and connections and due to their specific properties, it is maintained to divide chemistry into organic chemistry, called carbon connection chemistry and inorganic chemistry that deals with connections of other elements, as well as combinations of carbon, which are not, or cannot be considered as derivatives of hydrocarbons (Bielański, 2007, p. 3). However, in industrial practice there is no place for such an isolated division. It is more common for modern chemical industries to move away from a strategy, oriented on product specialization. Such a state is determined by growing competition in the market and most of all by the increase in product innovation. Marketed production of Polish chemical sector in 2012 amounted to more than PLN 131 billion. In the middle of 2013 there were 11 thousand companies in the chemical industry in Poland (Departament Informacji Gospodarczej, 2013, p. 4).

Due to the diversity of products, Polish chemical industry can be divided into several subsectors, each of which is an important pillar of the whole system. Among a large group, there are subsectors of fertilizers, plastics, petrochemical, pharmaceutical and a subsector of building chemistry. The largest companies in the various sub-sectors are:

Table 1. Leading companies in the chemical industry in Poland

Champions of Polish chemical industries	
Subsector	**Company**
Fertilizers	Grupa Azoty S.A., Anwil S.A., Ciech S.A.
Plastics	Synthos S.A., PCC Rokita S.A.
Petrochemical	PKN ORLEN S.A., Grupa LOTOS S.A.
Pharmaceutical	Polfa S.A., BIOTON S.A.
Building chemistry	ŚNIEŻKA Fabryka Farb i Lakierów S.A., SELENA FM S.A.

Source: own work.

Polish production of flagship products in the chemical industry in 2012 is shown in Table 2.

Table 2. Production of major chemicals in 2012

Product	**Unit**	**Number**
Petroleum	K. t	413.7
Rock salt	K. t	253.3
Gasoline	K. t	2,992
Diesel	K. t	8,082
Soda ash	K. t	830
Nitric acid	K. t	1,727
AmAmmonia gas	K. t	940
Liquid ammonia	K. t	967
Nitrogen fertilizers	K. t	1,391
Phosphatic fertilizers	K. t	343
Potassic fertilizers	K. t	257
Plastic total	K. t	1,464
Rectified spilit	K. hl	1,024

Source: *CHEMIK* (2013), Vol. 67, Iss. 11, p. 1147.

Nearly 274,000 people were employed in the production of the chemical sector in 2012. The employment growth rate in the years 2010-2012 was negative only for the production of pharmaceuticals. In the past few years productivity throughout the chemical industry has been increasing, reaching the highest level in the production of chemicals, 786,000 PLN per person in 2012 (Departament Informacji Gospodarczej, 2013, p. 4).

Table 3. Average employment in the chemical sector in 2010-2012

Category	**Average employment (thousands of people)**			**Dynamics of changes**
	2010	**2011**	**2012**	**2010/2012 (%)**
Production of chemical products	68	70	71	*104.4*
Production of pharmaceutical products	23	22	21	*91.3*
Production of rubber products	144	153	155	*107.6*
Total	235	245	247	*105.1*

Source: Departament Informacji Gospodarczej (2013), *Sektor chemiczny w Polsce. Profil sektorowy*, Polska Agencja Informacji i Inwestycji Zagranicznych S.A., p. 6.

5. Examples of using benchmarking tools in the chemical sector

In commercial practice, numerous basic chemical, physical and mechanical processes are used, *e.g.* extraction, distillation, filtration, mixing, drying, absorption, desorption, evaporation and crystallization. Depending on the purpose, unit processes are chosen in the way they would form together one piece. Although technologies of the specified standardized product groups are generally available, each process is unique and depends on technological nuances. An exemplary process of the production of granulated fertilizers shown below, does not deviate from the commonly used methods for preparing granules from a mixture of liquid and solid phases. Generally the combination of the procedure rests upon combining appropriate proportions of liquid with solid in order to obtain agglomerates having suitable physical, chemical and physico-mechanical parametres.

The solid in powder form is sprayed with the working fluid so that the particle agglomerates are formed with a sufficiently strong power of intermolecular bonds.

An exemplary production process of granulated NPK fertilizers:

Figure 2. Example of a production process of fertilizers
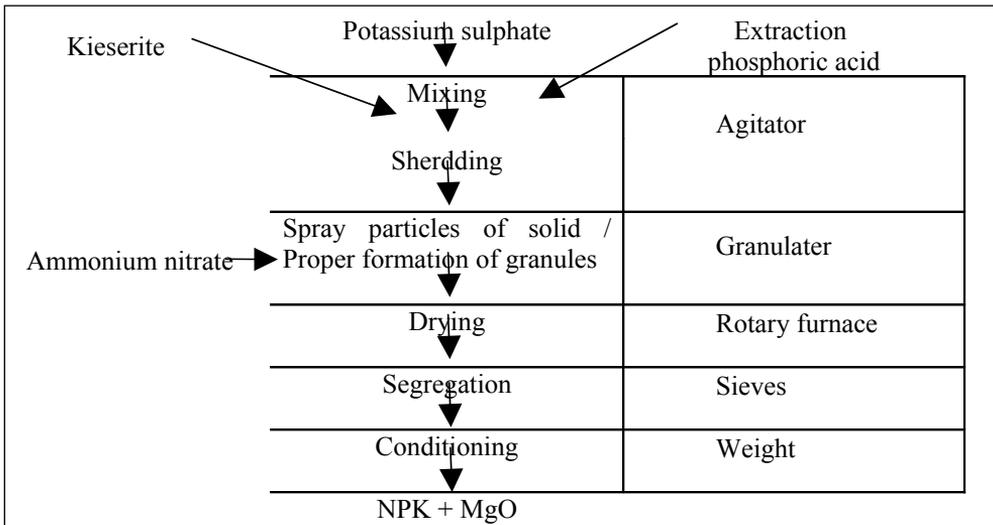
Source: own work.

Every industrial installation has a specified rate of maximal possible production. It is the rate that is usually not reached as it is dictated by safety conditions. A provision which is not used or is used occasionally is always left. Working at half capacity if the current demand is not designated, is a warning that there are problems in the process.

Therefore, in each project there is a number of characteristic values, which are the basis for carrying out internal process optimization due to a specific tool, which is undoubtedly benchmarking. A supervisor of a technology chain can easily identify the critical points of the process and compare them with the optimal values, which correspond to the assumptions of the design,

there by achieving an overall picture of the test situation. An example of a process evaluation card for a small production industry for granulated fertilizers is presented in Table 4.

Table 4. Sample data describing the work of installation for the production of granular fertilizers

No.	Parameters	Characteristic factor	Desirable value	Unit	Present value
	Data describing the work of the installation				
1	The maximum productivity	Mass	12	[Ton/day]	
2	Optimum productivity	Mass	10	[Ton/day]	
3	Technological fuel	Gas	1400	[m^3]	
4	Technological energy	Electricity	4000	[kWh]	
5	Preparing the installation to the work	Time	0:15	[h]	
6	Producing 1000 kg of product	Time	2:00	[h]	
7	Process of the granulation	Time	0:35	[h]	
8	Staying dried material in the rotary furnace	Time	1:35	[h]	
9	Number recycled oversize relative to 1000 kg of product	Mass	10	[kg]	
10	Packing and shipping the product to the warehouse	Time	0:10	[h]	
11	Set-up time installation	Time	0:30	[h]	

Source: own work.

It is extremely rare that in one company there are two identical installations. As a result, the internal benchmarking can be conducted only on the basis of an industrial project installation.

The existence of two identical installations does not necessarily mean production of two equivalent products. This is due to the fact that each process can be carried out under different conditions affecting the final product. Therefore, the concept of external benchmarking brings some risks arising from the choice of an appropriate standard, that is a partner in the process of analysis, and obtaining reliable information. If the information obtained from the pattern is unbelievable and yet it will be implemented in the process, it can cause great harm to the company. However, due to having some knowledge of the resource base pattern, relatively reliable information on the optimized process can be obtained or the information can be verified. Each product has its own characteristic values. For glass, for example, it is a heat conduction coefficient λ, for rails, however, it is a thermal expansion coefficient α. Products made in the chemical industry also have their characteristic values and on their basis some information about their production process can be obtained. Table 5 shows an example of a card that can create external benchmarking for the production of liquid fertilizers and verify information obtained from the model.

Table 5. A sample comparison card of two products

Parameters	Model value	Whether parameters are matching		The value obtained by the company X
		YES	NO	
pH	pH = 7.50 +/- 0.2		X	pH = 7.00 +/- 0.2
Viscosity	$\mu = 0.91\,[mPa \cdot s]$	X		$\mu = 0.91\,[mPa \cdot s]$
Density	r = 1.2 +/- 0.1 $\left[\frac{g}{cm^3}\right]$	X		r = 1.2 +/- 0.1 $\left[\frac{g}{cm^3}\right]$
Colour	Red		X	Dark red
Smell	Impalpable	X		Impalpable
Ingredients	Nitrogen, Potassium, Phosphorus, Iron, Zinc, Copper, Manganese, Vitamin C		X	Nitrogen, Potassium, Phosphorus, Iron, Zinc, Copper, Citric acid

Source: own work.

As in the case of fertilizers, benchmarking can be used to compare other chemical products, such as motor oils. However, the final result of the comparison, is heavily dependent on clarification of boundary parameters of the product.

6. Conclusion

In conclusion, benchmarking is a tool for defining the best practices in human resource management which allows to develop skills and qualifications of employees efficiently, and contributes to the strategy of a company. The article highlights that this process allows the use of internal or external resource in order to achieve market leadership. Benchmarking also stimulates the company to long-term planning that ensures the competitiveness of key business processes. This paper indicates that benchmarking is not merely an adjunct to strategic planning and does not constitute a single undertaking. On the contrary, as indicated by the analysis of XYZ company, it is a characteristic of a successful development of an individual because it is a constant factor that supports the processes of designing, planning and strategic thinking. Empirical experience shows that the development of benchmark performance indicators is extremely important throughout the planning process.

Bibliography

1. Balm J.G. (1994), *Benchmarking. A Practitioner's Guide for Becoming and Staying Best of the Best*, Paris, AFNOR.
2. Bendell T., Boulter L. (2000), *Benchmarking. Jak uzyskać przewagę nad konkurencją*, Kraków, Wydawnictwo Profesjonalnej Szkoły Biznesu.
3. Bielański A. (2007), *Podstawy Chemii nieorganicznej*, Warszawa, Wydawnictwo Naukowe PWN.

4. Bogan Ch.E., English M.J. (1994), *Benchmarking for Best Practices: Winning Through Innovative Adaptation*, New York, McGraw-Hill Companies.
5. Brilman J. (2002), *Nowoczesna koncepcje i metody zarządzania*, Warszawa, Polskie Wydawnictwo Ekonomiczne.
6. Camp R.C. (1989), *Benchmarking: The Search for Industry Best Practices that Lead to Superior Performance*, ASQC Quality Press.
7. *CHEMIK* (2013), Vol. 67, Iss. 11.
8. Czyż-Gwiazda E. (2006), *Benchmarking. Benchmark Index – czyli jak porównywać się z najlepszymi?*, Katowice, Wydawca Centrum Benchmarkingu Polska – TÜV NORD Polska Sp. z o.o.
9. Departament Informacji Gospodarczej (2013), *Sektor chemiczny w Polsce. Profil sektorowy*, Polska Agencja Informacji i Inwestycji Zagranicznych S.A.
10. Grudziewski W.M., Hejduk I.K. (2004), *Metody projektowania systemów zarządzania*, Warszawa, Difin.
11. Kuczewska J. (2007), *Europejska procedura benchmarkingu. Programy i działania*, Warszawa, Polska Agencja Rozwoju Przedsiębiorczości.
12. Martyniak Z. (2002), *Nowe metody i koncepcje zarządzania*, Kraków, Wydawnictwo Akademii Ekonomicznej w Krakowie.
13. Mertins K., Rabe M., Sauer O. (1993), Produktionsstrukturierung auf Basis des Strategischen Eigenfertigungsanteils, *ZwF*, 89(1-2).
14. Moriarty J.P., Smallman C. (2009), En Route to a Theory of Benchmarking, *Benchmarking: An International Journal*, Vol. 16, No. 4.
15. Porter M.E. (2001), *Porter o konkurencji*, Warszawa, PWE.
16. Proulx R. (2007), Higher Education Ranking and League Tables: Lessons Learned from Benchmarking, *Higher Education in Europe*, Vol. 32, No. 1.
17. Sapa R. (2005), *Benchmarking w doskonaleniu serwisów WWW bibliotek akademickich*, Kraków, Wydawnictwo Uniwersytetu Jagiellońskiego.
18. Supernat J. (2005), *Zarządzanie*, Wrocław, Kolonia Limited.
19. Węgrzyn A. (2000), *Benchmarking. Nowoczesna metoda doskonalenia przedsiębiorstwa*, Kluczbork-Wrocław, Oficyna Wydawnicza ANTYKWA.

Chapter 10

New Ways of Hotels Management in Poland

Halina Stoch-Parulok

1. Introduction

Tourism in these days is considered as one of the most important branch in world's economy. The hotel industry is getting much more sophisticated not only by the standard and luxury but also by the forms of management. Marketing play a key role in finding and fulfillment of client needs. The challenges of today's marketing are tied with internationalization, very quick environment changes, new forms of hobby and interest and unstable surroundings. Very important

issue is a system hotels which is united team of hotel facilities, managed by a central unit having specific characteristics in terms of features, the standard, the scope of services and other external characteristics. The characteristic feature of big systems are carried out by additional services, allowing for a fuller and more comprehensive ways to meet the needs of the guest. Another aspect of their activity is great ease with which include mergers or make divisions (Medlik, Ingram, 2003, pp. 116-120). A very attractive form of management has become franchising, and also much and much more popular in last year's condo hotels. This quite new and very innovative idea at polish market is very well known for example in USA. But the question is how it works? It is a chance for investors as well as clients, or it just give profits only for one of them? The main aim of this paper is just explaining mechanism of condo hotels.

2. Hotels in Poland

The available literature about national hotel management especially about system hotels is often fragmented and most of all very scattered. Branded hotels have currently the most power in hospitality industry. International hospitality management in the context of marketing allow for the achievement of both a competitive advantage, as well as to meet global demand and trends accompanying the continuous expansion of the hotel industry. However domestic market is rapidly growing so it carries possibilities of new ways of management. But to do this the segmentation process is obligatory. This is an important task, because some groups of consumers require a far different form of the product, what means its distribution and promotion than other customers. They want to have at their disposal highly competitive market. That is why we need greater inte-

gration of markets and increasing the company's experience and know-how (Olejniczuk-Merta, 2001, pp. 140-141).

According to the definition set out in the Law of Tourist Services on 29.08.1997, the hotel is "object with at least 10 rooms, including most places in a single and double rooms, providing a wide range of services related with the stay of customers". Regulations contained in chapter Five of this Act specifically express rules and forms to provide all hotel services (Ustawa o Usługach Turystycznych 29 of August 1997, Chapter 5).

Hotels in Poland are categorized by a 5-point scale consisting of stars. Categorization and register of hotels as well as other base of accommodation leads the Province Governor competent for the land on which the building is located (Sala, 2008, pp. 20-23).

Unfortunately, there is no one universally system of categorization containing hotels around the world. The most popular form is a system of signs with stars. It should be noted that the standard of hotels in the same category may vary in different countries. The main reason there are disparities in the level of development of these countries. In addition to the categorization based on stars there are another's based on numbers: A, B, C, D, E, and in the form of description (McIntosh, Goeldner, 1990, p. 236):

- Deluxe,
- Super deluxe,
- Superior/good,
- First-class reasonable.

Also the European Union hasn't developed so far a uniform system of categorization. It is caused especially by the resistance of hospitality and catering organizations, some hoteliers, as well as the countries governments. It's mainly about the costs necessary for the unification of the system, cultural and geographic differences as well as resistance to change of comprehension of the well-known domestic systems. It should be noted that categorization isn't mandatory in every country. An example would be the Scandinavian countries like Finland, Norway and Sweden. But in some countries for example Austria, Estonia, France, Ireland, Germany categorization is optional but not obligatory (Witkowski, 2007, pp. 61-64).

The main reason for using categorization is the ability to impact on the level of service quality. We can talk about the technical quality (a real product) and functional quality (relations, communication between customer and seller). But this is not the only method. Other ways of controlling the quality are (Drogoń, Dominik, 2009, pp. 115-122), (Świstak, Górska-Warsewicz, 2009, pp. 40-42):

- standardization,
- certification,
- the market and competitors' activities.

System hotels is usually a wider concept, under which can function specific hotel chains. However it happens that the chains of hotels operate independently (Milewska, Włodarczyk, 2010, p. 269). The precursor in this field were United States, where the systems have appeared before the Second World War (Szostak, 2008, p. 208).

Hospitality market and precisely its demand side is subject to segmentation. This allows to determine the purchasing power of discrete groups and the establishment of business profile for hospitality object. Resulting such actions both seller and buyer of services are beneficiaries. The following criteria are generally subject to segmentation (Świstak, Górska-Warsewicz, 2009, pp. 263-266):

- demographic characteristics of buyers: age, gender, household size, place of residence, profession, education, income level, reference group, the amount of free time;
- ways of buyers behavior primarily personality, motives and benefits of participation in the trip as well as opinions about the object, attitude towards its product range and frequency of purchase services.

Of course, the segmentation is not easy nor quick process. Although this is the basis for the selection of the target market which helps to predict the ways of reaching customers (Świstak, Górska-Warsewicz, 2009, pp. 263-266). Research shows that now a tourist destination is characterized by two main segments (Mill, 1990, p. 37):

- business tourism,
- leisure tourism.

On average, one on five travel in Canada and the United States is taken for business purposes. Always strong business relationships occurred between North America and Europe. Recent decades have focused attention on cooperation with the Far East. Business tourists are educated, wealthy, highly qualified on the job, often traveling by plane and staying in hotels of good quality. Is observed an increase of women in the participation in the business tourism which also has implications for the aviation and hospitality industries. Both sectors are trying to do their best to match up the specific needs of this type of tourists. Travel is paid by the company, and it is often reflection of created image. Hotel enterprises have created for such clients special loyalty programs. Examples might be programs used in the Hilton or Sheraton (Mill, 1990, pp. 47-52).

Business tourists significantly differ from tourists going on holidays. They expect a different type and standard of services, and also specific equipment necessary for their work. The result are specialized hotels operating both types of visitors. Hotel industry has a wide range of job opportunities. Only in hotel is a few positions enabling the employment. Most positions are at the reception department, service floors and restaurants. Job opportunities also exist in sectors supporting the work of the hotel *e.g.* marketing or accounting (Sala, 2008, pp. 20-23).

The rise and development of system hotels is inextricably linked with its precursors. Among the people who have shaped the modern hotel industry are: Cesar Ritz, Conrad Nicholson Hilton, Kemmons Wilson, John Willard Marriott (Szostak, 2008, pp. 13-20). As you can see the United States is the birthplace of the international hospitality systems, which have a three-stage structure, namely (*Hotels Magazine*, 2011, p. 22):

- basic level – hotel;
- intermediate level – brand;
- global level – firm, capital group.

As for the Polish market of system hotels the first of them appeared in the mid 70's of the last century and it was the InterContinental. For the last few years, in 2007 it was present already eight brands: InterContinental, Marriot, Hilton, Accor, Best Western, Starwood, Carlson and Hyatt with more than 100 hotels a whole. It's a pretty good number, if you take into account the fact that in 1990 there were only 11 of such hotels. System hotels operate mainly in large cities the type of Warsaw, Cracow, Poznań, Wrocław, Gdańsk, Łódź and Katowice. Increasingly, these objects are not only luxury hotels of four and five stars, but investments are run toward more economic base (Milewska, Włodarczyk, 2010 pp. 64-65, 78-79). System hotels in Poland doesn't always contribute to the creation of new buildings, some of the brands are based on takeover existing infrastructure. Polish investors involve activities of small and medium-sized objects primarily while foreign featuring usually with more capital are interested in large hotels. Currently,

most objects of system hotels is a mid-range buildings. The largest clusters of system hotels are mainly located in four provinces: Mazowieckie , Małopolskie, Lower Silesia and Silesia (Witkowski, 2007, pp. 23-46).

Over the past few years expansion of system hotels is determined by the development of techniques and communication technologies. Directly related to this is delivery of information to potential buyers, as well as the collecting data about them their tastes and preferences. On the other hand, applied information systems allows to reach out and evaluate the competitors from industry. Collected data should be first properly processed and then used in order to better reach to the customer and adapting the offer to his individual needs. Hospitality sector take advantage mainly from the personalization of product, cause in this direction is going the development of modern tourism. Global systems reservation used in hotels allow tourists to save the time required to plan their trip (Szostak, 2002, pp. 299-306).

Hotels can be associated with a particular capital group mainly through agreements such as the contract of: ownership, lease, franchise or lease. The form most commonly chosen by hoteliers around the world is the franchise that allows for rapid development of the market. It is an agreement according to which the franchisor offers a well-known brand in the market and access to production technology and suppliers. In turn, the franchisee shall bear the costs of both initial agreement and subsequent relating to participation in brand. The main reasons for this type of agreement are (Jermen, 2008, pp. 51-59):

- knowledge,
- experience,
- reputation and brand image.

However, you can also replace the drawbacks of such agreements it is mainly fees for membership and use of a particular brand. In addition, stands out the fees of marketing and promotion. These fees can be expressed as a percentage of the gross from room nights sold or to be attributable to a specific amount for one year of operation under the franchise (McIntosh, Goeldner, 1990, p. 108). Table 1 show the types and size of the franchise fees for selected world branded hotels.

Table 1. Costs associated with the franchise agreement for hotels with a minimum 300 number of rooms

Brand name	Initial fee	Fixed fee	Marketing fee	Addidtional fees	Percent of total rooms revenue
Hilton Garden Inn	142,500 $	5,562,411 $	4,348,794 $	938,000 $	12.91%
Hyatt Place	120,000 $	5,056,738 $	3,539,716 $	252,269 $	9.70%
InterContinental H&R	155,000 $	5,056,738 $	3,034,043 $	1,008,537 $	11.89%
Marriott	92,500 $	7,888,511 $	1,011,348 $	723,322 $	13.09%
Courtyard	150,000 $	5,562,411 $	2,022,695$	631,612 $	9.86%
Westin	115,000 $	8,899,858 $	2,022,695 $	948,838 $	15.86%
Crowne Plaza	152,500 $	5,056,738 $	3,157,852 $	849,619 $	11.85%
Radisson	150,000 $	5,056,738 $	2,022,695$	452,114 $	10.19%
Sheraton	115,000 $	7,281,702 $	1,011,348 $	948,838 $	13.26%

Source: Rushmore, Choi, Lee, Mayer, 2013, p. 13.

To sum up the hotel enterprises are making international expansion mainly in order to increase profitability. In addition, it reduces the risk of doing business. By focusing attention and actions on selected market area by a given corporation and by the influence of globalization, the company has a high ability to achieve success and dominance in a particular niche (Knowles, 2001, pp. 86-89).

3. The market of condo hotels

The history of condo hotels reaches 1970's when condominiums were set on Hawaii and Colorado ski areas. The political circumstances especially closing a law including tax loopholes caused the collapse of idea at the end of 80's. But from 2000's it returns to market with all power. Condo hotels are usually managed by well identifiable brands such as Starwood's St. Regis and W. Mariott's The Ritz Carlton, Hilton's Conrad or Mandarin Oriental. Some of condo hotels are situated in new buildings but some are transformed from historic buildings in big cities. Condo concept allows to increase a chance to realization of difficult projects (Miller, Washington, 2008, pp. 114-115).

Many of luxury hotels in USA were built only thanks that they were based on condo system. But with the economic and financial downturn the market of condo hotels has decreased. It is estimated that 30% of potentially buyers just withdrew from buying apartment (Miller, Washington, 2009, pp. 121-12).

There are several models of condo hotels. The most popular one is where developer sells all apartments and then client decide if he wants to have manage them by self or to give it for operator administration. In the second option apartment is selling just as plain hotel room and the revenue is split half by half between operator and owner. Another model assumes buying condo unit only or mostly for owner's needs. Of course client have access to all hotel amenities. Sometimes this two models are combined by developers and one part of building is rented and another one is only for owners of condo units (Parets, 2005, p. 92).

In early years of 2000 condo hotels had their golden age. The units arose among others in Florida where was really rapid boom for them. It made challenges as well as big opportunities for designers. Everything must had a special look and high-end finishing. Clients must been blown away and feel as they are most important owners. Luxury materials, high-end appliances, newest electronics equipment it all helps to acquire such sensations. It isn't easy to design apartment which must have commercial standards and on the other hand have a luxurious residential look not as at plain hotel. Sometimes there is need to combine kitchenette with living room or closet. For designers it does a project more complicated. They must arrange the space functionally but most of all with modern. The biggest challenge which facing the designer is that he must meet expectation of many people. His project is addressed to operator as well as to every owner. So many views so many tastes and so many characters. Generally speaking the result is conception consisting of modern, elegance, classic and rich elements (Sheehan, 2005, pp. 44-46).

Condo hotels rise quickly in the cities of United States of America as well as west European countries. In the first decade of years 2000 Florida was the biggest market of condo units in United States of America. In 2006 there was approximately 377000 hotel rooms under construction and among them there were 30,500 condo units (Benedetti, 2006, pp. 17-19). The reason is the opportunity to fast capitalizing of developer ability. They can sell units much earlier

before construction phase. Also they can obtain new resources for another investment much more quicker than from traditional hotel. Very often companies who are building such hotels also working with upscale brands. It helps to attract wealthy clients and to make profitable deals. Likewise the luxury brands willingly cooperate with developers in creating condo units. As said Jim Alderman who was previous senior vice president of development at Starwood Hotel & Resorts Worldwide "let's not ignore what drives corporate development profit". Also there are several reasons why clients are more eagerly to buy apartments at well branded hotel complex. First of all they gain own apartment with sense of luxury, secondly access to all amenities and services, and thirdly special treatment at every point of complex. They buy not only physical place but also extraordinary lifestyle which isn't available for everyone. It is package of image and added services. It can be said that everyone have benefits from condo hotels: developers, administrative company as well as clients. Condominiums are an achievable method for gaining success in financing hotels. But developers must be very careful because there are a lot of traps that can ruin a project. They must remember of risk and of potential difficulties. For example the building costs might be higher than expected so it implicates lower profits. But there is one golden mean which is location (Parets, 2005, pp. 89-92).

But there are many cases when condo unit doesn't generate a profit. What can do owner in situation when he had expected to earn some money and now he must pay extra for apartment maintenance? Example might come from Las Vegas. In 2008 a group of 40 owners file a lawsuits claiming that they have been deceived cause the salesman promised them revenue. But the salesman doesn't have full information about market, it's only his assumptions, so the only way to take good decision is to be aware of possible risk. Some of developers are truly frank, they are saying that condo hotels aren't moneymakers. When the downturn hit in the USA's economy it was projected that the supply for condo units fall from seven to four percent only in one year. By one the future of condo hotels is seen pessimistic. They say the model will come to an end soon and on the other hand there are optimists who believe that this is great and powerful product (Newman, 2008, pp. 91-93).

4. Conclusion

When we compare marketing of material goods with marketing of services we can notice several important differences between them. Marketing in hotel industry is unique because the rented room creates a derivative demand. It means that this room is not itself a product which is the reason for coming to a certain place. So it implicates new concepts in sales and management at all. (Medlik, Ingram, 2003, pp. 116-120). So what makes that condo hotels are such desire concept? It is a combination of time share system and traditional condominium. It is hybrid that hit the client's needs. Buyer have his apartment for their own and he must pay taxes, insurances and all maintenance fees but in return he gets profits from renting and the right to visit it during a specific number of days a year (Benedetti, 2006, pp. 17-19). Condo hotels are very interesting option for investment. It allows to own hotel room and use it in specific period and for the rest of the time rent it and reap the financial benefits. People between 40-60 years are the most affected by such proposals. One of disadvantage of apartment in condo hotel is the way of furnishing it because very often it's imposed by developer and the owner can't make changes. Additionally developer still keep the right for ownership of common areas as restaurants or spa (Palmeri, 2005).

If the structure of condo hotel is clear and understandable there is a greater chance of finding customers. But to be brief investments in condo hotel are affected by risk. It is very important to know about the level of resort occupancy as well as all fees required from owners. Such factors combined with of course owner knowledge about revenue allow to evaluate the risk properly and to invest wisely (Benedetti, 2006, pp. 17-19).

Bibliography

1. Benedetti M. (2006), Finding Your Way Up North: Condo Hotels Offer Alternative to Property, *Crain's Detroit Business*, Vol. 22, Iss. 23.
2. Drogoń W., Dominik P. (2009), *Organizacja przedsiębiorstwa hotelarskiego*, Warszawa, Almamer Wyższa Szkoła Ekonomiczna.
3. *Hotels Magazine* (2011), The Magazine of the Worldwide Hotel Industry, August.
4. Jermen D. (2008), Rodzaje przedsiębiorstw hotelarskich [in:] *Hotelarstwo. Usługi – Eksploatacja – Zarządzanie*, A. Panasiuk, D. Szostak, Warszawa, PWN.
5. Knowles T. (2001), *Zarządzanie hotelarstwem i gastronomią*, Warszawa, Polskie Wydawnictwo Ekonomiczne.
6. McIntosh R., Goeldner Ch. (1990), *Tourism Principales, Practices, Philosophies*, United States, John Wiley & Sons Inc.
7. Medlik S., Ingram H. (2003), *The Business of Hotels*, Oxford, Butterworth Heinemann.
8. Milewska M., Włodarczyk B. (2010), *Hotelarstwo podstawowe wiadomości*, Warszawa, Polskie Wydawnictwo Ekonomiczne.
9. Mill R.Ch. (1990), *Tourism the International Business*, New Jersey, Prentice Hall.
10. Miller R., Washington K. (2008), *Chapter 16: Condo Hotels*, Hotels&Resorts.
11. Miller R., Washington K. (2009), *Chapter 18: Condo Hotels*, Hotels&Resorts.
12. Newman M. (2008), Hotel-condos: A Broken Promise?, *National Real Estate Investor*, Vol. 50, Iss. 7.
13. Olejniczuk-Merta A. (2001), *Rynek młodych konsumentów*, Warszawa, Difin.
14. Palmeri Ch. (2005), *Checking Out and Into Condo Hotels*, Condo-hotel living.
15. Parets R. (2005), Why Condo Hotels Are a Hot Concept, *National Real Estate Investor*, Vol. 47, Iss. 5.
16. Rushmore S., Choi J., Lee T., Mayer J. (2013), *Hotel Franchise Fee Guide*, New York, United States, HVS.
17. Sala J. (2008), *Formy współczesnego hotelarstwa*, Kraków, Wydawnictwo Uniwersytetu Ekonomicznego w Krakowie.
18. Sheehan P. (2005), Goin' Condo, *Lodging Hospitality 9/1/2005*, Vol. 61, Iss. 12.
19. Szostak D. (2002), Miejsce nowoczesnych technik i technologii telekomunikacyjnych w hotelarstwie [in:] *Gospodarka turystyczna w XXI wieku – stan obecny i perspektywy rozwoju*, S. Bosiacki, Poznań, Akademia Wychowania Fizycznego im. Eugeniusza Piaseckiego w Poznaniu.
20. Szostak D. (2008), Łańcuchy systemy i sieci hotelowe [in:] *Hotelarstwo. Usługi – Eksploatacja – Zarządzanie*, A. Panasiuk, D. Szostak, Warszawa, PWN.
21. Świstak E., Górska-Warsewicz H. (2009), *Funkcjonowanie przedsiębiorstwa hotelarskiego*, Warszawa, Wydawnictwo SGGW.

22. Ustawa o Usługach Turystycznych z dnia 29 sierpnia 1997, rozdział 5.
23. Witkowski Cz. (2007), *Aktywność międzynarodowych systemów hotelowych na polskim rynku*, Warszawa, Almamer Wyższa Szkoła Ekonomiczna.
24. Witkowski Cz. (2007), *Hotelarstwo część I Podstawy hotelarstwa*, wydanie drugie, Warszawa, Almamer Wyższa Szkoła Ekonomiczna.

PART II

MECHANISMS AND SYSTEMS OF SHAPING HUMAN RESOURCES IN AN ORGANIZATION

———————————◼——————————

Chapter **11**

Human Resource Management Practices in Innovative Enterprises

Sylwia Wiśniewska

1. Introduction

Today, in the conditions of a turbulent environment, intensifying globalization, and the growing importance of knowledge, enterprises must implement innovations to stay in business. Traditional sources of competitive advantage are losing importance in the conditions of knowledge economy (Poznańska, 2008, p. 45). According to the report of the World Economic Forum "The Global Competitiveness Report 2008-2009" Poland occupies the low 64th position among 134 countries in terms of innovation indicators (Porter, Schwab, 2008, p. 278). At the same time it is worth noting that among the determinants of innovativeness of enterprises practices in the field of human resource management (HRM) play an important role.

This article attempts to identify the importance of human resource management practices in creating and implementing innovations in enterprises. The paper presents the essence of innovativeness and features of an innovative enterprise are described. Also definitional problems associated with the concept of human resource management are presented. Additionally, the human resource management practices used to stimulate and strengthen innovativeness of enterprises are discussed. The article was prepared on the basis of study of the literature. The author applied the descriptive method.

2. Innovative enterprises – theoretical aspects

In the literature, different views of the concept of innovativeness are present. In broad terms, innovativeness is defined as the seeking of unusual, creative and novel solutions to existing problems and needs. These solutions may mean new goods, services, processes or technologies (Dabić, Ortiz-De-Urbina-Criado, Romero-Martinez, 2011, p. 16).

A related approach is presented by A. Pomykalski (2007, p. 107). In his opinion, innovativeness is the ability of economic entities to constantly seek, implement and popularize innovations. However, T. Bal-Woźniak (2004, p. 20) accentuates the process nature of innovativeness. In her view, innovativeness is the ability (willingness, skills and possibility) of successful implementa-

tion of innovation processes, referred to as a set of activities aimed at the creation, implementation and dissemination of innovation (Fig. 1).

Figure 1. The concept of innovativeness
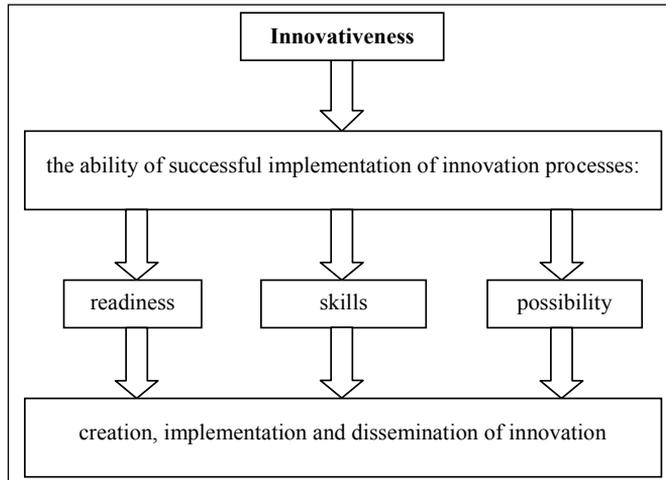
Source: own work on basis of Bal-Woźniak, 2004, p. 21.

The innovation process is also defined as the process oriented at developing new, or changed to a great extent, goods, services, processes and solutions in the scope of marketing, as well as organizational methods. This process comprises the following phases: acquiring or generating ideas, developing a new solution, testing the solution, implementation of innovations, marketing, sale, innovation diffusion (see: Knox, 2002, pp. 27-28; Dolińska, 2006, p. 12).

The "Oslo Manual" is the commonly accepted international methodological standard, presently applied in all countries conducting statistical research on innovation. It was prepared by a group of OECD experts. In accordance with this Manual, innovations include the implementation of the new and greatly upgraded product (product innovation), process (process innovation), new marketing activities (marketing innovation) or a new organizational method (organizational innovation) (Oslo Manual, 2005, p. 46).

The literature emphasizes that innovations are the products of knowledge and the results of innovation processes in which knowledge is obtained, flows, is used and developed (Brdulak, 2003, p. 60). B. Mikuła (2011, p. 13) indicates that at present the definitions are quoted which present knowledge as: providing information and understanding it and also confirmed conviction.

Therefore, summing up the question of defining the notion of innovativeness, the author of the paper assumes that innovativeness is the ability to generate and implement different types of innovations, notably: product, process, organizational and marketing innovations (Wiśniewska, Wiśniewski, 2012, p. 1624).

In turn, an innovative enterprise, as understood by the methodology of the "Oslo Manual", is such a company which in the examined period of time implemented at least one (product, process, marketing or organizational) innovation (Oslo Manual, 2005, pp. 58-59). According to

A. Francik (2003, p. 69) the fundamental features of an innovative company include the capability to:

- generate and implement novel goods, services, technologies or markets,
- seek novel goods, services, technologies or markets,
- change communications ways,
- break the routine,
- fast reaction on changes.

Similar features assumes A. Sosnowska (2000, pp. 11-12), who indicates:

- the capability to generate innovations permanently,
- the ability to take advantage of the innovative potential of a company to achieve and maintain a high competitive position,
- the capability to think long-term,
- flexibility of activities in adjusting to the changing environment,
- permanent contact with customers in order to learn about their current and future expectations effectively,
- having a team of innovators which would guarantee a high level of the innovative character of a company.

3. The concept of human resource management

The development of the concept of "human resource management" as a modern model of personal function, including all activities related to the functioning of individuals in an enterprise requires the definition of the concept of human resources (Król, 2006, p. 50; Pocztowski, 2007, p. 15).

According to A. Stabryła (2007, p. 11) human resources are a community of employees. They are "an organized whole made up of individuals", which creates a system that is described in the following aspects:

- organizational, which corresponds to teams and workgroups, identified in the company's organizational structure;
- ergonomic, relating to each type of employee – work, or employee – machine relationships;
- psychological, as a collection of individual human behaviors, determined in terms of motivation by the work environment, especially through the management process;
- socio-economic, which reflects the professional environment, acting as a labor force in the labor market' this aspect further characterizes human resources at the level of organization, for example by such determinants as interpersonal relationships, group experience and networking;
- legal, as a set of entities representing a party in agreements of employment (the employee – employer).

In the literature, there are many definitions of human resource management, ranging from a short and simple to lengthy and comprehensive descriptions. In short, HRM is the "process of managing human talents to achieve organization's objectives" (Haslinda, 2009, p. 180). Similarly, R.J. Stone (2009) human resource management describes as the productive utilization of human resources in order to achieve strategic business goals of the organization (Fong, Ooi, Tan, Lee, Chong, 2011, p. 705).

A related approach is presented by M. Armstrong (2010, p. 15). In his view, HRM is a strategic and coherent approach to the management of the most valuable asset of any organization that is employees – the people who individually and collectively contribute to the achievement of its objectives. H. Król (2006, p. 55) defines human resource management similarly. In his opinion, HRM is a modern concept of the implementation of the HR function in business, whose task is to adjust the characteristics of human resources with business goals harmonized with the needs of employees, with taking into account the internal and external conditions.

A broader definition of human resource management is presented by A. Pocztowski (2007, p. 34). In his view, HRM is a current concept of the management in the area of the personnel function, where human resources are treated as an asset and a source of competitiveness of the company. Strategic integration of the personal issues with the business affairs is called for, and an active role of line managers in addressing personnel issues, along with the need to create an organizational culture, integrate HR processes and build employee engagement as a means of achieving the objectives of the company are pointed out.

A similar definition of human resource management also presents Z. Pawlak (2011, pp. 34-35), interpreting HRM as a valid approach to the implementation of the HR function of organizations. It depends on the appropriate design and use of human resources to achieve the goals of the enterprise, taking into account the interests of employers and employees. HRM is based on current scientific achievements of the organization and management, in terms the state of economic development, especially the growing competition in the market and the globalization of economic, social and political relations. The management of human resources involves innovative information and communication solutions and transformations in the social sphere, such as the ongoing process of democratization of management, changes in the owner-ship structure of the capital (development of employee ownership) and changes in the mindset of employers and employees.

In turn, A. Stabryła (2007, pp. 10-11) assumes that HRM is focused on managing employee potential in the enterprise. As a scientific system, HRM is the study of management, related to the research on the personnel function. It is comprised of the following sub-fields:
- planning and analysis of employment;
- organization and control of work processes, personal controlling and auditing;
- programming and development of human resources;
- motivational systems;
- methodology of employee evaluation;
- leadership in organizations;
- managing competences, learning organization;
- managing human and social resources.

The practical range of human resource management includes the following tasks: issues of selection, employment and specialization, planning and programming, staff development, policy of recuperation, developing interpersonal relationships, controlling the use of human and social capital in the organization. These tasks form the area of managerial activities related to the implementation of the personnel function (Stabryła, 2007, p. 11).

In terms of model of HRM, the system consists of three main components: an HR strategy as an integral part of the business strategy, HR processes integrated with key business processes, and tools used to resolving individual personnel matters. In the center of the interrelationships of these three parts are the people working in the HR area of the enterprise, particularly operational managers and human resource managers, whose competence and commitment determine

the effectiveness of other elements of the system. The method of their identification, mutual relationships and functional determinants depend on many internal and external factors (Pocztowski, 2007, pp. 35-36).

The main features of HRM as a means of carrying out the personnel functions in the enterprise should include (Pawlak, 2011, p. 35):

- seeing employees as an asset of strategic importance in which one should invest;
- a comprehensive view of the company staff, *i.e.* treating the employees as a team, rather than stand-alone individuals;
- underlining the need for expanded participation of employees to decide on the financial results and the use of capital;
- focus on individual and team development of employees as a condition for the development of the enterprise;
- the need for more flexible qualifications of employees as a factor facilitating the functioning of a competitive labor market;
- use of flexible forms of employment in the interest of both employers and employees;
- the use of different forms of remuneration: current and deferred, material and non-material, and different pay systems;
- taking HR actions and making HR decisions in the context of the organizational culture that makes up the internal norms, values, customs, traditions, attitudes and beliefs;
- focus on the social order and mitigation of disputes and conflicts (individual and collective);
- exposing the ethical aspects of relations and corporate social responsibility.

4. Importance of human resource management practices in creating and implementing innovations in enterprises

Human resource management practices can stimulate and energize innovativeness of enterprises, primarily through the construction of suitable architecture models of strategic human resource management and their effective implementation, on top of development according to the needs of the enterprise. In addition, HRM practices can support the development of innovative organizations through the innovation-oriented attitudes and employee behaviors (Borkowska, 2010, p. 240).

HRM models focused on creating innovative business models are those by R.E. Miles and C.C. Snow and also R.S. Schuler and S.E. Jackson. The first model involves the construction and development of a market-oriented human resource management system. This model is in fact addressed to those enterprises whose innovation results from the permanent search for new products and markets. Implementation of product innovation and servicing new markets need to rapidly hire employees with the right skills. According to the authors of this model, generating the required knowledge and skills within the enterprise is difficult and time consuming, therefore, one must look for them elsewhere (Jimenez-Jimenez, Sanz-Valle, 2005, p. 366). HRM practices, which are included in the analyzed model are listed in Table 1.

Table 1. HRM practices to support innovativeness of enterprises in the R.E. Miles and C.C. Snow's model

HRM practices	R.E. Miles and C.C. Snow's model
Recruitment and selection	− Focus on "buying" knowledge and skills − Hiring almost exclusively from outside the company − The use of psychological tests − The low level of employment stability − Almost no actions aimed at integrating employees
Trainings	− Limited training programs − Search and acquisition of knowledge and skills outside the enterprise
Development and internal career opportunities	− Very little use of internal career ladders
Performance appraisal	− Conducting division/corporate employee evaluation − Identification of the needs of staff − Results-oriented procedure − Cross-sectional comparisons
Compensation	− Directly proportional to the performance − Total compensation heavily dependent on the performance, which is to ensure a high motivation to work − External competitiveness
Other HRM practices	− Low employee participation − Job enrichment − Implicit job analysis

Source: own work on basis of Jimenez-Jimenez, Sanz-Valle, 2005, p. 367.

In turn, R.S. Schuler and S.E. Jackson's model links HRM practices with three types of competitive strategy defined by Porter: cost, quality and innovation. Within the framework of this model employee behaviors are analyzed in terms of requirements as set by the individual strategies of competitiveness. On the basis of the conclusions of these analyzes, by using HRM practices, employee behaviors are developed that are deemed desirable from the point of view of a given strategy. In this model, the enterprise that wants to bring an innovation strategy must develop flexibility, tolerance of uncertainty, responsibility and ability to work and achieve long-term goals as part of the team in their employees (Jimenez-Jimenez, Sanz-Valle, 2005, p. 366). Specific human resource management practices aimed at supporting innovativeness of enterprises, which includes the R.S. Schuler and S.E. Jackson's model are shown in Table 2.

Table 2. HRM practices to support innovativeness of enterprises in the R.S. Schuler and S.E. Jackson's model

HRM practices	R.S. Schuler and S.E. Jackson's model
Recruitment and selection	− Focus on hiring employees with high technical and research competencies − Use of external sources of recruitment − High employment stability
Trainings	− Wide application − Employees' responsibility for learning − Job system that allows employees to acquire knowledge and skills that can be used in other positions in the company
Development and internal career opportunities	− Broad, specific and frequently used career paths − Mandatory competency growth
Performance appraisal	− Well-defined criteria − Use of employee evaluation focused on achieving long-term collaborative
Compensation	− Wide range of awards − Compensation includes a low base rate, extended for transfer of shares to employees in the company's assets and an extensive benefits package − Rewarding innovation teams − Total compensation corresponding to the competence of the employee (competency-based pay)
Other HRM practices	− High employee participation − Job enrichment − Implicit job analysis − Cross-functional teams − Communication allows to obtain feedback on sales of innovative products

Source: own work on basis of Jimenez-Jimenez, Sanz-Valle, 2005, p. 367.

In the knowledge-based enterprises and in ones focused at increasing the level and dynamics of innovativeness High Involvement Work Practices (HIWP) takes special importance – the concept of HRM based on a high worker involvement. Key practices in HIWP are usually four out of the following (Borkowska, 2010, pp. 53, 57):
- recruitment and selection of employees,
- investing in the acquisition and development of knowledge and skills of employees,
- effect-based remuneration,
- developed information and communication system covering all employees,
- employee participation, especially direct, but also indirect (representative) related to the relationship between management and trade unions and/or other employee representative bodies,
- periodic employee evaluation.

The HIWP model, by building on the commitment, fosters innovation-oriented behaviors and attitudes of employees that promote innovation within a company. Involvement is a lever for innovation, which in turn improves the economic efficiency of enterprises and enables the achievement of sustain-able competitive advantage. The importance of HIWP in promoting innovation is also evident in stressing motivating through participation, and orientation at development of intrinsic motivation. In addition, this concept has a broad, complementary and equal remuneration system rewarding for results, and application of identification as motivating tools. In this system, the growth of business results as a whole is inextricably linked to the broader benefits for employees – both tangible, such as participation in profits, and intangible: job satisfaction or growth opportunities (Borkowska, 2010, pp. 55, 58, 240-241).

Human resource management based on a properly executed HIWP concept can stimulate innovativeness and add vibrancy to the enterprise through (Borkowska, 2009, pp. 19-21):

- stress on people as animators of business results. HIWP stresses the importance of employee involvement and satisfaction as a means of achieving satisfaction of other stakeholders;
- an integrated approach with higher expectations from work on the part of knowledge workers, whose share in the total employment is growing with the development of knowledge-based economy;
- shaping pro-innovation and creative behaviors; the employee becomes a partner and co-host, identifies with the enterprise and its objectives, participates in activities that go beyond the tasks assigned to them, and looks for solutions that deliver business benefits, provides better service to customers. HIWP is, therefore, particularly desirable in companies focused on the development of innovation with a broad participation of employees and customers, based on high technologies and employing highly skilled people;
- employees are more open to change, which allows for the effective management of change. This is a very important question in relation to the common need of introducing change. HIWP leads to better utilization of the involvement and creativity of employees, supports the construction of a pro-innovation culture that allows the freedom to exchange ideas and experiences, and builds employee satisfaction;
- greater commitment of individuals in the company, achieved by building the motivation for participation focused on the development of intrinsic motivation, which reduces the risk of losing talent to competitors;
- support for improving the quality of work that goes beyond the framework of Total Quality Management (TQM);
- strong influence on positive relations between people, including ones between the management and trade unions or worker councils. Based on participatory involvement, cooperation, openness to change and creativity of employees, it significantly weakens the role of conflicts that occur when generating and implementing innovation.

5. Conclusion

Innovativeness and market success of an enterprise is subject to many factors, both internal and external. It is therefore difficult to assess the direct impact of human resource management systems for innovativeness of companies. However, one cannot underestimate the importance of HRM to stimulate and add dynamics to innovativeness of enterprises. Human resource man-

agement based on a well-executed HIWP concept may indeed effectively create and enhance business innovation in terms of the knowledge economy. At the same time it is worth noting that the choice of an appropriate HRM model is not enough to support significant innovativeness of enterprises. A proper implementation and strong commitment of all employees in the effective implementation of its provisions is necessary.

Bibliography

1. Armstrong M. (2010), *Strategiczne zarządzanie zasobami ludzkimi*, Warszawa, Oficyna a Wolters Kluwer business.
2. Bal-Woźniak T. (2004), O podmiotowych uwarunkowaniach innowacyjności, czyli pierwotnych przyczynach braku aktywności innowacyjnej [in:] *Przedsiębiorczość i innowacyjność małych i średnich przedsiębiorstw – wyzwania współczesności*, (eds.) A. Kaleta, K. Moszkowicz, L. Woźniak, Prace naukowe Akademii Ekonomicznej we Wrocławiu, No. 1030, Wrocław, Wydawnictwo Akademii Ekonomicznej we Wrocławiu.
3. Borkowska S. (2009), Human Resource Management and Innovation in the Business Organization, *Human Resource Management*, No. 2.
4. Borkowska S. (2010), ZZL dźwignią innowacyjności przedsiębiorstw [in:] *Rola ZZL w kreowaniu innowacyjności organizacji*, (ed.) S. Borkowska, Warszawa, Wydawnictwo C.H. Beck.
5. Brdulak J. (2003), Zarządzanie wiedzą a innowacyjność [in:] *Zarządzanie wiedzą w polskich przedsiębiorstwach*, A. Błaszczuk, J.J. Brdulak, M. Guzik, A. Pawluczuk, Warszawa, Wydawnictwo Szkoły Głównej Handlowej w Warszawie.
6. Dabić M., Ortiz-De-Urbina-Criado M., Romero-Martinez A.M. (2011), Human Resource Management in Entrepreneurial Firms: A Literature Review, *International Journal of Manpower*, Vol. 32, No. 1.
7. Dolińska M. (2006), Wpływ kapitału intelektualnego organizacji na rozwój innowacji, *E-mentor*, No. 2.
8. Francik A. (2003), *Sterowanie procesami innowacyjnymi w organizacji*, Kraków, Wydawnictwo Akademii Ekonomicznej w Krakowie.
9. Haslinda A. (2009), Evolving Terms of Human Resource Management and Development, *The Journal of International Social Research*, Vol. 2, No. 9.
10. Jimenez-Jimenez D., Sanz-Valle R. (2005), Innovation and Human Resource Management Fit: An Empirical Study, *International Journal of Manpower*, Vol. 26, No. 4.
11. Knox S.J. (2002), The Boardroom Agenda: Developing the Innovative Organization, *Corporate Governance*, No. 1.
12. Król H. (2006), Podstawy koncepcji zarządzania zasobami ludzkimi [in:] *Zarządzanie zasobami ludzkimi. Tworzenie kapitału ludzkiego organizacji*, (eds.) H. Król, A. Ludwiczyński, Warszawa, Wydawnictwo Naukowe PWN.
13. Mikuła B. (2011), Istota zarządzania wiedzą w organizacji [in:] *Komunikacja w procesach zarządzania wiedzą*, (ed.) A. Potocki, Kraków, Fundacja Uniwersytetu Ekonomicznego w Krakowie.
14. *Oslo Manual. Guidelines for Collecting and Interpreting Innovation Data* (2005), Third Edition, Paris, OECD and Eurostat.

15. Pawlak Z. (2011), *Zarządzanie zasobami ludzkimi w przedsiębiorstwie*, Warszawa, Wydawnictwo Poltext.
16. Pocztowski A. (2007), *Zarządzanie zasobami ludzkimi*, Warszawa, PWE.
17. Pomykalski A. (2007), Innowacyjność przedsiębiorstwa a sieciowe zarządzanie organizacjami w regionie [in:] *Zarządzanie wiedzą w warunkach globalnej współpracy przedsiębiorstw*, (eds.) J. Bogdanienko, M. Kuzel, I. Sobczak, Toruń, Wydawnictwo Adam Marszałek.
18. Porter M.E., Schwab K. (2008), *The Global Competitiveness Report 2008-2009*, Geneva, World Economic Forum.
19. Poznańska K. (2008), Działalność badawczo-rozwojowa przedsiębiorstw i jej umiędzynarodowienie [in:] *Innowacyjne systemy, procesy i metody zarządzania międzynarodowego*, (ed.) M. Trocki, Warszawa, Oficyna Wydawnicza Szkoły Głównej Handlowej w Warszawie.
20. Sosnowska A. (2000), Systemy zarządzania firmą innowacyjną [in:] *Zarządzanie firmą innowacyjną*, A. Sosnowska, S. Łobejko, A. Kłopotek, Warszawa, Difin.
21. Stabryła A. (2007), Podejście podmiotowo-relacyjne w doskonaleniu struktury organizacyjnej, *Zarządzanie Zasobami Ludzkimi*, No. 6.
22. Stone R.J. (2009), *Managing Human Resources: An Asian Perspective*, Milton, John Wiley & Sons, cited by: Fong Ch.Y., Ooi K.B., Tan B.I., Lee V.H., Chong A.Y.L. (2011), HRM practices and knowledge sharing: an empirical study, *International Journal of Manpower*, Vol. 32, No. 5/6.
23. Wiśniewska S., Wiśniewski K. (2012), Human Resource Management in a Knowledge-Based Organization, *Economics and Management*, Vol. 17, No. 4.

Chapter **12**

Quality of Human Resource Management in Employer Branding

Urszula Bukowska

1. Introduction

For many years management of organizations have perceived the need to promote the image of the company. Its aim is to strengthen their products or services market position. However, it has turned out that companies compete not only for winning favour with clients but also with employees. It mainly concerns the companies where the employees are considered to be key stakeholders, because they possess significant and rare qualifications. Such organizations strive for shaping the image of the employer by using different factors. Therefore, the aim of this article is to define the role of one of these factors, the quality of human resource management, in employer branding.

2. Employer branding

2.1. The essence and determinants of the employer image

Functioning of an organization depends on its participation in different markets. One of them is the labour market, where not only two sides of the employment attitude, employers and employees, are present, but also different subjects. The subjects are institutions in charge of employers, labour offices, personal counseling services, training companies and both previous and potential employees. In the labour market there comes into being the image of the employer, which can be defined as a certain way of perceiving them by the subjects mentioned above. Because the subjects can be assigned to one of the two categories of stakeholders, internal or external, it is possible to identify both an internal and external image of the employer. The way of perceiving an organization in the labour market has a dynamic nature. It has been changing as a result of some factors dependent on the employer, or independent of him, as a consequence of some actions taken or abandoned by him, or taken by other subjects. The employers who know how they would like to be perceived, are able to shape their image in the labour market. The purpose of the employer branding is to make the image positive and strong. In other words,

the employer will be perceived in the labour market in a positive way, and his image will be clear and consistent. Therefore, it is essential to determine some factors distinguishing the employer from the competition (Backhaus, Tikoo, 2004, p. 502). As a result of a consistent and positive image, the employer will obtain the optimal supply of staff[1] (also from the external labour market, which is confirmed by empirical studies (Lievens, Van Hoye, Anseel, 2007, p. S48)), will reach the desired level of employee loyalty (Backhaus, Tikoo, 2004, p. 504), the employees will identify themselves with the organization and they will feel responsible for its functioning. What is more, the level of trust to the employer will be higher.

Determinants of the internal employer image, among other things, are:
- quality of human resource management,
- the employer's fulfilling a psychological contract signed with an employee,
- communication system in the organization,
- organizational culture,
- management style.

For the employer image there are two important categories of work characteristics, instrumental and symbolic (Lievens, Van Hoye, Anseel, 2007, p. S48). The former let describe work/the employer by means of objective and specific qualities, exemplified by attractive salary, safety at work, variety of tasks (Lievens, Van Hoye, Anseel, 2007, pp. S48, S50). Symbolic features are, however, subjective, abstract, and elusive. As examples, there should be mentioned honesty, enthusiasm, competence, prestige (Lievens, Van Hoye, Anseel, 2007, pp. S48, S51). Therefore, it can be concluded that work in a given organization results from some rational reasons, yet emotions triggered by the employer, are equally important.

The external image is, to a large extent, a derivative of the internal image. Nevertheless, one can notice that it is being created also in a direct way, since quality of human resource management affects the opinion on the employer in the external labour market. There are four significant task areas of the HR function, namely recruitment, training, gratification, and dismissing employees which will be explained in the following paragraph. The employer striving to create a positive opinion about themselves in the external labour market, can use the following aspects:
- transmission through the employees,
- writing techniques (employment advertising, annual reports, social reports, bulletins),
- participation in contests for the best employer (*e.g.* Top Employer),
- special events (*e.g.* participation in a trade fair),
- a web page of an organization, where information concerning their human resource management is presented.

The first of the aspects mentioned above is not fully controlled by the employer, so perhaps that it is the reason for regarding it as particularly credible in the external labour market. Apart from that, some researchers claim that the external image can be treated by the employer as a mirror, where their internal image is being reflected (Lievens, Van Hoye, Anseel, 2007, p. S46).

---

[1]   In connection with the achievement of the desired supply of staff, the employer with a positive image is defined as the employer of choice.

2.2. Destruction of the employer image

It has been previously mentioned that the employer image can be changed as a result of various factors, dependent and independent of the employer. These changes do not always lead to the goal desired by the employer. It may happen that the employer image gets worse because of the changes. Factors dependent on the employer, which have a destructive effect on the employer image, are as follows:

- violation of labour laws, most often regarding the falsification of documentation concerning working time, remuneration irregularities, discrimination against employees;
- actions connected with signs of mobbing, so involving harassment and employee bullying. Mobbing, prohibited by law, is particularly harmful for the employer image, also the external one. The reason is the media interest in disclosed cases of workplace bullying;
- lack of adherence to moral norms, so taking action by the employer, that, even though is lawful, yet immoral;
- acting in accordance with the law and ethics, yet not beneficial to the employees (*e.g.* staff reductions, cutting pay in case of financial problems of the company).

Whereas factors independent of the employer, which are destructive for his image, are as follows:

- taking action by the competition in order to make their own image look better, resulting in a deterioration of the image of the other employers;
- taking action by the competition, which is aimed at spreading unfavourable rumours about the employer;
- stereotypes distorting the professional image in the labour market.

Knowledge of the factors destructive for a company image in the labour market can be productively used. Shaping the image of the employer is about a conscious avoidance of the situations potentially harmful to the employer image. What really matters is that it is easy to tarnish one's reputation, but it is difficult to make it good again.

3. Quality of human resource management

3.1. A personal function and its quality determinants

It has been stated in the previous part of the article that one of the employer image determinants is the quality of human resource management. Human resource management is one the ways of a personnel function realization. This function includes entirety of "actions connected with people aiming at achieving the organization goals and fulfilling its members needs" (Antczak, 2005, p. 18). The role has been developing since the beginning of the 20th century, when it became a separate function in enterprises. Changes taking place because of it, concern functional, institutional and instrumental solutions.

The scope of the personnel function had been limited for a long time. It dealt mainly with the aspects of employment and remuneration. However, later on it turned out that the better appreciation of an employee, the better enrichment of the personnel function. At present, actions concerning the personnel function can be attributed to the following processes: entry into the organization, functioning in the organization, leaving the organization (Pocztowski, 2003, p. 39).

Entry into the organization is recruiting candidates for the job, their selection, as well as professional and social adaptation. The functioning of the employees in the organization needs to take such action as evaluating employees, their development, motivating, and rewarding. Actions in relation to leaving the organization by an employee, depend on the initiator of such a situation, the causes, the amount of people leaving. The starting point for all processes related to human resource management should be planning staff.

The realization of the HR function depends on a number of factors which, depending on the source, can be defined as internal or external conditions. To the first belong the socio-economic, legal regulations, the impact of trade unions within the regional or national scope. Internal factors relate to the specifics of the organization, its history, the industry in which it operates, the strategy, the level and structure of employment, organizational culture and company unions. In all conditions, this function can be implemented efficiently and effectively, so it can have a proper quality. A measure of the effectiveness of the HR function will be to ensure the organization of human resources to enable it to achieve current and strategic objectives. Efficiency, in turn, requires a look at the personnel function from the angle of inputs and outputs. This efficiency is thus linked to lowering, or even eliminating, the costs of non-compliance and lost benefits. The first include the cost of errors and the costs exceeding the requirements (Bank, 1996, p. 112). The costs of lost benefits, however, are revenues lost due to the poor management of human resources. As previously mentioned, efficiency and effectiveness can be considered quality attributes of human resource management.

The following factors contribute to the efficient and effective management of human resources:
- the personnel strategy,
- process and systemic approach in the implementation of the personnel function,
- the quality of the task areas of the personnel function and the tools used in them,
- a personnel service competence.

Practising the personnel function at a strategic level, not just at an operational one, is seen as a manifestation and the effect of the evolution of this function. Ch. Fombrun, N. Tichy and M. Devann from the University of Michigan made the connection between the personnel function and the strategy of the organization, by developing the first model of human resource management. In this model, the personnel function was dependent on the strategy of the organization, which has been the subject of criticism (Paauwe, 2004, p. 26). The authors of the following models, Harvard Model, and other models inspired by it, for instance D.E. Guesta's, C. Hendry's, or A. Pettigrew's, put great emphasis on the strategy, noticing the need to integrate it with the personnel function (Bratton, Gold, 2003, pp. 20-26; Paauwe, 2004, p. 25). Currently, it is assumed that one of the functional strategies (relating to the type of the function implemented in the organization) is a personnel strategy. The researchers emphasize that personal strategy can have a comprehensive or fragmentary nature, referring to the various task areas of the personnel function, business processes or market segments. It is important, however, that it is formalized in a document which forms an integral part of the strategy in a company (Pocztowski, 2003, p. 61). The personnel strategy organizes activities within the personnel function, gives them direction and makes them not accidental, therefore, it is of great importance to the quality of the organization. If the employer gives priority to the shaping of their image in the labour market, it ought to be reflected in the personnel strategy.

Quality management specialists argue that effectiveness increases when the action and the resources used with it are managed as a process, which is confirmed by ISO 9000 norm. It is also

suggested that these processes are treated as elements of the system, so that a synergistic effect will be achieved, "according to which the interaction of different factors, not necessarily locally optimal, may enhance the final effect (the global one)" (Hamrol, 2007, p. 117). The process approach to the personnel function results in its particular task areas grouping in the form of organized activities. They are systemically intertwined, interact with each other, many a time serving for other task areas, process-recognized, as input and output. D.E. Guest in a model HRM developed by himself, assumed that introducing an integrated and coherent set of the personnel function tasks areas will make it possible to achieve better results by employees (increasing productivity, quality, innovation, lowering absence, rotation, combativeness), and, as a result, by the organization as well (Bratton, Gold, 2003, p. 22). In one of the publications it has been mentioned that it is possible to achieve the spiral effect quality, due to the coordination of timing and in terms of content while taking action (Lipka, 2005, p. 146).

Because, as it has been noted, in the personnel process the output of one process is at the same time the input of another (*e.g.* assessment results are used in the training process, in remuneration, human resource planning precedes, among other things, recruitment of employees), the efficient and effective course of process-organized task areas is very important. The procedure is determined by procedures and regulations, which are the result of standardization. Standards relating, directly or indirectly, to the personnel function are introduced at the supranational, national, and industrial level, and their source can be praxeology, law and ethics. An example of the norm determined at the supranational level is ISO 10015 *Quality Management-Guidelines for Training*. The standards set at the industrial level in relation to the personnel function are remuneration regulations, recruitment, assessment, and training procedures. It is important for employees that the appropriate standardization documents are made public, so they can meet information needs concerning the personnel policy. At the same time transparency of these standards creates confidence in the employer, which is crucial for their image in the labour market.

For the employer image the quality of human resource management task areas is particularly important. However, not all of them are equally significant. For instance, human resource planning is a process that seems to be not as important so as to affect their opinion on the employer. Nevertheless, the employees experience its effect in other processes, for example in the recruitment process. The recruitment process can be used as a means of shaping the image in the internal and external labour market. It is worth noting here the importance of the selection. The method of its realization has an effect on creating the opinion on the employer both by the rejected candidates and those who have been successfully accepted for a position in a company. Moreover, carrying out socio-professional adaptation in an organized manner has a beneficial effect on the employer internal and external image, whereas evaluating employees affects directly only the external employer image. Furthermore, the effect is stronger when the process of evaluation is not conducted in accordance with accepted principles (*e.g.* confidentiality of results, the open nature of the goals, and assessment criteria), when it is not free from error. Then it has a negative impact on the opinion about the employer. The area of staff development, especially connected with training courses, is essential for both internal and external employer image. In the external labour market a development opportunity offered by the employer is extremely important, for the employees, however, the aspects of making these training courses interesting and accessible to each and every employee play an important role. Favouring certain employees, or offering training courses which seem to be unattractive in view of a subject, time, or place where they are located, is ineffective and has a negative impact on the image of the employer. It is also signifi-

cant for both the internal and external image of the employer to remunerate employees. Not only competitive remuneration matters, but also its proper calculation and timely payment. Of course, dismissing employees is not without significance for the employer image. It is a particularly conflictogenic area of the personnel function, and thus it has always a potential negative impact on the employer. Through the adherence to the rule of law and ethics, the employer can only reduce this negative impact.

The personnel services factual knowledge concerning their duties is an extremely important factor determining the quality of human resource management. In the professional literature the following obligations of these services are indicated: taking care of proper relations between employees and employers, investing in employees, taking appropriate action in particular task areas of the personnel function, cooperation on creating the development strategy of the organization, building the position of the personnel function among other functions of the company. These tasks are part of the role of the spokesperson for employees, human capital developer, functional expert, strategic partner and leader in HR (Ulrich, Brockbank, 2008, pp. 207-225). In connection with such defined roles, for the efficient and effective implementation of the personnel function, specialist knowledge, skills and attitudes are essential. It is worth emphasizing that due to the fact that human resource management has not only operational but also strategic dimension, among those responsible for its implementation, not only the personal services are mentioned. These entities are in fact the line managers, and sometimes even customers who are involved, for example, in evaluating employees. The competence of those involved in the management of human resources form the trust in the organization, which is especially important for the image of the employer. Competent human resource management at the strategic level is manifested by creating the appropriate personnel strategy, working out appropriate procedures and regulations. The result is trust to the employer. Competent use of these procedures and regulations creates confidence in a subordinate-superior relationship.

3.2. The risk of the personnel function

Uncertainty and risk are connected with the realization of all the functions of the enterprise. One of the authors noted that the risk is defined in many different ways, but it generally means "unwanted, uncertain event, and, to be more precise – uncertain event causing loss" (Ostasiewicz, 2003, p. 3). Some authors, however, combine the risk and the positive phenomena, claiming that the opportunity to make a profit may be its consequence. (Bizon-Górecka, 1998, p. 180). Therefore, one can point out two types of risks: pure (static) risk, connected with the probability of loss, and speculative (dynamic) risk, which leads to the loss or profit (Bizon-Górecka, 1998, pp. 18-19). However, uncertainty means lack of knowledge concerning some events (Ostasiewicz, 2003, p. 4). It is a subjective category, impossible to estimate, as opposed to the risk (Lipka, 2002, p. 19). In practice, the making decisions situations based on some measurable and accurate data, are rare. More often, the management of the organization is therefore accompanied by uncertainty or risk.

The personnel function realization is determined by, as mentioned above, numerous factors. In other words, human resource management occurs in certain conditions. Since they are not always characterized by stability and repetitiveness, one can assume that these conditions create the feeling of uncertainty. Personnel risk is also discussed, however, as A. Lipka (2002, p. 24)

points out, it would be more appropriate to say "uncertainty of the personnel actions of the organization", because it is often impossible to determine the likelihood of the risk. The quoted author states that the justification for deliberations on the personnel risk (defined as engaging in conditions of uncertainty in activities related to human resources) is the fact that uncertainty and risk are associated with each other, because uncertainty generates risk (Lipka, 2002, p. 24). Another argument for the use of the term "personnel risk" is the fact that activities in the field of human resource management taken in conditions of uncertainty may cause losses. More than once these losses can be prevented or one can try to limit them. It fits in with the desire to increase the efficiency of human resource management. Inadequate quality of human resource management is undoubtedly a risk factor contributing to the deterioration of the image of the employer.

In relation to all the task areas of the personnel function and individual personnel processes, partial personnel risks can be indicated. These risks include the risk of staff planning, recruitment of the employees (and here most of all the risk of selection), the risk of assessment, the risk connected with the development of employees, remuneration, motivation, and dismissal. It has been previously mentioned that the quality of the individual personnel processes is also important because of the fact that the output of one process is usually the input of another. One of the researchers noticed that the personnel risk is a drawn risk, because one defeat experienced during the realization of one function entails another failure during the implementation of other functions (Lipka, 2002, p. 43). The loss of a positive image of the employer will surely be a loss. It clearly demonstrates the need to focus on the quality of human resource management.

4. Conclusion

The quality of human resource management determines the employer image. However, it does not only concern the image shaping in the internal labour market. This quality has an impact on the information about the employer provided by the employees to the external labour market. Information on the implementation of the personnel function is also transmitted to the external labour market of the employer. For this purpose, they use their websites, brochures, advertising for employees, social reports.

The employer who does not pay attention to the quality of human resource management, puts their image at risk. In other words, attention to the quality of human resource management can also reduce the uncertainty of personnel actions, and, what follows, the risk of deterioration in the employer image. The manifestation of this attention will be a developed and implemented personnel strategy that eliminates the randomness of human resource management. For this reason, system and process presentation of the personnel function is also beneficial. Norm transparency relating to the personnel processes, contributes to the emergence of the culture of trust in the organization, which is necessary for a positive image of the employer. The employer who neglects the quality of any task area of the personnel function, puts themselves at risk, and the risk has a drawn nature, because its effects will be seen in other areas of the personnel function and will also concern the image of the employer.

Bibliography

1. Antczak Z. (2005), Funkcja personalna w przedsiębiorstwie w okresie transformacji gospodarczo-społecznej w Polsce, *Prace Naukowe Akademii Ekonomicznej im. Oskara Langego we Wrocławiu*, No. 1058, Wrocław, Wydawnictwo Akademii Ekonomicznej.
2. Backhaus K., Tikoo S. (2004), Conceptualizing and Researching Employer Branding, *Career Development International*, 9, 4/5.
3. Bank J. (1996), *Zarządzanie przez jakość*, Warszawa, Gebethner & S-ka.
4. Bizon-Górecka J. (1998), *Monitoring czynników ryzyka w przedsiębiorstwie*, Bydgoszcz, TNOiK, OPO.
5. Bratton J., Gold J. (2003), *Human Resource Management. Theory and Practice*, Palgrave Macmillan.
6. Hamrol A. (2007), *Zarządzanie jakością z przykładami*, Warszawa, Wydawnictwo Naukowe PWN.
7. Lievens F., Van Hoye G., Anseel F. (2007), Organizational Identity and Employer Image: Towards a Unifying Framework, *British Journal Management*, Vol. 18.
8. Lipka A. (2002), *Ryzyko personalne. Szanse i zagrożenia zarządzania zasobami ludzkimi*, Warszawa, Poltext.
9. Lipka A. (2005), *W stronę kwalitologii zasobów ludzkich*, Warszawa, Difin.
10. Ostasiewicz W. (2003), *Niepewność i ryzyko*, Kraków, Wydawnictwo Akademii Ekonomicznej w Krakowie.
11. Pocztowski A. (2003), *Zarządzanie zasobami ludzkimi*, Warszawa, Polskie Wydawnictwo Ekonomiczne.
12. Ulrich D., Brockbank W. (2008), *Tworzenie wartości przez dział hr*, Kraków, Oficyna a Wolters Kluwer business.

Chapter **13**

Selected Factors of Employer Branding in the Light of Empirical Research

Anna Dolot

1. Introduction

In the face of increasing competition and more frequent and significant financial limitations companies are seeking different ways for standing out. Creating positive image of an organization through various tools and activities was firstly aimed at current and potential clients. It wasn't hard to realize though, that on the one hand an employee himself can be (or is) the company's client. On the other hand as one of its fundamental elements, he creates its image in a very significant way. Hence the increased attention for creating corporate image as an employer.

The aim of the following article is the analysis of the factors that create organization's image in the eyes of its employees based on empirical data. Research have been conducted in Kraków in 2013 on 122 employees of big (both Polish and multinational) companies. On the one hand the area of research provides answer to which elements of employer branding actually exist and function in organizations and which of them are regarded positive, thus, marked high in the questionnaire as those influencing positive image and which are considered irrelevant according to employees.

2. Nature of corporate image

Firstly, it is crucial to focus on a term "corporate/organization's image" and its selected elements apart from employer context. According to one of the definitions organization's image is a collection of ideas, expectations, convictions and knowledge about it. Image consist of a range of rational and emotional features referring to a given company. They emerge as a result of conscious and unconscious actions of a business entity. Therefore, the image is a reflection of a given institution in social awareness, which is opinion, evaluation and attitude of a particular individual (Urbaniak, 2003). Hence appearance of emotional aspect, which can suggest that image can not only be objective but mainly subjective, bound with people's emotions (clients, employees, business partners). And so, as people react differently and emotionally to various actions, factors, situations, behaviors, stimuli in general, that different (unchanging only in a given

moment) can be the image of a company according to a given person. In practice it means that in spite of the fact that a given institution has been working for a positive image for years, one person's opinion can change it from positive or neutral to negative. Additionally, it needs to be emphasized that a given institution's activities (willing to create a positive image) can be seen as organization intended (positively) but others can evaluate it just the opposite (negatively). It needs to be pointed out also that company's image will have variable character, with changing dynamics. Interestingly enough, it is typical for a human being to act on emotions and be a subject to social pressure, therefore positive aspects of a company are usually herald by the company itself (not so often by the recipients), on the other hand, negative incidents can be seen as much more serious than reality, be magnified and exaggerated. In other words, any negative emotions will be more powerful than positive in a business environment.

Hence, the emotional factor is highly significant in the image context and implies so frequent personal opinion of recipients and observers about particular events.

Another definition claims that a company's image is a developed (often by a field specialists) public appearance which puts it in a good light and serves gaining social acceptance of its activity and at the same time attracts more and more followers, clients, *etc*. (*Słownik współczesnego języka polskiego*, 1996). It means, that activities are aimed at potential clients, who decide about the state of a given organization on the market, which implies that image is the area of expertise mainly for marketing specialists. It needs to be emphasized, though, that a key client and showcase of an organization is its employee, thus, the term corporate image as an employer appeared (employer branding). According to one of the specialists in the field of image building, employees of a given organization have substantial meaning especially for companies providing services but also for non-profit organizations. He emphasizes that an employee himself can be the factor that distinguishes a given organization. For a company having excellent employees requires meticulous selection of people having contact with clients, and providing thorough training (Altkorn, 2004).

At this point, for better understanding further content, image features are presented below.

Table 1. Types of corporate image

Image features	Explanation
Positive/negative	Positive image of a company means that the environment has positive feelings towards the company, usually as a results of gained experience.
Weak/strong	Strong image means that a company has a clearly determined position in community awareness.
Self/ public	Self-image is a way of perceiving the company by the company itself (management and employees). Public image, by contrast, is the idea of a company the public has of it.
Created directly/ indirectly	Image can be created directly through personal experience of somebody who knows a given company. Image is created indirectly by a person as a result of incoming information and personal judgment of the company.
Existing/planned	Existing image is how the company is perceived at the moment. By contrast, planned image is a target image.
Clear/unclear	An image is clear when its elements that comprise it give unclouded idea of the object in a person's mind.

Source: Urbaniak, 2003.

It needs to be emphasized, that corporate image will be strong and clear only if there are continuous actions in management sphere. It means that it requires time effort and financial expenditures, thoughtful and planned strategy and tools. The requirements will be different in case of external activities and different for internal, aimed at employees and creating corporate image as an employer. However, the self-image a company has (what employees think and say about the company and working for it) can strongly (especially in the closes area, region) affect the public image, no matter the external activities (advertising, PR, sponsoring) done by a company.

3. Employer branding profile

In the reference books there can be found numerous definitions of employer branding and surprisingly some of them are pointing out different but not less important aspects. One of the most detailed definition of a corporate image as an employer indicates that it is an image (reflection) developed in current and potential employees' minds based on their personal experience (regarding current employees) or incoming information to potential corporate members and any other types of mass media (Baruk, 2006). Important elements of personal features are pointed out by the author of another definition emphasizing that employer branding covers system of values, policy and activities aimed at drawing, motivating and keeping current and potential employees of a company (Backhaus, Tikoo, 2004). He states the necessity of taking action in order to select and recruit new employees, creating motivational systems and taking other actions to cause positive feedback from employees. Another specialist in the field of employer branding highlights that employer branding is a way of perceiving an organization on external and internal labor market (Bukowska, 2012). The reason for quoting this definition was that it seems especially valid when it comes to empirical studies. Along with the definition the author claims that depending on recipient's workplace, employer branding can be divided into:
- external, when the way of perceiving a company is considered on external labor market by potential employees and also by former ones, other labor market entities like human-resources consulting agencies, job centers, National Labor Inspectorate;
- internal is determined by current employees' impressions about their company as an employer (Bukowska, 2009).

Many image specialists emphasize that different measures are used to create external and internal employer branding (*e.g.* Altkorn, 2002; Kozłowski, 2012). Sometimes it seems that there is a certain conflict of interest between external and internal recipients of factors creating corporate image. As mentioned before, activities creating corporate image require expenditures. Since different factors create internal and external employer branding, every company needs to decide where and how much of dedicated resources will be spent. It must be decided then, because every company has limited financial capacity.

Many factors can influence employer branding. They can come from inside of a company as well as can derive from its environment where it operates. Therefore, exemplary determinants of employer branding can be distinguished as follows:
- external (business, law, labor market status);
- internal (general organization's image, corporate culture, management style, corporate strategy, its structure, quality of human resources management and quality of the resources) (Bukowska, 2009).

It seems that both internal and external factors will influence the way an employee interprets and evaluates his employer. Conducted empirical research include selected external factors, thus, the division was mentioned.

Therefore it is crucial to note the reference books to indicate the range of possible factors creating internal employer branding. As previously mentioned Bukowska shows determinants that have internal organizational nature. These determinants are mainly the following:
- an employer guarantees fulfilling his end of the psychological contract with an employee,
- the quality of human resources management,
- corporate culture,
- applied human resources policy style,
- management style,
- applied communication style (Bukowska, 2009).

According to another author the most important spheres of employer branding inside a corporation are:
- internal communication,
- career paths,
- trainings,
- employee evaluation system,
- satisfaction surveys,
- salary and benefits motivators,
- events integrating employees,
- value system,
- implementation of CSR for employees (Kozłowski, 2012).

In the context of quoted literature it needs to be highlighted that both internal and external factors of employer branding were examined during the empirical research. Particular questions pointed out certain groups of issues, thus:
- corporate communication was examined by analysis of occurrence and significance rating *i.a.*: corporate communication system (*e.g.* organizing meetings, where information about corporate plans, corporate state *etc*. are given) and feedback from supervisor in order to develop and educate (although this aspect can be counted as human resources management as well as leadership style);
- human resources management (as suggested by Kozłowski this group includes: career paths, trainings, employee evaluation system, salary and benefits motivators) was examined by analysis of occurrence and significance rating *i.a.* development potential *e.g.* participating in trainings, development programs, equitable salary, attractive salary, execution of evaluation system, professional development plan/setting career path, benefits motivators like: child's care (*e.g.* corporate nursery, preschool), free membership cards to swimming pool, gym, fitness *etc*., a company mobile phone with free private calls, health insurance;
- management style (how subordinates are influenced by their supervisors to achieve objectives and complete tasks) was examined by analysis of occurrence and significance rating *i.a.* clarity of goal setting and expectations, supervisor's praise and appreciation, possibility to participate in taking important decisions for the company, possibility to decide independently on time management and the way tasks are completed.

The study pointed out also factors like: friendly atmosphere at work or job security which are influenced by a number of previously mentioned factors.

From the external factors of employer branding group certain elements were selected:

- sector, which company develops (focused especially on innovations);
- opinion about an organization (expressed by the business and private environment of the study respondents, trust and brand recognition);
- multinational working environment;
- corporate social responsibility (pro-social and pro-environmental activities);
- site, appearance and equipment of an organization;
- the way of conducting application and selection process.

At this point it needs to be pointed out that it is not possible to study all the factors of employer branding from the employees point of view through one questionnaire, therefore only selected areas were considered. The inspirational reason to choose these particular factors was a remark made by Altkorn in one of his publications. He emphasizes that employer branding appears as a result of following mechanism:

- an employee evaluates his professional status;
- the evaluation is a reason to be satisfied or dissatisfied with his job, which creates corporate image;
- the image shapes the way he feels about his job (Altkorn, 2002).

Author of this article knows from her practical experience that factors presented in the questionnaire are often designated as the ones that are truly influencing employer branding. Therefore, a question arises, do they actually operate in organizations and are they really (and which ones the most) important for employees.

4. Empirical research results

As previously mentioned, 122 respondents took part in the research, who were at that moment employees of large organizations with headquarters or affiliates located in Kraków. It needs to be highlighted that there were at least 5 employees from each organization and at least one of them was a manager. The above assumptions were intentional and were made to analyze the subject of the study in companies with greater potential (large organizations often use wider range of methods to increase employer branding than smaller ones, due to bigger financial means). Additionally, the aim was to find out employees opinion with broader experience and being in charge of group of subordinates (thus appearance of managers among respondents).

There were 29% of women and 71% of men in the sample. In terms of age sample presented following values: 37% persons aged 30-34 years, 22% persons aged 25-29 years, 20% persons aged 35-39 years, 12% persons aged 40-44 years, 5% persons aged 45-49 years. Due to the criterion of job position 25% of the respondents were managers and 75% were specialists.

The analysis of external factors which influence employer branding is depicted by Figure 1. Respondents agreed that whether company is trustworthy was the most important factor (almost 20%). The runner-up factors are brand recognition and positive image on the market.

Figure 1. Significance of external factors of employer branding on the market
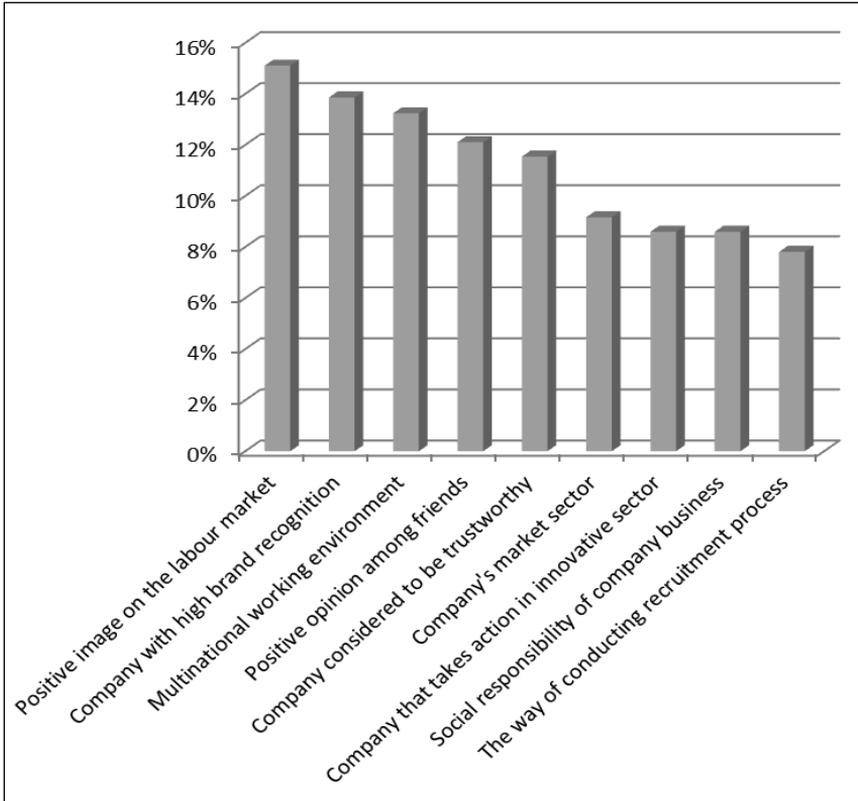
Source: own work.

Then, internal factors were analyzed that can influence employer branding. In the first part of the study the respondents were asked to point out which of the 25 given factors influencing employer branding occur in their companies where they are currently employed. The results are presented in the Figure 2.

Figure. 2. Frequency of occurrence of internal factors of employer branding in respondents opinion
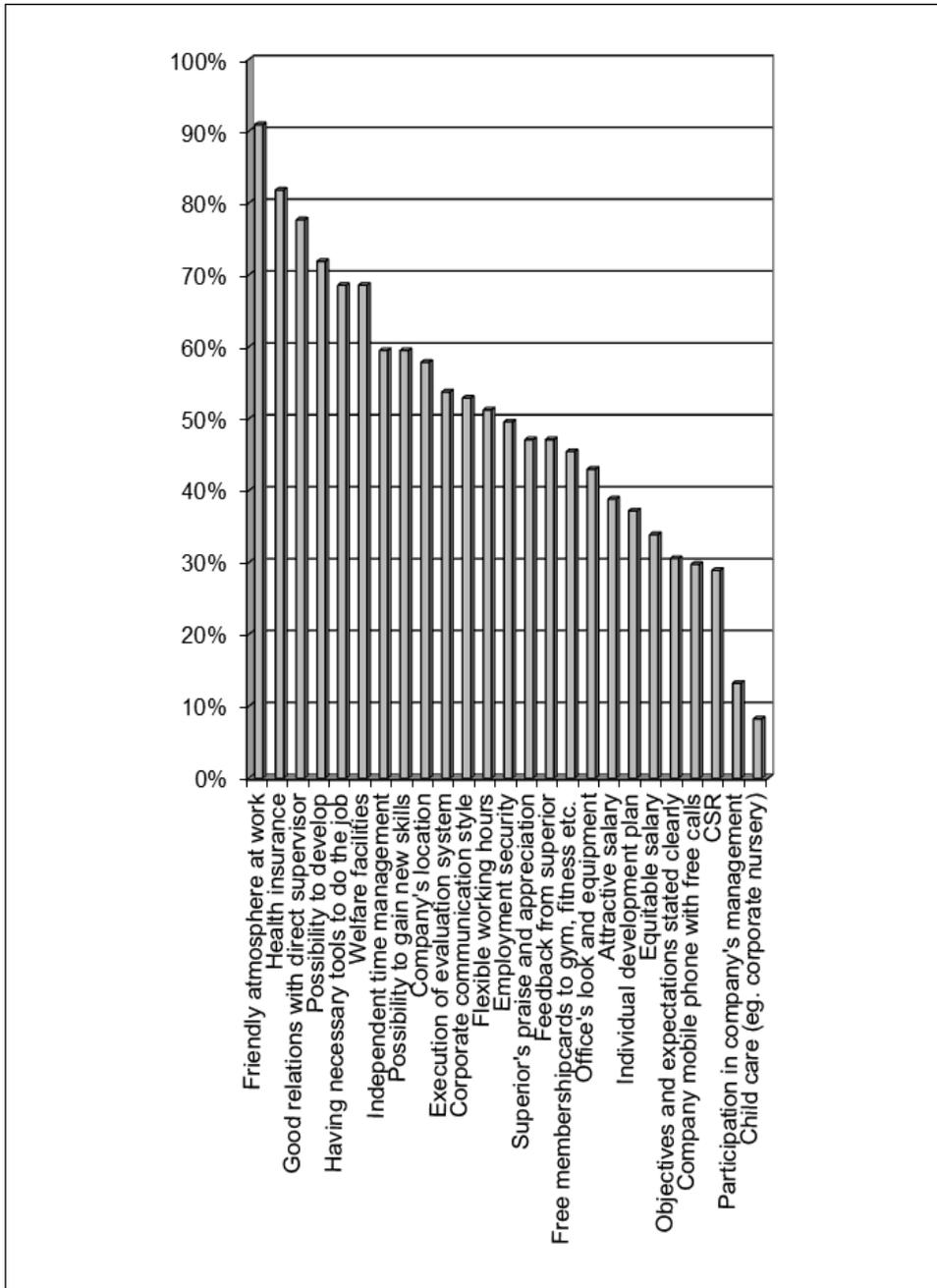
Source: own work.

Interestingly enough, the most frequently chosen factor was friendly atmosphere at work. Second came an element of motivational system – health insurance and third was – being with good relation with direct supervisor. The results were positive and sometimes even surprising. Friendly atmosphere at work surely increase job satisfaction and sense of fulfillment, can also affect positively employees' efficiency. Unfortunately, it is still uncommon to ensure corporate nurseries or kindergartens for the employees' children (last place on the list). Possibility to participate in making important decisions for the company took low place as well. It is very disappointing, because this is the element which, later on, greatly contributes to identifying with a company.

Secondly, the respondents were asked to choose 10 the most important factors that influence employer branding (regardless of the fact whether the factor have ever appeared in their companies or not) and number them from 1 (the most important) to 10 (still important but on the 10th place). The results are shown in the Figure 3 (the results were converted in a way that the highest score means the highest place).

It seems to be a positive phenomenon, that both friendly atmosphere and good relations with direct supervisor are common in large organizations in Kraków, for the two elements placed in the first four the most important factors influencing employer branding in the eyes of employees. However, the most popular factor was "attractive salary" which sounds reasonable (real-life and practical). Unfortunately, this element was not even in the first ten of the factors which appear in large companies in Kraków (it was situated rather at the end of the list). It is consolatory that possibility to develop through *e.g.* taking part in a training course was on the third place. Generally, it is an investment that brings benefits not only to a given company but to a whole city (investment in human capital).

Figure 3. Significance of internal factors influencing employer branding in respondents opinion
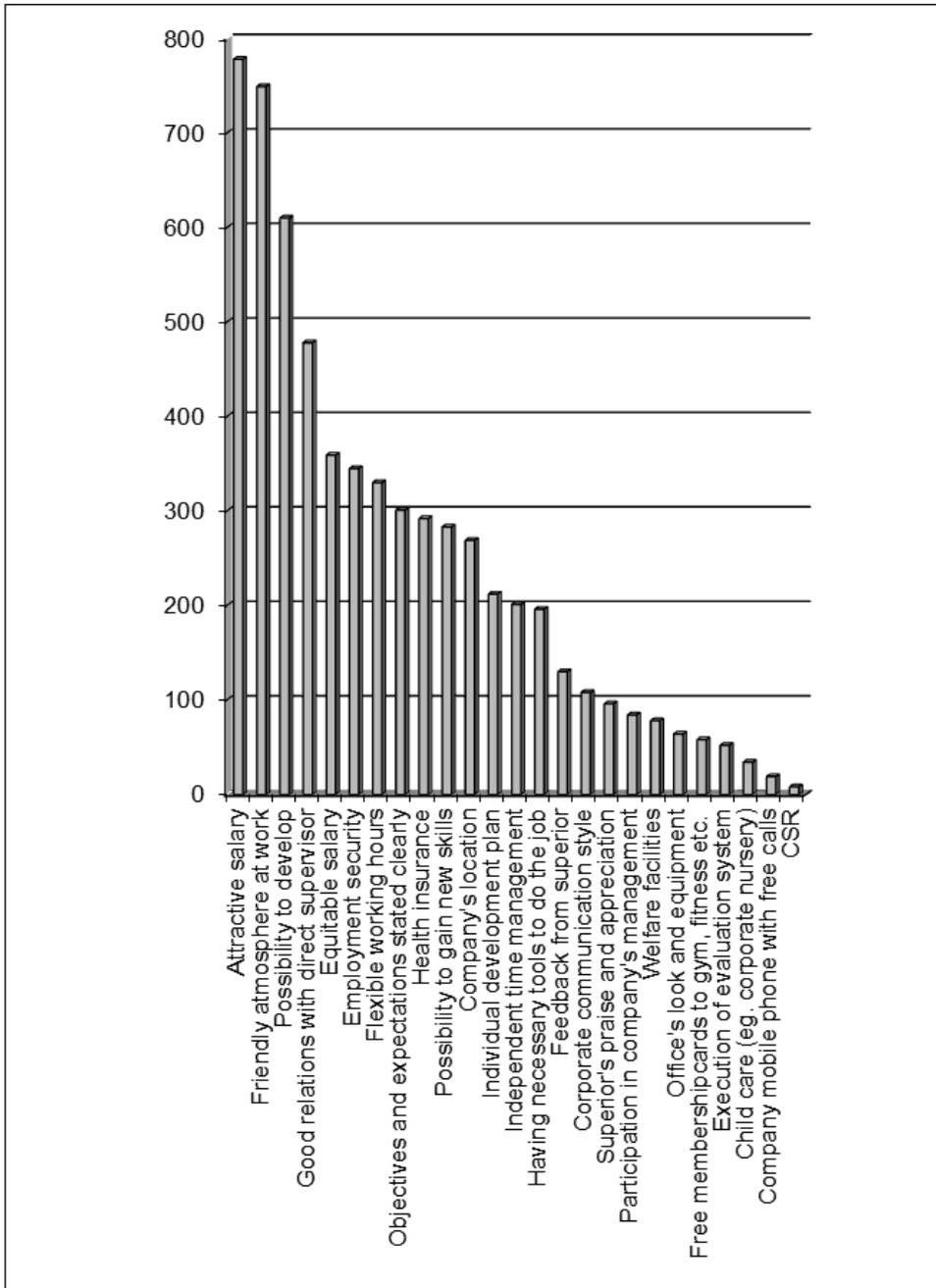
Source: own work.

Further analysis of gathered data pointed out that corporate charitable activity and/or environmental friendly policy are both factors that score the least points on the list of all factors influencing employer branding. At the same time, both factors were analyzed independently. Figure 4 shows the answer to: Does the company's environmentally friendly policy influence employer branding? So many as 73% of respondents in total claimed that this is the factor that influence employer branding.

Figure 4. Respondents' answer to: Does the company's environmentally friendly policy influence employer branding?
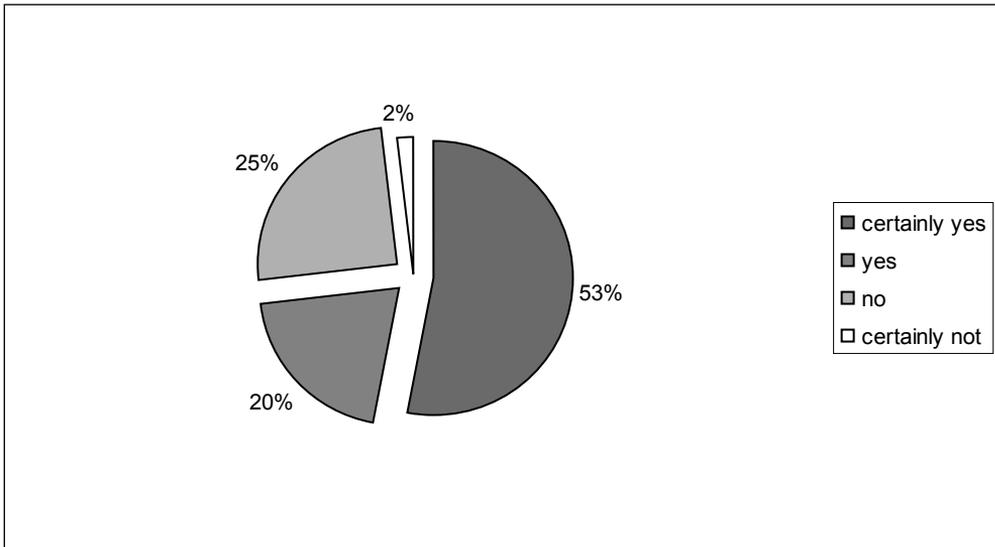
Source: own work.

What is interesting, certain statistical dependencies were noticed about the analyzed subject. It turned out that according to Spearman's correlation coefficient (equal -,262820, on the significance level $p < 0,05$) there is a dependency indicating the following fact: with age of a given respondent the tendency to choose "absolutely not" increases (in other words they pay attention to company environmentally friendly policy less as an element of employer branding).

Even larger number of respondents (77%) gave a positive answer to: Does the charity activities of the company influence employer branding? Figure 5 presents the structure of answers.

Figure 5. Respondents' answers to: Does the charity activities of the company influence employer branding?
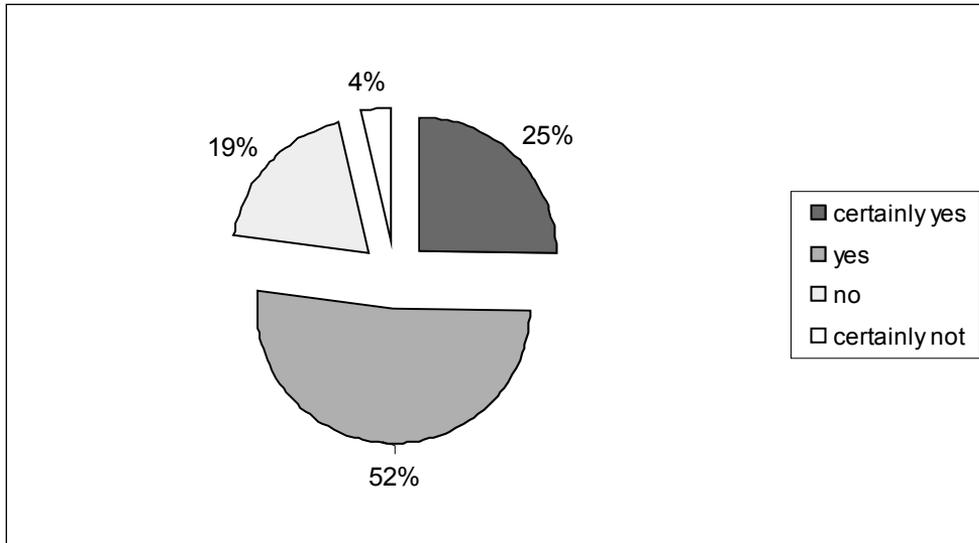
Source: own work.

It can be argued why the above factors are considered the least important from the wide range of other factors, and at the same time the majority of respondents claim that the factors are actually important. Perhaps, employees have the tendency to express positive opinion about these factors at other people's employers, not necessarily their own.

5. Conclusion

Employer branding can be influenced by many factors and can change dynamically in time. In analyzed large companies in Kraków, among all external factors, the most popular is regarding the company as trustworthy. On the other hand, the external factors (existing and significant) the one concerning atmosphere at work is always marked high. Despite the fact that, intangible factors (beside atmosphere at work also good relations with direct supervisor, possibility to develop, flexible working hours) are marked high, tangible factor (attractive salary) turned out to be also important to the respondents, but unfortunately uncommon.

Bibliography

1. Altkorn J. (2002), *Kształtowanie rynkowego wizerunku firmy*, Kraków, Wydawnictwo Akademii Ekonomicznej w Krakowie.
2. Altkorn J. (2004), *Wizerunek firmy*, Dąbrowa Górnicza, Wyższa Szkoła Biznesu w Dąbrowie Górniczej.

3. Backhaus K., Tikoo S. (2004), Conceptualizing and Researching Employer Branding, *Career Development International*, Vol. 9, No. 4/5.
4. Baruk A.I. (2006), *Marketing personalny jako instrument kreowania wizerunku firmy*, Warszawa, Difin.
5. Bukowska U. (2009), Rola kultury organizacyjnej w kształtowaniu wizerunku pracodawcy [in:] *Kulturowe uwarunkowania zarządzania kapitałem ludzkim*, (ed.) M. Juchnowicz, Kraków, Wolters Kluwer Polska.
6. Bukowska U. (2012), Kształtowanie wewnętrznego wizerunku pracodawcy – implikacja dla jakości życia w pracy [in:] *Praktyka zarządzania jakością w XXI wieku*, T. Sikora, M. Giemza, Kraków, Uniwersytet Ekonomiczny w Krakowie.
7. Kozłowski M. (2012), *Emlopyer branding – budowanie wizerunku pracodawcy krok po kroku*, Warszawa, Wolters Kluwer Polska.
8. *Słownik współczesnego języka polskiego* (1996), Warszawa, Wilga.
9. Urbaniak M. (2003), *Wizerunek dostawcy na rynku dóbr i usług*, Łódź, Wydawnictwo Uniwersytetu Łódzkiego.

Selected Psychosocial Determinants of Building Organizational Commitment

Alicja Szczygieł

1. Introduction

Contemporary human resources management requires development of employees' engagement into aims that are put forward and realized by organizations. Management that encompasses this direction of operations brings significant advantages for a company. An involved employee realizes tasks with joy and satisfactions, he demonstrates pro-activity, creativity and a willingness for development (Zawadzka, 2010, p. 167). Employee's engagement also decides about realization of his every day duties in a careful manner that complies with the company's mission. Teams of people immersed in work create good atmosphere of the company, support each other and introduce innovative changes that are advantageous for an organization.

There are numerous factors that influence organizational engagement of employees. Among them we can list organizational culture based on trust, employee's personality, a feeling of satisfaction from the performed professional duties, relations with a superior, self-esteem, fulfilled needs, hierarchy of values of an employee.

2. Significance of organizational engagement

In literature of the subject there are various captures of a definition of organizational engagement presented.

W.A. Khana defines personal engagement as "using oneself to realize organizational roles. The engaged employees express themselves physically, cognitively and emotionally during realization of organizational roles" (Rudawska, 2011, p. 75).

D. Schulz, S.E. Schulz define organizational engagement as "size of psychological identification with organization or attachment to it" (2002, p. 316). We can differentiate several components of engagement: "acceptance of organizational values and aims, readiness to make efforts to the benefit of the organization, strong desire to become a member of the organization" (Schulz, Schulz, p. 316).

Hewit Assciates determines an engaged employee as a person, who speaks, remains and acts (Rudawska, 2011, p. 77). A person that stands out with these assets represents the company in a positive lights during conversations with partners or clients. He connects his professional plans with it and cares for an organization to achieve successes. An engaged employee is willing to devote his additional time for the organization.

A similar definition of engagement is presented by Wilmar Schaufelieg, who argues that "engagement is a psychological state, which mediates in influence of work and individual resources on organizational results" and this is "a positive state of mind regarding work, characterized with vigor, absorption and devotion" (Zawadzka, 2010, p. 156). Vigor is among other motivation for action and achievement of an aim; devotion – identification with a company' absorption – performing tasks with positive attitude, joy, high concentration and involvement.

M.L. Berry and M.L. Morris present engagement as "a state, where an employee is active at work, has positive attitude towards it and satisfied with it" (Juchnowicz, 2012, p. 34).

Salancik, in his definition, draws attention to the role of behavior in developing engagement. According to this author, "engagement is a condition, where a unit connects its actions with its opinions, and these opinions support its actions and its participation in specific events" (Armstrong, 2001, p. 126).

Eurofaud, in the published report from research, entitled "A report based on the fifth European Working Conditions Survey" (2013), states that employees' engagement refers to a possibility of their participation in the process of making decisions, which influence their work (www.eurofound.europa.eu/publications/htmlfiles/ef1330.htm).
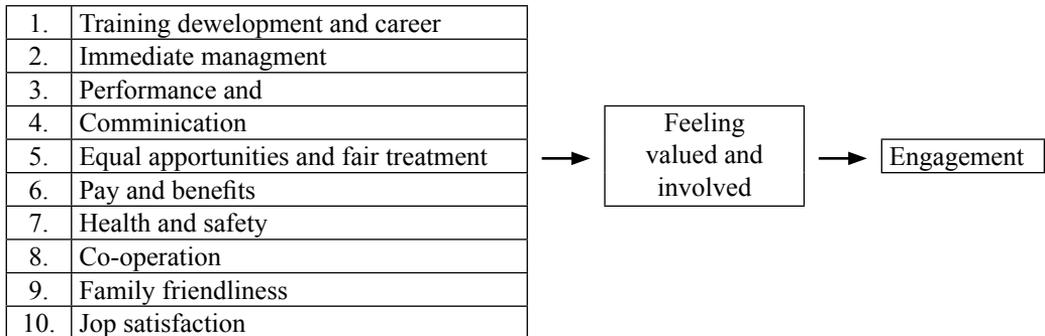
Definitions of engagement proposed in the mentioned literature of the subject may be demonstrated from the perspective of an employee' attitude. An attitude is "a trend for positive or negative behavior towards various objects. Attitudes direct, dynamize or reduce reaction, action of a unit or of a group, placed within a specific social situation" (Borkowski, 2003, p. 85). Nowak S. defines attitude of an employee as "proneness to react in a specific manner, towards tasks and results of it work" (Juchnowicz, 2010, p. 33). There are basic components of an attitude differentiated: affective, cognitive, evaluative and motivational (Reber, 2002, p. 527). The affective component refers to emotional relation towards the attitude's object (*e.g.* a commissioned task). An employee that is affectively engaged "identifies with the organization, internationalizes its values and attitudes and conforms to requirements" (Schultz, Shultz, 2002, p. 318). A cognitive component is a way of thinking about the object of attitude. An engaged employee thinks and speaks about the company in a positive manner. The motivational component refers to disposition to action, and the evaluative one regards the approach of a person towards the object of attitude, which for example may be positive or negative. An employed person gets engaged in tasks from his own initiative, he is highly motivated to achieve the aim and is willing to devote his additional time to do it. Objects of attitudes embrace values that are esteemed by the subject, encompassing *e.g.* other people (friends, family), concepts that are believed in and created by the person, events, material things and the object itself (Borkowski, 2003, p. 85).

An engaged employee has positive attitude towards his task, he realizes it willingly with strong motivation, feeling positive emotions such as joy, satisfaction. He describes his work in superlatives, he does not criticize the company outside in front of other subjects (employees, clients, *etc.*). He likes his work and identifies with it.

3. Determinants of engagement of an employee

There are numerous factors that decide about employees' engagement in an organization; IES model (created for research purposes) points to a strong relation between the feeling of being appreciated and participation and engagement (Robinson, Perryman, Hayday, 2004). The authors also present a group of another factors that build engagement of employees. The most significant ones comprise of trainings, development and career, direct supervisors, results and evaluations, communication, opportunities and fair treatment (Robinson, Perryman, Hayday, 2004) (Tab. 1).

Table 1. Factors determining the involvement of employees in the organization

1.	Training dewelopment and career
2.	Immediate managment
3.	Performance and
4.	Comminication
5.	Equal apportunities and fair treatment
6.	Pay and benefits
7.	Health and safety
8.	Co-operation
9.	Family friendliness
10.	Jop satisfaction

Feeling valued and involved → Engagement

Source: http: www.employmentstudies.co.uk/pubs/summary.php?id=408 [20.05.2014].

E. Bombiak present a ranking of factors that influence engagement and results of work according to employees and employers (Bombiak, 2010, p. 68) (Tab. 2).

Employees gave the highest significance to financial remuneration and possibilities of development. According to them, the smallest motivating effect is achieved by orders, prohibitions, terms and conditions and instructions for fulfilling professional duties.

Table 2. Ranking of factors that influence engagement according to employees and employers

	Evaluation of subordinates	**Evaluation of supervisors**
1.	Primary remuneration	Primary remuneration
2.	Bonuses	Bonuses
3.	Participation in profits	Participation in profits
4.	Possibility of development	Allowances
5.	Fine relations between people	Possibility of development
6.	Allowances	Financial prizes
7.	Periodic evaluations	Proper working conditions
8.	Promotion	Fine relations between people
9.	Independence in decision making	Periodic evaluations
10.	Recognition and respect	Feeling of employment safety
11.	Proper working conditions	Ration persuasion

Source: on the basis on Bombiak, 2010, p. 68.

On the basis of literature, Juchnowicz (2012, p. 53) lists ten most significant aspects that influence engagement of an employee. They embrace:

- "leader behaviors of the higher management personnel,
- relation with a direct supervisor,
- interesting and challenging work,
- perspectives for development,
- participation in decision making,
- independence of action,
- team corporate culture,
- fine internal communication,
- proper working conditions,
- supporting systems and structures" (Juchnowicz, 2012, p. 53).

Taking the direction of human resources management, the employees' engagement is first of all influenced by: "management of diversity, using competences, shaping balance: work – life, proper management in the form of motivation and application of a psychological contract, health management causing in the employed a proper perception of a load (Lipka, Winnicka-Wejs, Acedański, 2012, p. 90).

Literature point to numerous factors that influence development of engagement of employees. Among those above mentioned determinants, the author emphasized motivation, prized values of the employees and fine internal communication.

3.1. Significance of the prized values and motivation in development of employees' engagement

A research project (own research) was realized in a big company from the sector of financial services. Analysis was applied to the training process, where 114 persons took part in, including 99 women and 15 men, in the age from 26 to 55. All were intermediary employees responsible for sales of financial products offered by the company – a share unit of an investment fund. Persons that lernt possessed medium (48 employees) or higher (66 employees) education. Aim of the research was to develop capabilities of sales of the product offered by the company – the investment fund. The company advertised it in its sales points (posters, leaflets). Most of the employees have already sold with kind of fund but results were not satisfactory for the company. A group of 94 employees was authorized to sale share units of the fund before directing them to take part in the training, and 20 persons did not hold such a right.

Aim of the research was to obtain information regarding relation of the chosen values priced by the employee with his:

- effectivenes of learning during the training, expressed by an increase in knowledge,
- effectivenes of work expressed in the number of obtained volumes.

There was also an attempt taken to check, whether content of a communicate sent by the managers to the employees influences motivation for active participation in the training.

In order to examine the values prized by employees, Work Importance Study (WIS) by Super was applied. The main assumption of this method is examination of motivation for work and engagement into work and professional career, but also connection of those variables with a subjective evaluation of life quality (www.alta.pl). The questionnaire is divided into three parts.

They embrace: The Questionnaire of Preferred General Values, the Questionnaire or Social roles' Significance and the Questionnaire of Values Realized within the Roles. In the described research the Questionnaire of Preferred General Values was applied, which allows to determine the degree to which a single unit prefers each of the 21values, enabling reproduction of their individual hierarchy.

These values were defined by Super in the following manner:

- using abilities – a possibility to use and develop own abilities and interests;
- achieving mastery – a feeling of satisfaction that arises from work that is well-performed;
- promotion – interest in vertical promotion, professional development and a growing social status;
- own development – a possibility to learn, discover new theories, ideas; interest in development of one's own subjectivity;
- aesthetics – interest in aesthetics, participation in creation of beauty in the surroundings;
- altruism – helping others, also at one's own expense, concentration on general values of the society;
- autonomy – a willingness for independent decision making;
- creativity – interest in creating something original, demonstrating invention;
- material benefits – interest in material benefits, having high remuneration, *etc*.;
- own lifestyle – a possibility to live in accordance with one's values, not complying with group standards;
- physical activity – a willingness to be physically active;
- prestige – interest in a status arising from respect and esteem, a feeling of being important, recognized;
- risk – taking risk resulting from the performed actions, ability to act in unfamiliar situations;
- social interactions – attitude towards being in a group, interest in team work;
- social relations – interest in a possibility to obtain emotional support from colleagues and friends;
- changeability vs. routine – interest in changeability, variety, diversity of actions;
- good work environment;
- commonness of experiences and view of the world – interest in commonness of experiences and of view of the world, a possibility of identifying with significant values and customs of a group;
- physical effort – concentration on physical and not material aspects of work, taking actions that require physical effort;
- economic stability and safety, interest in economic stability, durability and safety (Hornowska, Paluchowski – on the basis of material obtained thanks to kindness of the ALTA company).

In order to examine the increase of knowledge of the learning employees, they filled a test prepared by a team of coaches responsible for the training. The persons filled the test twice during the training. First time before the training was started and second time before it was finished. For research purposes, also financial results of the company based on the number of share units in a fund sold by an employee, a month before he took part in the training, and three months after its completion. Right after completion of the training, the employees also filled a survey. Its purpose was to obtain knowledge on manners of motivating employees by direct supervisors, to take active part in the education process.

3.2. Prized values and effectivenes of work

On the basis of comparison of the sold volumes and trained employees it was found out that there was a significant increase in effectiveness of the employees after the training. In the performed research of influence of individual characteristics of an employee, expressed with prized values, on his effectiveness at work, a statistically significant dependence for values was noticed for values "achieving mastery" and "autonomy". For the remaining 19 values determined in the WIS, there were no statistically significant differences spotted. It seems that influence of these values on effectiveness of work of learning persons is connected with character of the performed work, which consists in, among others, abilities to interest a potential client with the sold product and consequent realization of actions. According to the obtained results of research, it was found out that good effects are achieved by those, for whom it is important to achieve mastery at work, *i.e.* those who care for quality of the fulfilled professional duties. These persons aim at realization of their task in a reliable manner. They show a willingness to meet a challenge that is perceived as important, they persistently head towards achievement of the set goal. "Autonomy" proves that the persons, who prize that value prefer to make decisions independently, which may be very useful in case of conversations with clients, which are non-schematic and adjusted to individual expectations of each client.

3.3. Prized values and an increase in knowledge

On the basis of the conducted analysis it was found out that there is a statistically significant difference between an increase in knowledge and the following prized values: application of one's own abilities, achieving mastery, autonomy, lifestyle, changeability. Persons that prefer the value: "application of capabilities", they are motivated to develop their abilities, capabilities and interests, thanks to which they take part in trainings more willingly. Employees, for whom "achievement of mastery" is important, are satisfied with a feeling of well-performed work, awareness that others see results of their work; attitude rather towards a task (work) than career, a willingness to meet challenges of a tasks perceived as important, durability of the achievements. Persons that prize "their own lifestyle" put emphasis on defense of their own values (*e.g.* connected with education, work), and are not easily influenced by others. Employees that value "autonomy" give credit to a possibility of making decisions, plans and realizing tasks independently. Persons that value "changeability" prefer diversity, variety of actions.

On the basis of research it was found out that an increase of knowledge of the learning persons is influenced by values that they prize. Employees that prefer the listed values are more willing to learn, their development is significant for them, they are motivated to achieve aims, *e.g.* the professional ones. They are not influenced by persons, who prize other values or expressing other beliefs than their own.

3.4. Content of the communicate and motivation for active participation in a training

Employees directed to take part in the training not always received from their managers proper information on the program and expected results of the training. A group of 47.37% had

knowledge on this topic, but the remaining participants did not receive such information. Majority of employees, who talked about the program with their supervisors was not satisfied with quality of the received information, and they assessed it as insufficient (51.75%) or satisfactory only to a low extent (4.39%). Part of the group was of the opinion that the message was good (22.81%) and very good (9.65%). A group of 11.40% of employees directed to the training evaluated the quality of its message as medium. On the basis of the Pearson's linear correlation coefficient r = -0.31, it was determined that persons, who supervisors spoke to about the training program, were then more satisfied with their participation in the organized training that the employees, with whom there was no conversation.

Majority of the questioned employees (59.65%) did not receive any information on the reasons why they were chosen to take part in the training. Such information was obtained by 39.46% of the surveyed. From this group of workers, the persons determined the quality of the received information as good and very good (respectively: 18.42% and 7.02%). The remaining persons that spoke on the topic of provided information though that it was satisfactory to medium extent (9.65%). A small group of the examined was not satisfied with quality of information and assessed it on a low or very low level (respectively: 3.51%, 2.63%).

Supervisors of the learning employees used two main arguments in order to motivate them to take part in the training. One group of employees (47.37%) was suggested that the training is a chance for their development, the second one (47.36%) that it is a professional duty. Only some supervisors (5.26%) treated the training as a distinction for the employee. Nobody pointed to a possibility of promoting an employee through development of competences. While applying ANOVA: $F(1.107) = 11.09$, $p < 0.01$ a statistically significant relation between the manner of motivation of employees by supervisors to take part in the training and later satisfaction was noticed. Employees, who were suggested that the training is a chance for development were more satisfied with participation than those, who were informed that it is their professional duty to take part in the training.

4. Conclusion

Attitude of engagement is advantageous for development of the company and employees themselves. An engaged person is characterized with a positive attitude towards work, he has higher internal motivation, realizes tasks in accordance with his own beliefs, which makes him feel better. Such an employee realizes tasks on the highest level and participates in generation of benefits for the company (Zawadzka, 2010, p. 165).

The presented research shows that among numerous determinants that influence activation of employees there are also the values prized by an employee, especially: achievement of mastery and autonomy. Communication that takes place between an employee and his supervisor is also significant. Proper content of the communicate, directed *e.g.* on benefits for the employee, a possibility of promotion or learning, may influence the increase of internal motivation[1] of an employee and engagement into tasks that he is ascribed with. Employees' feeling that the company is willing to and does invest in their professional development. Persons that take part in the training process feel that they are treated by the company in a very serious way. Engagement and iden-

---

[1] Internal motivation – engaging in a given action because it brings pleasure, activates interest (Hamer, 2005, p. 136).

tification with values and mission realized in a given company increases inside them (Zbiegień-Maciąg, 2006, pp. 141-142). Trainings also support enhancement of internal communication, because everyone learns how to solve specific problems, which methods to use, which one are good and which should be eliminated. Everyone obtains knowledge in the field of mutual cooperation supporting creation of positive atmosphere, leading to engagement. Investing in development of employees also fulfills their needs and realizes values that are significant for them.

However, it needs to be remembered that engagement that is too strong may negatively influence physical and mental conditions of an employee, leading to worcaholism. People addicted to work have high motivation to act and achieve the set goals. They devote their free time, family, friend to the successes of their own and of the company (Ratajczak, 2007, pp. 150-151). They realize aims at a company's and at their own cost. Therefore, healthy engagement and maintenance of balance between professional and private life is significant.

Bibliography

1. Amstrong M. (2001), *Zarządzanie zasobami ludzkimi*, Dom Wydawniczy ABC.
2. Bombiak E. (2010), Motywowanie pracowników w świetle badań empirycznych, *Zeszyty Naukowe Akademii Podlaskie w Siedlcach*, *Seria: Administacja I Zarządzanie*, No. 86, pp. 65-79.
3. Borkowski J. (2003), *Podstawy psychologii społecznej*, Warszawa, Dom Wydawniczy ELIPSA.
4. Hamer A. (2005), *Psychologia społeczna*, Warszawa, Difin.
5. Juchnowicz M. (2012), *Zaangażowanie pracowników*, Warszawa, Polskie Wydawnictwo Ekonomiczne S.A.
6. Lipka A., Winnicka-Wejs A., Acedoński J. (2012), *Lojalność pracownicza*, Warszawa, Difin.
7. Ratajczak Z. (2007), *Psychologia pracy i organizacji*, Warszawa, Wydawnictwo Naukowe PWN.
8. Reber A.S. (2002), *Słownik psychologii*, Warszawa, Wydawnictwo Naukowe "Scholar".
9. Robinson D., Perryman S., Hayday S. (2004), *A Raport Researched by IES*, www.employ mentstudies.co.uk/pubs/summary.php?id=408,2014 [20.05.2014].
10. Rudawska A. (2011), Motywowanie do zaangażowania w organizację oraz życie społeczne i rodzinne, *Master of Business Administration*, 1/2011, pp. 76-86, https://www.google.pl/?gws_rd=ssl#q=Rudawska+-+Motywowanie+do+zaanga%C5%BCowania+w+organizacje [15.05.2014].
11. Schulz D., Schulz S.E. (2002), *Psychologia dzisiejszej pracy*, Warszawa, Pilskie Wydawnictwo Nauk.
12. Zawadzka A.M. (2010), *Psychologia zarządzania w organizacji*, Warszawa, Wydawnictwo Naukowe PWN.
13. Zbiegień-Maciąg L. (ed.) (2006), *Nowe tendencje i wyzwania w zarządzaniu personelem*, Kraków, Oficyna Ekonomiczna.
14. www.eurofound.europa.eu/publications/htmlfiles/ef1330.htm [19.05.2014].
15. www.Alta.pl [19.05.2014].

Chapter 15

The Role of the Incentive System
in the Development of Employees Involvement

Grzegorz Pamuła

1. Introduction

Modern economy is increasingly being called knowledge-based economy. The essential thing, which is a proof of such facts is a business practice. One of the primary criteria for the company's survival is becoming the value of intangible assets. These are no longer identified only with patents, brand, or goodwill, which was as far as any indefinite values (Edvinsson, Malone, 2001, p. 32). Currently, as part of intangible assets outside the previously mentioned items are know-how, and above all the intellectual capital of the company. However, despite the fact that no one disputes the existence of the intellectual capital of the company, there is no generally accepted definition of this issue. There is also no standard as to how to measure intellectual capital, or present it in financial statement.

The common component is the human capital of employees, which most researchers listed as the primary component of the intellectual capital of the company. It becomes, therefore, a particularly important value for the company, in other words, a key success factor. Thus, an appropriate choice of the employees, their work preparation, taking into account its's individual characteristics and to keep them in the enterprise is a strength of the modern enterprise. The question arises how companies can achieve this state. The answer to the question is to shape the engagement of employees.

Companies usually employ involving HR departments or hiring specialized companies in this field. Smaller companies are usually assigning someone employed to this task. However, whether the selected employee will be a source of future value - added largely depends on its engagement to the company.

It is worth noticing that the engagement of employees can have a positive impact on the company, but also on employees. The issue of labour and wages has been known for centuries, and today it should be noted that condition for the professional and private development is performed profession. Both types are associated with salaries.

2. Intangible assets in the context of labour issues

2.1. Labour as a value

Nobel Prize winner E.S. Phelps puts the work in the center of a normal life. He sees deep parabola between the benefits which are from being an employee, and private life. It is believed that mental stimulation resulting from performed tasks allows them to develop the ability to solve problems, improve processes, create new processes, and also teaches interpersonal conflict resolution. The author recalls the words of T. Veblen's theory: "humanity directs something more than hedonism and willingness to enter into trade relations. There is also a desire to self-improvement and curiosity of how the world works, or how to make it work better – the instinct of good works".

E.S. Phelps notes that labour is performing intellectual function, and by creating a sense of belonging also fulfills a social function. The author also notes that by participating in productive activities of companies, labour is realizing higher needs of employees.

A. Marshall notes that the profession performed by the man is keeping the vast majority of the most effective work of the mind. It is therefore clear that a person's character is shaped by the thoughts and feelings that are connected with performed tasks and relationships with colleagues (Phelps, 2013, pp. 27-31).

E.S. Phelps also notes that despite the increase in wages in the last 50-100 years, people want to work more than a few hours a week. The author believes that this is due to the achievement of a balance between income and leisure time. Because people are financing leisure time activity from salary. The second reason is the need to have money for consumption, savings, but also for others. We want to ensure the survival of children and parents. An important element is the coexistence with other employees, because we want to achieve a similar income to be able to participate in group activities (Phelps, 2013, p. 29). Above claims implies the idea that work is a particularly important element of human life.

Moreover, the content and quality of work also affects the company where he works. The point of assessing the effectiveness of both businesses and implementation of intellectual and social function is employee engagement. These relations are illustrated in Figure 1.

Figure 1. Implications of employees engagement
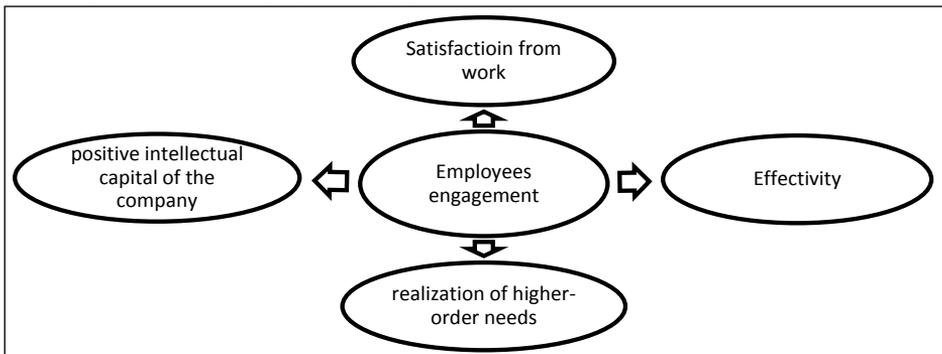
Source: own work.

2.2. Human capital and labour

It is worth noting that research on the development of poorer countries carried out by T. Schultz indicated that faster development of societies stems from investment in society. The author noted that traditional economic models do not work in poorer countries. He noted, however, that faster growth is determined by social investment. According to Schultz's theory human capital is an attribute of all congenital and acquired skills and also investment in these skills (Dobija, 2004, p. 150). The author lists five groups of factors that develop human capital:

- formal education,
- training in the workplace,
- health,
- study programs for adults,
- migration.

Schultz points out also that the rate of returns on investment on human capital is higher than the return on other investments. At this point it is also worth noting that the theory of human capital investment also take into account the acquisition of information about labour market, which in the long term allows you to customize your skills to labour market needs (Jarecki, Kunasz, Mazur-Wierzbicka, Zwiecha, 2010, p. 19). The employer can affect the four above groups.

G. Becker develop human capital theory in microeconomic terms. His research recognizes the need to differentiate pay according to possessed competence. The difference in pay is connected with the division on general and specific education. The costs of general education, in an indirect way is covered by employee. It is assumed that the payment received by an employee is below the level of payment he would receive elsewhere in order to cover the costs of training. Therefore, the net wage is the difference between gross pay and the amount of expenditure incurred by the company for his training. Specific training costs are covered by a company, because those competences would not bring higher income to the employee in another company. Hence the lack of differentiation between gross and net pay in the case of specific training. Employee receives a premium over wages of generally educated people. In those case, the employee leaving is connected with mutual loss. Company is losing the capital invested in the specific education of employee, and the employee loses the premium he received. It can be noticed that those payment rules are building employee engagement. Sallary is here payment for acquired competence. The author also notes that there are two types of education which will not bring the future costs: increased productivity, resulting from learning, but unrelated to any training. This issue can be interpreted as a factor of experience. The second type of training that will not bring future costs is the preparation for the job newly hired person (Dobija, 2004, p. 152).

2.3. Corporate intellectual capital

Corporate intellectual capital is a term commonly used. It is increasingly treated as a source of competitive advantage and value of the company, which is popularly called "goodwill". One of the most popular models of intellectual capital of the company is a model created by L. Edvinsson and MS Malone. In their research, the company is compared to a tree, while the role of the root attribute to intellectual capital. This comparison leads to the conclusion that the company cannot function in the long term without intellectual capital. The authors divide intellectual

capital into three basic categories: human capital, structural capital and client capital. More detailed diagram of the company's capital structure is shown in Figure 2.

The analyze of the above capital structure lead to the following formula defining intellectual capital: human capital + structural capital = intellectual capital.

The result of the authors' research is often used Skandia navigator, which refers to hole company operating in a certain space of time, where the main point are people who integrate the entire enterprise over time and across the capital structure. This is illustrated in Figure 3 (Edvinsson, Malone, 2001, p. 32).

Figure 2. Model of the market value Skandia
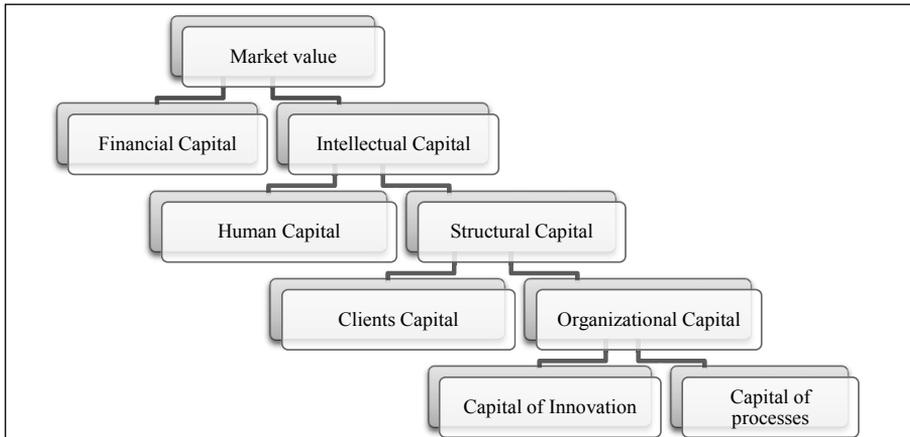
Source: Edvinsson, Malone, 2001, p. 45.

Figure 3. The Skandia Navigator
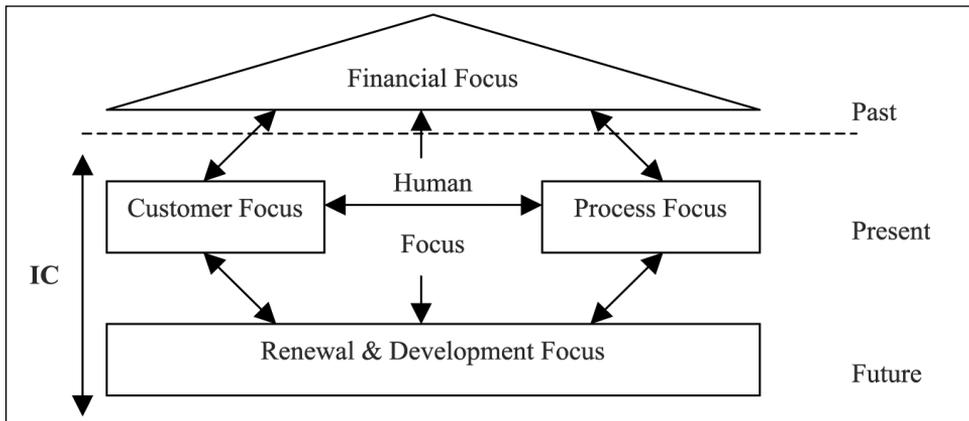
Source: Edvinsson, Malone, 2001, p. 45.

Intellectual capital is very popular subject of research, the table below shows some research examples.

Table 1. Summary of models of intellectual capital

Author	Elements of intellectual capital
L. Edvinsson	Human capital Structural capital (clients capital, organizational capital)
H. Saint-Onge	Human capital Clients capital Structural capital
K. Sveiby	Individual competence External structure Internal structure
G. Roos, J. Roos	Human capital Organizational capital Capital renewal and development Relational capital
T. Stewart	Human capital Clients capital Structural capital
A. Brooking	Assets for the people Marketable assets Infrastructure assets Intellectual property Assets

Source: Kasiewicz, Rogowski, Kicińska, 2006, p. 93.

2.4. Human capital as a Key Performance Indicators

In the context of intellectual capital it is easy to see that the main part of intangible assets of company is related to the people. Therefore, examination of employees engagement should be part of the management process. A few years ago, HR departments were measuring job satisfaction. Nowadays, the emphasis is set on employees engagement. It is extremely important, because in knowledge-based economy intangible assets determine the market position, and sometimes even decides about the survival of the company (Jabłoński, Jabłoński, 2005, p. 37).

When companies are planning employment, they are looking for competencies necessary to achieve their goals. It is worth note deeper relationship between knowledge management and building employee engagement with strategic dependence pyramid shown in the following figure, if the employees are related to the objectives of the company, it could lead to very good results.

Figure 4. Depending on the strategic pyramid

At the same base of the pyramid is building employees engagement. Involvement can be built by allowing for the development of the employee, which also implies the development of the entire organization. At the same time it is worth noting that the development of human capital is associated with education. Hamblin lists five levels of assessment of the learning process, it is shown in Figure 5. In level 3 there is appearing change in behaviors that affect the continued attitude of the employee, and this in turn determines the achievement of the objectives of the vision and mission of the company. That is presented in Figure 5.

Figure 5. Levels of the learning process
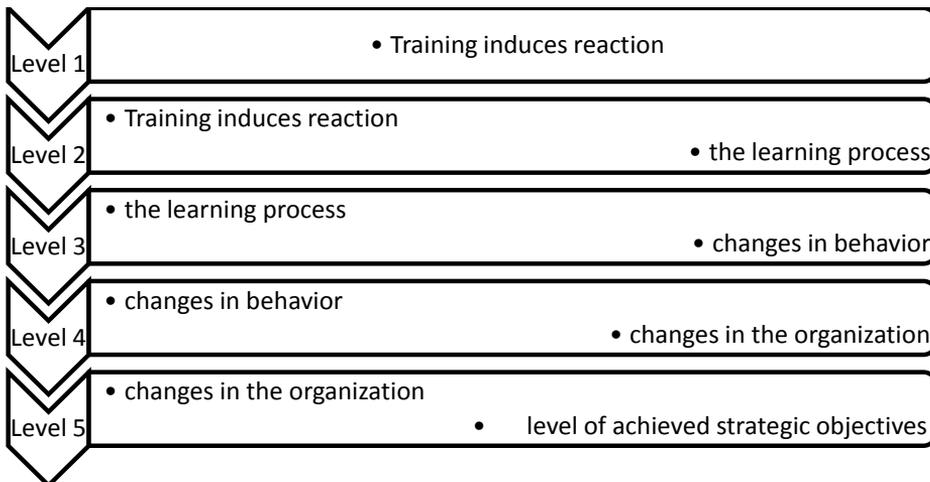
A company that wants to be competitive in terms of the knowledge – based economy should invest in intellectual capital, which is primarily the staff. The easiest way is to organize training, striving for competence development of employees. However, it is worth noting that usually person remembers:

- 20% of what they hear,
- 50%-70% of what they hear and see,
- 90% of what she performs (Zbiegień-Maciąg, 1996, p. 90).

Enterprises should therefore build employee engagement, which will imply a measurable benefits, as shown in Figure 6.

Figure 6. The process of employee engagement

Source: own work.

3. Involvement of employees

Previous part of the paper presented issues related to the involvement of employees and what are the benefits for an organization. This part of the article focuses on the topic of the engagement, what it is and what it determines.

M. Juchnowicz cites the following definitions of engagement "intellectual and emotional commitment to the organization or the size of the effort put in by the employee[1]". As an alternative, author gives the claim that engagement is "a situation in which the employee is granted at work, has positive attitude and is satisfied from[2]" (Juchnowicz, 2010, p. 35).

It is worth analyze the factors, that are affecting on engagement (Juchnowicz, 2010, p. 55):

- leadership behaviors of senior management,
- relations with the immediate supervisor,
- interesting work, which is a challenge,
- the prospect of development,
- participation in decision-making,
- self-reliance activities,
- teamwork corporate culture,
- good internal communication,
- adequate working conditions,
- supporting systems and structures.

Analyzing the last of the factors you need to consider what systems can help build employee engagement.

---

[1] Own translation: „intelektualne i emocjonalne oddanie organizacji lub wielkość wysiłku włożonego w pracę przez pracownika”.

[2] Own translation: „Jako alternatywę podaje twierdzenie, że zaangażowanie jest „stanem, w którym pracownik udziela się w pracy, jest pozytywnie nastawiony i z niej zadowolony”.

The classic method of measuring engagement is a model of The Gallup Organization. The questionnaire used in the study expressed 12 the following statements:

1. I know, what is expected from me at work.
2. I have the materials and equipment I need to do my work right.
3. At work, I have this opportunity to do what I best every day.
4. In the last seven days, I have received recognition or praise for doing good work.
5. My supervisor, or someone at work, seems to care about me as a person
6. There is someone at work who encourages my development.
7. At work, my opinions seem to count.
8. The mission or purpose of my company makes me feel my job is important.
9. My associates (fellow employees) are committed are doing quality work.
10. I have a best friend at work.
11. In the last six months, someone at work has talked to me about my progress.
12. This last year, I have had opportunities at work to learn and grow.

Due to how the staff will refer to the above statement, employees are divided into 3 groups: engaged, disengaged and actively disengaged. There is also calculated the index of engagement Q12. Management receives information about the structure of the engagement and development opportunities (Juchnowicz, 2010, p. 65).

4. The incentive system and its effectiveness in shaping employees engagement

4.1. The incentive system, and the system of remuneration

A common word is motivation. Incentive systems are widely used in enterprises, usually authors mention that salaries are essential component of incentive system. However, if we look at the remuneration system in a broader sense it can be said that the remuneration system is equivalent to the incentive system (Juchnowicz, 2010, p. 140). The structure of the incentive system is shown in Table 2.

Table 2. The structure of the incentive system

Incentive system				
Material rewards		Immaterial rewards		
Cash prizes	Reward in kind	In the organizational area	In the socio-psychological area	In the technical area
- Constant wage - Bonuses - Cash Rewards - Additives, subsidies - Participation in the company's financial results	- Colliery - Training, conferences, - Bonuses - Privileges	- Promotion horizontal and vertical - Power - Access to information - The content of the work	- Praise and awards - Ability to work in a company with high reputation - Working in a good team - Strong positive associations informal - Self- - Security of employment	- Ability to work on modern apparatus, - Computer assisted

Source: Juchnowicz, 2010, p. 141.

The above diagram of incentive system can be easily connected to S. Borkowska's concept of total remuneration. The author believes that the modern economy based on knowledge, move away from commonly understood material aspect of wages. In addition to money and material reward, there should be also the nature of the work and its compliance with employee competencies. You can cite a quote from the S. Borkowska's article: "These changes determine the untying of remuneration to the position for their binding to the employee, his competences and effects work and their expectations towards work[3]" (Borkowska, 2012, p. 11). Also, employers expect employees to engage in the work, and even creativity, which is a lever of innovation. In contrast, innovation is often associated with the mission and vision of the company.

In analogy to the above table it can be provide the incentive scheme in terms of S. Borkowska's total remuneration.

---

[3] Own translation: „Zmiany te determinują odchodzenie od wiązania wynagrodzeń ze stanowiskiem pracy na rzecz ich wiązania z pracownikiem, jego kompetencjami i efektami pracy oraz jego oczekiwaniami wobec pracy".

Table 3. Total remuneration

Total remuneration				
The material			Discretionary	
Wages and salaries in cash			Work-related	External reward
• Constant wages and salaries	• Variables wages and salaries	Additional benefits	• The content of the work • Organisation of work • Self-reliance • Participatory decision-making	• Public Praise • Diplomas • Distinctions • Participatory in decision-making • reward in cash or in kind

Source: own work based on Borkowska, 2012, p. 13.

Wages variables are divided into two categories:
1. Short-term Incentives: Bonuses, Awards surplus piecework, commission.
2. Long-term incentives: ownership, deferred-savings.
   This division shows close similarities with the previously presented incentive system.

4.2. The effectiveness of the system of remuneration

E. Beck-Kral believes that "the remuneration of workers is the key, the most difficult and the most expensive function of human resource management[4]" (Beck-Kral, 2012, p. 23):
- key – because it is affecting on attracting, motivating and retaining of the best employees,
- the most difficult – because the solutions are directly determining the behavior and attitudes of employees,
- the most expensive – expenditure on salaries is always important component of the company's costs.

That is why it is so important that the selected set of incentives led to the expected behavior of employees. According to M. Juchnowicz: "Due to the nature, complexity and effects posed by rewarding employees, evaluation of effectiveness of the whole system should be an essential element of the remuneration management in any organization[5]" (Juchnowicz, 2011, p. 102).

According to S. Borkowska effectiveness of remuneration can be seen in two planes (2006, p. 122):
1. Economic (direct analysis) – measurable benefits of remuneration system, that is, in purely economic terms difference between the obtained effects, and expenditure incurred.
2. Social (indirect analysis) – acquired intangible benefits, which in the long term translate into tangible benefits.

---

[4]   Own transaltion: „wynagradzanie pracowników to kluczowa, najtrudniejsza i najbardziej kosztowna funkcja zarządzania zasobami ludzkimi".

[5]   Own translation: „Ze względu na istotę, złożoność oraz skutki, jakie niesie ze sobą wynagradzanie pracowników, ocena efektywności całego systemu powinna być nieodzownym elementem procesu zarządzania wynagrodzeniami w każdej organizacji".

The company assessing incentive system should evaluate the particular area of employees engagement. The important element is also attracting and retaining the best employees and motivating employees to achieve better results and professional development.

4.3. Is the engagement enough?

Some experts believe that employee engagement is a long process. It requires the use of several- plan introduced in accordance with the objectives involved. K. Ayers shows the five major needs of employees. It is believed that the implementation of these needs will allow employees to approach the work with passion. Among these needs author mentions respect, learning and development, "being inside", the need for significance and to be in the winning team. These needs are hierarchical, so you can reach them only gradually. The hierarchy is shown in Figure 7.

Economic practice shows that a well-prepared plan, involving the entire company can bring measurable results. An example is Heinz, which operates a three degrees plan Heinz Global Performance System. The plan was scheduled for 5-7 years. In 2009 introduced the first stage, which is to raise awareness of employees, that the consumer pays the salary. The second phase focused on the integration of all employees in the change process. The purpose of the last step is to consolidate the new attitudes that have improved the performance and functioning of the company.

Figure 7. The Passion Pyramid
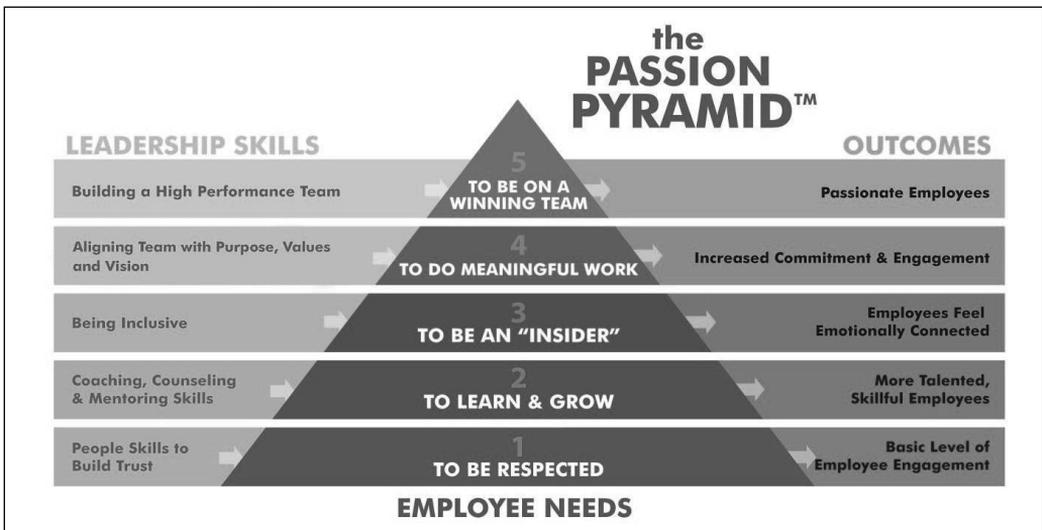
Source: http://www.integroleadership.com/images/PassionPyramid_HI.jpg.

The introduction of the program had several objectives:
- improve financial performance;
- changing the organizational culture;
- creation of new development plans for employees, which will meet the expectations of employees.

Heinz Global Performance System is the technical transfer of responsibility to all employees, the introduction of best standards, constant and systematic development of human capital of workers and their motivation, the search for new, more effective solutions to change the way of thinking and acting. This system need appropriate communication tools to work properly. These are:

- visualization of good and bad attitudes,
- using benefits language,
- promotion of project branding,
- periodic assessment of knowledge, attitudes and engagement of employees,
- motivating by using visualization performance (Berłowski, 2014, p. 24).

5. Conclusion

Modern economy is based on knowledge, technical progress, innovation. These words sound like slogans, though, they are determining economics. An example confirming the value of intellectual capital is at least Microsoft. therefore intangibles become particularly important for today's businesses. The primary value is intellectual capital, where in the middle are employees. Skandia navigator shows that human capital determines the functioning of the company. Therefore, the key factor is the engagement of employees.

Example Heinz, the results after the introduction of HGPS are at the highest level allows you to see the advantages of such an approach. Involving employees in the objectives of the company gives a chance for the development of individual employees and business development. An important element in shaping the engagement is broadly understand remuneration. Complex approach allows to note that even the organization and content of the work may be part of the incentive system, that create engagement. The basic condition that will allow for the development of enterprises through the engagement of employees is to change the thinking of employees, but also managers.

Bibliography

1. Phelps E.S. (2013), *Praca za płacę*, Warszawa, Kurhaus Publishing.
2. Bauer K. (2004), KPIs – The Metrics that Drive Performance Measurement, *DM Review*, September.
3. Beck-Krala E. (2012), Ocena efektywności systemów wynagrodzeń, *Zarządzanie Zasobami Ludzkimi*, No. 5.
4. Berłowski P. (2014), Kurs na zaangażowanie w firmie Heinz, *Personel i Zarządzanie*, No. 4/2014.
5. Borkowska S. (2006), *Zarządzanie zasobami ludzkimi. Teraźniejszość i przyszłość*, Warszawa, IPiSS.
6. Borkowska S. (2012), Struktura wynagrodzeń w procesie zmian, *Zarządzanie Zasobami Ludzkimi*, No. 5.
7. Bramley P. (2001), *Evaluation of the Effectiveness of Training*, Krakow, Publishing Economics.

8. Dobija D. (2004), *Pomiar i sprawozdawczość kapitału intelektualnego Przedsiębiorstwa,* Warszawa, Wydawnictwo Wyższej Szkoły Przedsiębiorczości i Zarzadzania im. Leona Koźmińskiego w Warszawie.

9. Edvinsson L., Malone M.S. (2001), *Kapitał intelektualny. Poznaj prawdziwą wartość swego przedsiębiorstwa odnajdując jego ukryte korzenie*, Warszawa, PWN.

10. Jabłoński A., Jabłoński M. (2005), Controlling wiedzy w kapitale intelektualnym organizacji, *Controlling i Rachunkowość Zarządcza*, No. 8.

11. Jarecki W., Kunasz M., Mazur-Wierzbicka E., Zwiech P. (2010), *Gospodarowanie Kapitałem Ludzkim*, Szczecin, ECONOMICUS.

12. Juchnowicz M. (2010), *Zarządzanie przez zaangażowanie. Koncepcje, kontrowersje, aplikacje*, Warszawa, PWE.

13. Juchnowicz M. (2011), Dylematy oceny efektywności wynagrodzeń w organizacji gospodarczej [in:] *Efektywność gospodarowania kapitałem ludzkim*, (ed.) P. Bohdziewicz, Łódź, Wydawnictwo Uniwersytetu Łódzkiego.

14. Kasiewicz S., Rogowski W., Kicińska M. (2006), *Kapitał intelektualny. Spojrzenie z perspektywy interesariuszy*, Kraków, Oficyna Ekonomiczna.

15. Zbiegień-Maciąg L. (1996), *Marketing personalny*, Warszawa, Business Press.

16. http://www.integroleadership.com/images/PassionPyramid_HI.jpg.

Chapter **16**

The Role and Meaning of Employee Motivational Systems in the Modern Management of Organization

Beata Olszewska-Łabędź

1. Intoduction

The motivation system is now one of the key elements of human resource management. It not only increases engagement of the employees and strengthens their bond with the employer, but also allows to create a friendly atmosphere in the team and to stand out from the competition. Assuming that the goal of the company is the development, strengthening position and profit-making, the way to achieve this lays in an effective activity of employees, their initiative and commitment. The quality of human resources left at the disposal of the company is one of the factors determining the company's position in the market. The condition for productive work is a comprehensive and effective system of motivation. The system, which properly uses the needs and abilities of employees, and gives them satisfaction.

2. Motivation – main concepts and general outline

Currently, financial incentive is not the only effective motivator. More and more employers realize that employees expect something more than attractive wages and they treat their work not only as a source of livelihood, but also a place of realization of their passions and development of the relationships with people. That is why they offer their employees a comprehensive motivation systems, including both wage components (performance bonuses, allowances greeting), and non-wage – tangible and intangible. Rewarding good performance, benefits package and attractive training programs often give much better results than the wage increase or "carrot and stick" method, which is now considered by experts to be even discouraging. Appropriately tailored motivation system not only allows to recruit the best employees and encourages them to take the extra effort to implement the company strategy, but also affect the positive image of the organization.

Employee motivation is one of the main components of business management. In the motivation process there is motivating person (manager) and the motivated person, who is an employee. It is the manager responsibility to motivate subordinates. Direct supervisor is required to influence employees effectively, due to the fact that being a person authorized to manage, his obligations are becoming the implementation of the various activities involved in the management process, and thus his duty is to motivate others (Kopertyńska). The process of motivating to the work involves the formation of a system of forces that tends to keep the employee in the manner required by the employer. It is, therefore, a conscious and deliberate impact on worker by providing the means and possibilities to meet their requirements in a such way that both sides would benefit. A well-functioning motivation system increases efficiency and, consequently, the company profit as well as affect employee satisfaction at work. Managers should understand the enormous role of motivation in determining the results of the employee.

3. The importance of motivation in the workplace

Motivation is the desire to take certain actions conditioned by the ability to meet some needs of the individual. The concept of motivation is inextricably linked with the concept of needs, which means the status of certain deficiencies, undervaluation (Leśniewski, Predygier, 2007, p. 94). The motivation process begins from the need or feeling a certain lack, scarcity. For example, an employee feels that he is too poorly paid. He experiences a certain lack and feels the need for more income. The reaction of the employee is to seek ways to meet this need, for example, he puts more effort into the job, to get a salary increase or he is looking for a new, more profitable work. The next step is to choose one of the solutions. Then, after taking up activities according to choice, employee assess the effects in terms of the fulfilling the needs. If the employee obtains the desired effects of actions, it is likely to accept for longer a new way of working. On the other hand, if the change of behavior does not bring the hoped pay rise, he will look for new solutions (Griffin, 2004, p. 519).

Understanding motivation – which induces, orients and sustains human behavior was important for managers. There are many theories of motivation. Most of them differs in terms of guidance on what the manager should do to get the maximum efficiency of subordinates. However, most successful managers have been convinced that people respond positively to praise and encouragement. Managers who are able to find the key to the source of its employees motivation, may benefit from the huge productive source of energy (Stoner, 1992, pp. 358-359).

Managers want to motivate employees to increase efficiency, loyalty, commitment to the organization and employment stability. The most commonly used incentive is money. Salary is an important element of the motivational system. It is a basic driving force, what is confirmed by research experiments. The importance of money as a means of motivating is strongly determined by individual needs and expectations. The role of the wage motivation system of any organization is very important. Thanks to wage we can stimulate certain attitudes and people's behavior, as well as we can encourage to achieve more efficient work and abilities development (Kopertyńska).

Money, in the form of wage is the source of employees income, means of stimulation of activities, part of the organization costs, part of the employment relationship, the determinant of social status, social differentiation, quality of life, need for affiliation, social security, self-esteem, recognition of possessed talents, skills, qualifications. This is the result of the fact, that wage fulfill five es-

sential functions: cost, income, motivational, social and market (Kopertyńska). The wage payment systems is one of the strongest factors determining attitudes, motivation and behavior of employees. Properly designed system attracts suitable employees, lets them retain in the organization and inspires them to achieve high performance (Bagieńska, 2008, p. 297).

The financial compensation is not the only way to motivate employees. More and more often we are beginning to note non-wage incentives that not only motivate to more efficient work, but also allow to keep in the company the most valuable employees. In the group of motivators an important role is played by training and development of employees. Staff training meets the needs and expectations of employees and it is of great motivational value because of (Kopertyńska):

- opportunity for professional development,
- creation of conditions for self-realization of the employees,
- increasing the "flexibility of qualifications", what increases the employability on the labor market,
- shaping the career path of employees.

In the group of non-wage motivational elements of tangible nature, there are furthermore: insurance, vouchers, assignment employees to a company car, mobile phone. Another benefit is also covering medical care for workers and their families, *etc.* In the group of non-wage motivators of an intangible character, very important is the fact of having a job, which is a source of regular income. The wage in our conditions is still an substantial element of motivation, however, having a job is often more valuable than the amount of remuneration. With certainty and stability, employees associate the opportunity to achieve a number of other benefits, having both material and immaterial dimension. In this group of motivators the promotion is very important. Employees highly value the possibility of promotion to a higher position, clear career paths, assistance in professional development of direct supervisor.

Another very important element in intangible motivating is a good organization of work. It is used as a versatile and relatively inexpensive means of motivating and as a way of enabling workers participate in management. The compound of the organization of work is also working time and its organization. Properly selected, it gives the opportunity to manage employee own time and performance as well as allows to satisfy personal needs, and consequently, the work gives greater satisfaction. Important incentive is also independence of realisation. Independence means freedom of action and decision-making. A large self-reliance and acceptance of responsibility is particularly important for employees seeking big challenges (Kopertyńska).

Effective employees motivation not only rely on the constant increase of spending and it is not one hundred percent dependent on the financial resources of the employer. Very often the above cited methods to motivate staff bring the company the highest benefit (Kochańska-Mierzejewska). The amount of remuneration is no longer the most important motivating factor. Job security and good atmosphere in the workplace count more. This result confirms that there is a high level of uncertainty in work maintenance and reduction to wage incentive is not enough. Employees want to treat the company, in which they work as a place where they can develop, educate and make money. Thanks to it they can achieve self-reliance, independence and job satisfaction (Smoleń).

4. Motivational meaning of rewards and punishments

Rewards and punishments accompany people since the beginning of the history and are powerful means of motivational influence on employee behavior. They are mainly related to wage and the possibility of promotion. The use of sanctions is designed to eliminate behavior contrary to the expectations of the organization. In contrast, the function of prize consists in shaping and consolidating behaviors aimed at achieving organizational goals. Awards give us a lot of pleasure and the positive emotions associated with them cause that we are beginning to appreciate and enjoy the work we do. They conducive to shape among employees a positive attitude towards work, which usually results in higher efficiency, quality and creativity as well as a willingness to cooperate with others for the good of the whole organization (Kostera, Kownacki, 1997, pp. 403-404). Punishing, as a use of different types of sanctions, teaches employees to avoid threats. If rewards and punishments are to be effective in motivating employees they must fulfil the following conditions (Kostera, Kownacki, 1997, pp. 405-406):

1. Employees must know how the system of punishment and reward works in the organization. The responsibility to provide the relevant information lies with the managers.
2. It is important that the system has been approved by the people concerned both managers and subordinates.
3. Awards should be attractive, and the penalties severe. Often employers at low cost want to get extraordinary results by proposing a worker with 25 years experience free ticket to the cinema.
4. It is necessary to respect the principle of rewards and punishments gradation. The essence of the awards gradation is to create a path of professional success, on which "a walk" requires a lot of effort, but in return more and more attractions wait for the employee. In case of penalties it is the path of failures, but long enough that gives the time for the reflection and a chance to stop in a safe place. Relatively rapid strengthening behavior is important. As an example may be the comparison of the two wage systems. In the first, the money are paid out after each work week, in the second – once a month. An employee who receives money more frequently, although it is less amount, knows better the relation between the quantity and quality of work and pay. The amount of remuneration informs about how management assesses the activity of the employee. This creates the basis for the future and relatively rapid change in behavior.
5. Consistency in the application of reinforcements is important. Each positive behavior should be rewarded (it does not have to be intangible property, sometimes just a smile and a good word is enough). Then, any inappropriate behavior must be punished.
6. In order to use reward and punishment effectively, the quality of the emotional relationship between the employer and the employee should be high. Reinforcements have greater motivational value when they come from a respected person having authority. More often, they are then perceived as fair and they strongly affect the continuation of rewarded behavior or modification of penalized behavior.
7. Employer using reward and punishment as a motivating tool should adjust it to the personality of a subordinate and to that what is really important to him or her.

The most important asset in the organization should always be the human resources. Knowledge, skills, abilities, attitudes, values and experience of the employees are becoming increasingly important as a factor of competitive advantage. Properly motivated employee brings to

the organization not only knowledge and skills but also commitment to the company matters. A company that strives for success should take care of their most valuable assets – employees.

Currently, within the modern motivational systems more and more companies offer their employees additional benefits. The most common additional benefits offered by the company in 2013 were training and professional courses. They were offered by over 92.8% of entrepreneurs. The report "Polityka świadczeń dodatkowych w 2013 roku" (Politics of additional benefits in 2013) prepared by Sedlak & Sedlak company shows that the biggest amount of companies offer their employees additional benefits. Popularity of benefits is growing. Only a few of the companies are planning to resign from selected additional benefits. In addition, the surveyed companies intend to introduce to its offer new benefits. Many companies, to finance the benefits, use the funds accumulated in the Employee Benefit Fund (EBF). The largest group of companies in the framework of the EBF allocates for benefits from 801 to 1,200 PLN per year. However, only 29.9% of the companies inform their employees about the value of the offered package of additional benefits.

The results of the report clearly shows the high popularity of additional benefits as a part of remuneration package. 97.5% of the surveyed companies offer their employees additional benefits (Fig. 1).

Figure 1. Percentage of companies offering in Poland in 2013 to additional benefits
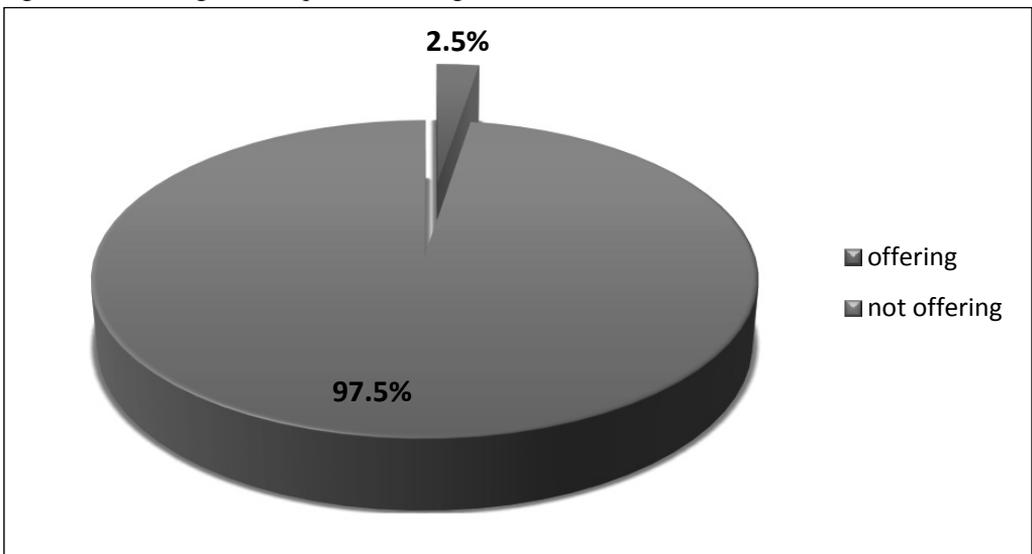
Source: report "Politics of additional benefits in 2013", Sedlak & Sedlak.

The positive meaning of benefits is indicated by fact that 15.9% of companies plan to offer additional employment benefits in the nearest future (Fig. 2).

Figure 2. Percentage of companies which plan to introduce a new additional benefits in 2013
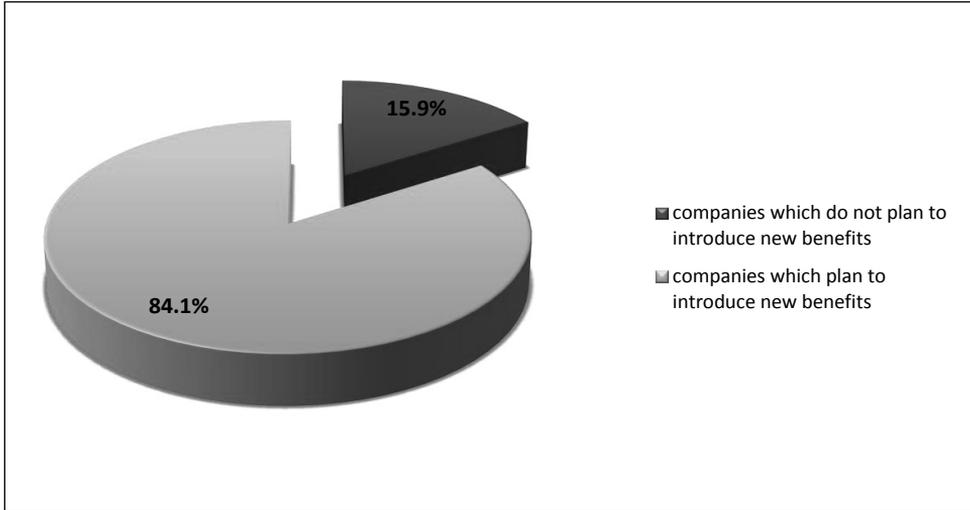
Source: report "Politics of additional benefits in 2013", Sedlak & Sedlak.

Only 2.6% of companies want to resign from selected additional benefits (Fig. 3).

Figure 3. Percentage of companies intending to resign from selected benefits in 2013
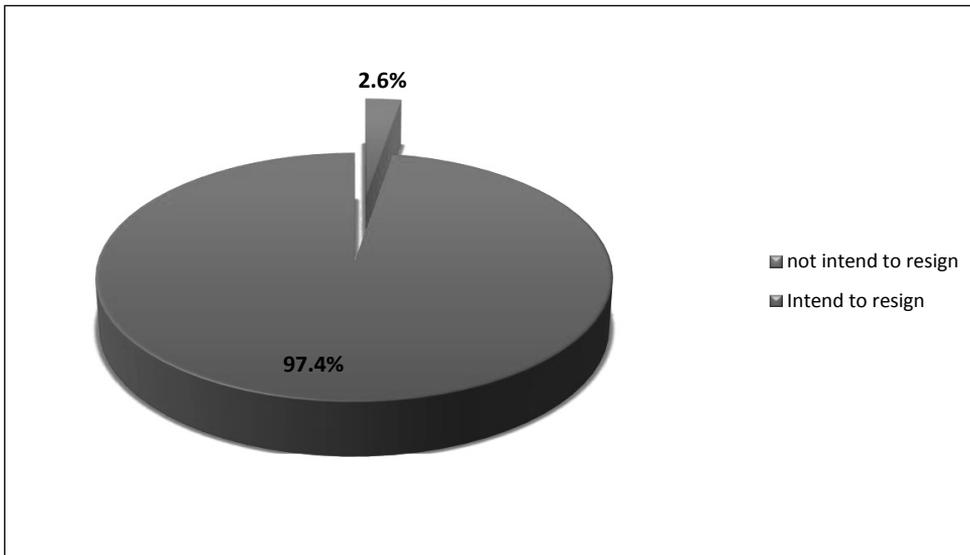
Source: report "Politics of additional benefits in 2013", Sedlak & Sedlak.

The most common additional benefits offered by the company are training and vocational courses, which are proposed by more than 92.8% of the companies. In addition, companies allow

their employees participate in professional conferences (85%) and give the opportunity to attend language courses (81.7%). 73.2% of enterprises in the context of benefits offer their employees participation in sports activities (swimming pool, gym or fitness classes). In the next place in terms of popularity (72.5%) is basic medical care. The same percentage of respondents also points out offering subsidizing education to the employee (Fig. 4).

Figure 4. The most popular additional benefits among companies offered to the employees in 2013
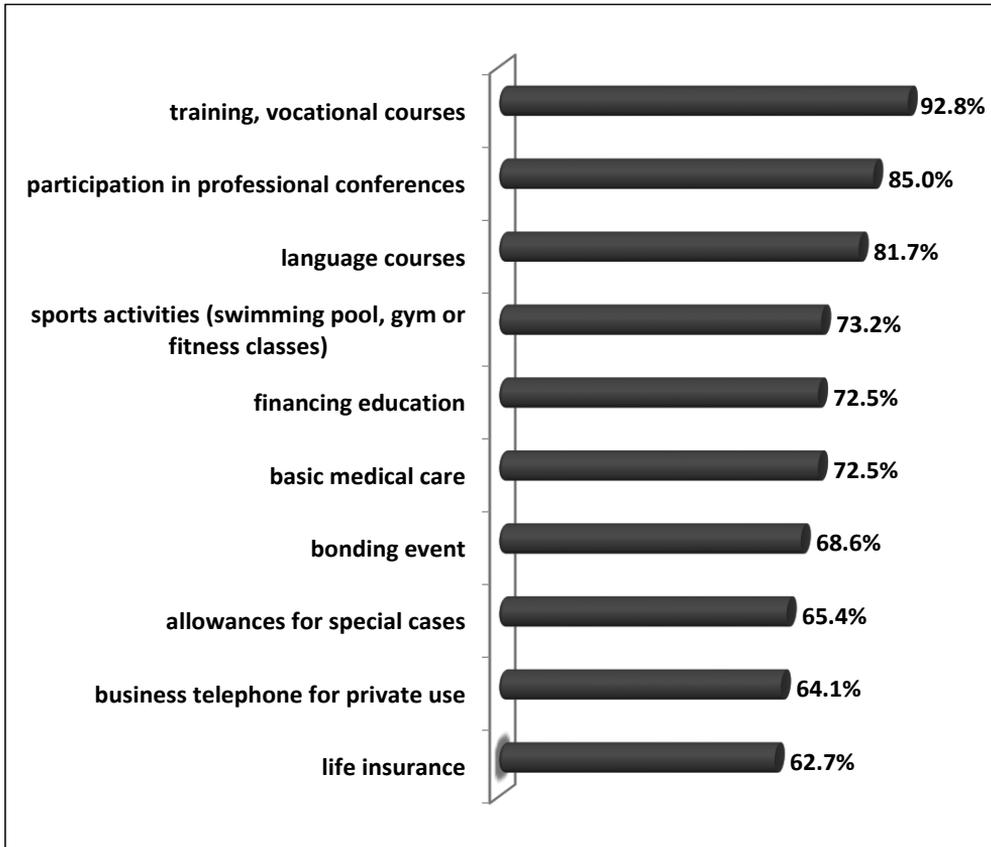
Source: report "Politics of additional benefits in 2013", Sedlak & Sedlak.

5. Additional benefits in cafeteria system

One of the elements supporting the motivational aspect of the additional benefits is to offer cafeteria. Thanks to this solution, the employee has the option to choose benefits included in the package to which the employee is entitled to. In 2013, only 28.6% of companies offered such solution (Fig. 5).

Figure 5. Percentage of companies offering employees the opportunity to choose additional benefits in 2013 (n = 154)
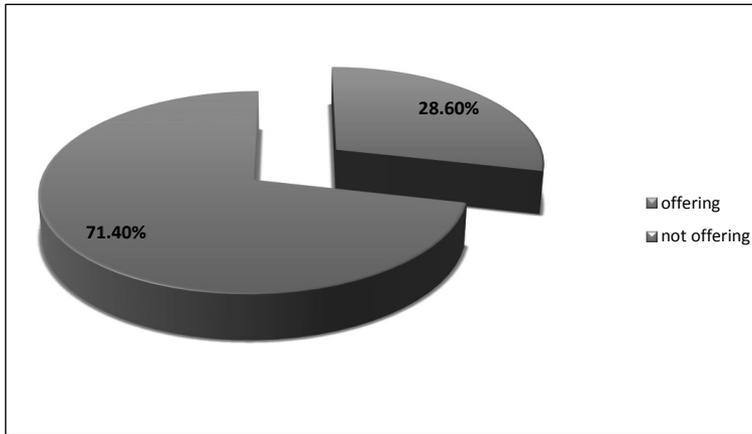
Source: report "Politics of additional benefits in 2013", Sedlak & Sedlak.

Access to the cafeteria is different in industries and in companies with different levels of income (Tab. 1).

Table 1. Percentage of companies offering employees the opportunity to choose additional benefits in 2013 (in %)

		n	offering opportunities
industry	contruction	10	40.0
	trade	11	36.4
	industry total	68	20.6
	food industry	11	27.3
	electromechanical industry	28	32.1
	chemical industry	10	10.0
	information technology (IT) and telecommunication	10	40.0
income	from 10 to 100 mln PLN	29	0.0
	more than 100 mln PLN	114	28.1
employment (employees)	from 50 to 249	29	13.8
	from 250 to 499	27	33.3
	from 500 to 999	35	25.7
	more than 1000	61	34.4
capital	predominance foreign capital (more than 50%)	110	25.5
	predominance polish capital (more than 50%)	43	36.4

Source: report "Politics of additional benefits in 2013", Sedlak & Sedlak.

In the industrial enterprises cafeteria was offered by 20.6% of companies. In the electro-mechanical industry, cafeteria was offered by 32.1% of enterprises. On the other hand, none of the companies of chemical industry participating in the research did not offer cafeteria. Equally clear differences can be observed between companies with different levels of income. Companies that generate the turnover over 100 million PLN, gave the opportunity to choose benefits package in 28.1% of cases. Employees in smaller companies with income between 10 and 100 million PLN, were not given such opportunities. Approximately 9.2% of the companies spent on fringe benefits per employee from 101 PLN to 300 PLN per month, while 19.3% of the respondents spend 100 PLN. A large group of companies (18%) is not able to estimate how much it is spent on benefits (Fig. 6).

Figure 6. Monthly amount of expenditure incurred by employers on fringe benefits for employees in 2013 (n = 153)
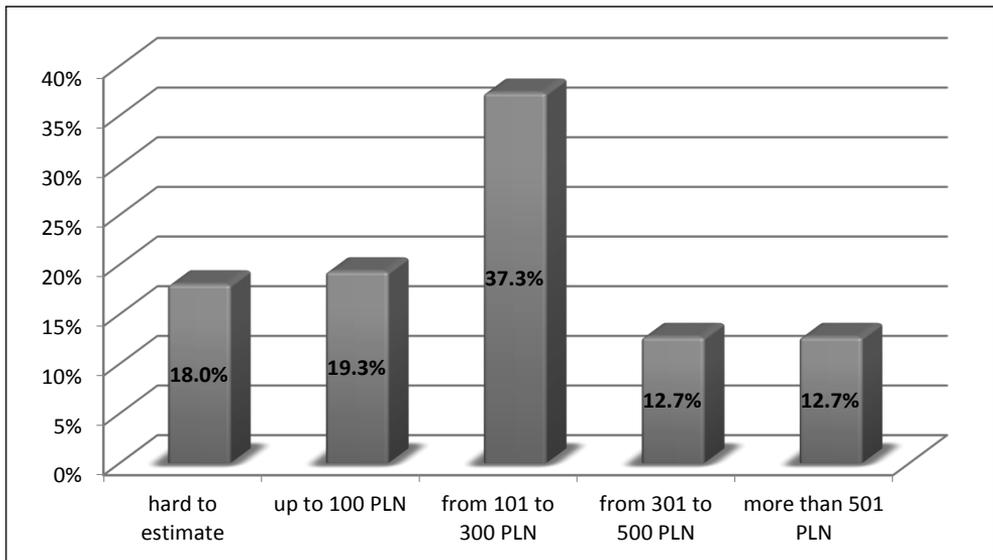
Source: report "Politics of additional benefits in 2013", Sedlak & Sedlak.

The Employee Benefit Fund (EBF) is used under the policy of granting employees additional benefits. Among the research participants it functioned in 87.7% of the enterprises. The EBF is most commonly found in Polish companies (95.3%), large companies employing more than 1,000 employees (93.4%) and generating income higher than PLN 100 million (91.2%).

6. Conclusion

An important element of the motivational system is to ensure employee the possibility of development according to aspirations. Development is an important factor for self-realization, which increases self-esteem and has a positive effect on the level of employee engagement.

The creation of a coherent motivational system in an organization requires employers creativity, good organization, knowledge of the needs of their employees and consistency in achieving the objectives. The benefits of a well-developed motivational program, can not to be underestimated. A motivated employee is more associated with his employer and much less considers the possibility of changing jobs. Researches show that the level of commitment to work directly transfer into a desire to change it. Only 7% of the employees that feeling the involvement look for a new job, while on average 19% of employees admit to participate in the recruitment process. Underestimation on the part of superiors and the company, and a sense of loneliness in achieving ambitions are the most frequent reasons for resigning from job, whereas engaged employees are more productive, better understand their role in the company's business strategy and are much more willing to take the extra effort to perform assigned tasks. Well thought-out motivational system is therefore an investment for the company, on which return does not have to wait long.

Bibliography

1. Bagieńska A. (2008), Rola systemu wynagrodzeń we współczesnej gospodarce, *Zeszyty Naukowe Politechniki Białostockiej*, No. 11, http://pbc.biaman.pl/Content/9875/ZN+EiZ+nr+11.pdf.
2. Dobrowolska Wesołowska M. (2008), *Zarządzanie przez motywowanie – motywująca rola dyrektora placówki oświatowej*, Starachowice.
3. Griffin R.W. (2004), *Podstawy zarządzania organizacjami*, Warszawa, Wydawnictwo Naukowe PWN SA.
4. Kochańska-Mierzejewska B., *Skuteczne metody motywacji pracowników*, e-Gospodarka.pl, http://www.firma.egospodarka.pl/26882,Skuteczne-metody-motywacji-pracownikow,1,47,1.html.
5. Kopertyńska W., *System motywacyjny w organizacji (I)*, WIEDZAinfo.pl Otwarty Uniwersytet Ekonomiczny, http://www.wiedzainfo.pl/wyklady/119/system_motywacyjny_w_organizacji_i.html.
6. Kopertyńska W., *System motywacyjny w organizacji (II)*, WIEDZAinfo.pl Otwarty Uniwersytet Ekonomiczny, http://www.wiedzainfo.pl/wyklady/119/system_motywacyjny_w_organizacji_i.html.
7. Kostera M., Kownacki S. (1997), Kierowanie zachowaniami organizacyjnymi [in:] *Zarządzanie. Teoria i Praktyka*, (eds.) A.K. Koźmiński, W. Piotrowski, Warszawa, PWN.
8. Leśniewski M.A., Predygier A. (2007), *Kompendium wiedzy z zarządzania organizacjami*, Kielce, Wydawnictwo Akademii Świętokrzyskiej.
9. Smoleń M., *Motywacja czynnika osobowego w gospodarce opartej na wiedzy*, Uniwersytet Rzeszowski Zakład Ekonomiki i Organizacji Przedsiębiorstw, http://www.univ.rzeszow.pl/ekonomia/zeszyty/Zeszyt10/43.pdf.
10. Stoner J., Wankel Ch. (1992), *Kierowanie*, Warszawa, Państwowe Wydawnictwo Ekonomiczne.

Chapter **17**

Trying to Scratch the Concept of Personnel Management for the Company Employing People with Disabilities

Monika Trętko

1. Introduction

Start of management science dates back to the ancient Egyptians already using elements of management in the activities of everyday life. From ancient times to the present day science of management has undergone a significant evolution. The biggest development of management science is attributed to the twentieth century, when it developed the school organization and management. Since the beginning of the twentieth century, since when management attempted to rely on scientific grounds, until the late 60th century management was conceived as an activity management, including the following sequences of the case: planning, organizing, deciding, motivating and controlling, called classical management functions (Stoner, Freeman, Gilbert, 2011, pp. 51-57). Classical management functions separated the first "classic" Henri Fayol management. However, look at the process management has changed since that time in a meaningful way. It should go back to the definition of the management process developed by management science relevant to developers, which was limited to the determination of management as a set of activities, including planning and decision making, organizing, leadership, *i.e.* managing people and controlling) directed at the organization's resources (human, financial, material and information) and performed with the intention of achieving the objectives of the organization in an efficient and effective (Griffin, 2005, p. 6). Extracting from this definition only human, we can say that management is effectively directing human behavior for effective organization in the enterprise. It is nothing other than personnel management. The concept of personnel management has been enriched with new elements. Today is known as human resource management and is the assumption that it is not possible to develop a universal model, which prove itself in any organization. There is a set of concepts, methods and techniques, from which you can select a specific set and test it in specific circumstances (Human Resource Management. Organization's human capital formation, 2006, p. 30) (Tab. 1).

Table 1. Comparison of MR and HR

Personnel Management (MR)	Human Resources Management (HR)
arrangement	customer orientation
consequence	cooperation in relations supervisor – employee
pursue separate functions	integrated control functions

Source: own work.

The beginning of the twenty-first century was characterized by significant changes of global dimension. The causes of change is competition, new markets, changes in the financial system and the new network competition. These changes affect the business environment and induce them to seek new ways and concepts of management. It is mostly motivated by the search for ways for it to become a leader in the market ahead of the competition, better meet customer needs, shorten the run time of key business processes, and make good use of previous experience in the industry and previously acquired knowledge. Changes in organization and management, to a large extent are caused by linking emerging technology and technology management.

Today in our country, many people with disabilities seeking permanent employment and is affected by unemployment. Potential employers often guided by stereotypes and do not want to hire people with disabilities, due to the high labor costs, which are related to, inter alia, the need to adapt to the needs of the workplace and the need to eliminate architectural barriers. It should be noted, however, that does not apply to all persons with disabilities. In Poland there are several companies that employ people with disabilities. Often there are also problems in the field of business management. This problem is often the inability to choose the optimal management approach to the specifics of people with disabilities. It is important that the concept of management company employing disabled people was built on a pedestal ones, while taking into account the needs of persons with disabilities.

The aim of the work is to develop a draft of a new management concept Disability management (disability). This concept contains in its structure elements of Lean Management (lean management) and intra benchmarking employees. Personnel management should be based on proper techniques, motivation, based on the "carrot approach", involving and encouraging employees with additional privileges to the activities of the organization. Motivational techniques to bring company to provide employees with opportunities for development, and self-promotion opportunities. Motivation will focus on appreciating efforts of employees and creating a friendly environment at work.

2. The use elements of other concepts

The science of management has to his credit a number of concepts and management methods, which elements can be used to develop optimal management approach for a company employing people with disabilities. They have been developed based on observations of companies that have applied them in their area. On this basis, are already known their strengths and weaknesses, so based on this knowledge, you can develop a management concept ignores its weaknesses. Please note that it is not always a possibility, since the successive implementation of the developed concept of management is dependent on the number of individual factors internal (enterprise resource), which involve a number of external factors (business environment) (*Strategic Analy-*

sis, 2014, p. 2). Internal factors that should be taken into account are: the mission and objectives of the company, people, structure and resources, and technology (Stabryła, 1996, pp. 9-10). In contrast, external factors are mainly a tool composition marketing mix: product, price, distribution and promotion (Wang, Wang, Yao, 2014, p. 4) (Fig. 1).

Figure 1. The effect of internal and external factors on the management concept

External factors

Internal factors

mission and goals of the company

resources and technology

Developing the concept of management

promotion

people

structure

product

price

place
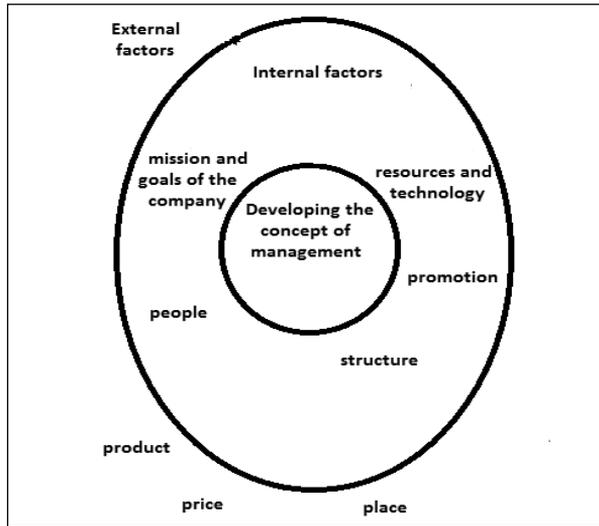
Source: own work.

2.1. Lean Management

The concept of lean management comes from Japan and is called "lean" or "Lean" management. Its source is in the concept of lean production ("lean production"), used in the Japanese carmaker Toyota in response to a lack of resources. It became necessary to find a solution so assuming that resource limitation will no longer constitute a significant problem in the company. Popularized the concept of lean production has provided manufacturers reduction needs in relation to, among others. production space, manpower, time required for installation, the time spent on research and development, and materiel. In addition, increased quality of the final product (Zimniewicz, 2009, p. 37). The concept of lean management rationalization covers all areas of the company from production to logistics. It was developed on the basis of the automotive industry, however, it should be emphasized her versatility and the ability to use in all sectors of the economy. Significant changes are taking place in the sphere of corporate management. The autocratic leadership style becomes meaningless under the influence of the transfer of more powers and responsibilities to lower levels. It is therefore necessary to get rid of hierarchical thinking in favor of thinking about group cooperation. It changes the role of the manager to coach. In addition, this concept encourages management to rethink their tasks. Hence, the major components (principles) concept are: teamwork, personal responsibility, feedback, right customer, the priority value added, standardization, continuous improvement, the immediate elimination of the causes of errors, predict a gradual improvement (Martyniak, 1997, p. 25) (Tab. 2).

Table 2. Characteristics of the components of Lean Management

Component of lean management	Characteristic
Groupware	– performance of the group is greater than the individual employees (synergy), – the group is responsible for the tasks entrusted to it, which develops in the decision-making autonomy, – reduction of the superior control for self-control, – concern for greater autonomy groups, because it leads to greater motivation and willingness to work group members,
Decentralization of decision	– eliminates middle management levels, transferring decision-making powers to lower levels of the organizational structure, – increases: autonomy, responsibility and self-control group,
Customer Orientation	– directing the activities to meet the needs of customers by listening to their comments on the satisfaction of its products,
Continuous improvement – kaizen	– employees should make proposals for improvement, – stimulates a competitive advantage,

The flattened hierarchy	– flat organizational structure through which:
	  + is easier to coordinate activities,
	  + runs better communication,
	  + is increasing interest in the client,

Rejection errors at source	– error detection and elimination of the least cost to the place of origin, while the most expensive on the client, – earch and debugging is the responsibility of each employee,
Avoiding extravagance and waste	– waste is defined actions do not value and magnifying it: redundant resources, waiting time, *etc*., – rationalization process = elimination of waste,
The continuous flow of materials	– the materials are in continuous movement, – actions avoiding the stocks, or freeze capital, – the principle of on-time delivery (just-in-time),
Total Quality Management (TQM)	– attitude of the staff of the high quality of our products, looking at it from the point of view of the customer, – the basis of management is „quality circles",
Simultaneous improvements	– simultaneous development of the concept, product planning, production and implementation of production, – saving time, which is an important factor in competitiveness.

Source: own work based on Gendo, Konschak, 1999.

Lean management does not bring any new rules to the specific business management. It should be noted, however, that it is a capacious concept emphasizing the importance of changing the key factors for the gradual establishment. These are:
- improving the quality and development of new products,
- flattening structures and good business relationship with the environment,
- strengthening the competitiveness and better use of staff.

Of all the important principles in the concept can extract the three most important, which are:
- close to the customer,
- a change in corporate culture,
- "team game" (*The Need for Greater Autonomy of the Workers*, 1993, p. 25).

In the light of empirical research concept was a large group of supporters among entrepreneurs who valued it parallel engineering (cooperation of specialists from all areas of the company, under the guidance of project leader), on-time delivery and comprehensive treatment processes. Also emphasized the importance of existing elements such as teamwork, customer orientation, *etc*. Through research it was noted that the use of lean management on the basis of the company can bring a number of opportunities, but also risks. After entering reported:
- increase the competitive ability, through cost reductions, reduced extravagance and higher quality,
- increase in labor productivity, flattening the hierarchy, shorten decision-making,
- paying more attention to the needs and wishes of our customers,
- an increase in employee satisfaction through better communication between managers and employees,
- increased staff motivation and their identification with the success of the company (Zimniewicz, 2009, p. 41).

Based on the research, it was concluded that the most important finding should be attributed to dialogue with colleagues, their motivating, stimulating them to the concept of belief and constantly training. Created a set of instruments that serve to increase the liquidity and efficiency of the organization and which include communication and information, delegation of responsibility, team building, project management. Emphasized the need for training and seminars, as has been postulated that thanks to affect significantly the efficiency of the company (Sussmann, Kraus, 1994, p. 75).

After the presentation of the most important principles of Lean Management, we can infer that it contains in its structure a number of elements that can be used in the management of employing people with disabilities. Features The ends *i.e.* cooperation between workers, group work and the changing role of the manager are a valuable source of information for the development of the new characteristic concept for a company employing people with disabilities.

2.2. Benchmarking

Benchmarking is a concept which assumes comparison to the best, motivated by the desire to catch up with them, focus on the best class of goods or services... It is defined as the process of learning from competitors. The word benchmarking means the reference point, allowing an idea of where the place we are (Sprow, 1995, p. 1). Benchmarking is a broad and allows you to compare products, services, methods and processes. It is defined as a search for the most effec-

tive methods for the activity capable of achieving a competitive advantage. There is also a comparison of the processes, products and services with their counterparts from the best competitors. It is the search of best practices by learning from others and use their experience (Martyniak, 1996, pp. 303-304).

There are three types of benchmarking: internal, competition-oriented and functional. In assembling the components, which should be characterized by the concept of the enterprise employing people with disabilities, we consider only internal benchmarking. It is the matching process within the company. Its advantage is the relatively easy access to information. Comparing enterprise level gives good results in diverse businesses. This is also a kind of defects, which are narrower field of view and the possibility of bias in the company (Zimniewicz, 2009, p. 13).

Today, benchmarking is most common in the area of employee. The staff is constantly compared to their partner better and becoming the most successful reaching colleague. Partner becomes for them their idol and the epitome better themselves after the changes. However, remember to keep clean in the sense that dictates ambitions, because "good partner benchmarking is not known" (Pieske, 1994, p. 20). Rating only on the basis of parameters allows you to discover part of the truth about the partner, but almost nothing is said about the differences existing between their practice and the practice of benchmarking partner. Parameters can not fully discover the causes and effects of interacting factors on the employee. Employers also suggest to ready models for comparisons, *e.g.* in the form of advertisements team leader, an employee working best. Employees often do not have the skills to equal its partners, which is why it is important for them to re-training process as an opportunity for gaining new qualifications. In this way they become, according to the notion that, as good as their partners. Often use the information gained against its partners. Nowadays, it becomes a cause of the rat race that is boundless striving for material and professional success. Rat Race is most common where employees who have worked for the probationary period, are seeking permanent employment.

2.3. Optimal motivational techniques

Returning from work, we see scrolling through the city crowds of workers returning from work. Is it, however, the employees satisfied with their jobs? Given the high unemployment in our country, it seems so. High unemployment significantly affects persons with disabilities, of which up to 26.71% are unemployed, and 22.26% are job seekers (*Study of New Opportunities and Possibilities. Persons with Disabilities in the Labor Market*, 2007, p. 91). We are pleased that we have any work. However, ambitious people are not always happy with it. Satisfaction and job satisfaction are affected by many factors. One of the tools used to measure the level of satisfaction is the Job Description Questionnaire (JDI). It is used to measure the five factors based on which you can determine the level of job satisfaction. These are:
- remuneration for work,
- the possibility of advancement,
- supervision in the course of their work,
- adapt the workplace to the needs of the worker,
- relationships with colleagues (Schulz, Schulz, 2002, p. 1).

On the other hand Minesocki Satisfaction Questionnaire (MSQ) giving assessing the level of dissatisfaction with the work, analyzed the following factors:

- achievements,
- independence,
- recognition,
- operating conditions (Schulz, Schulz, 2002, p. 2).

Of great importance is also the specificity of personnel management and incentive system at work. Personnel management should be based on appropriate techniques of motivation. One such technique is the "carrot method", which consists of encouraging employees with additional privileges to the activities of the organization. Motivational techniques should be based on the factors causing job satisfaction, because through it they become relevant in use in the enterprise. They should also lead to provide employees with opportunities for development, self-education and opportunities for advancement. Motivation should be focused on appreciating efforts of employees and creating a friendly environment at work.

2.4. Observations deaf author

By presenting the most important features of the concept of Lean Management and Benchmarking Staff and the demonstration of factors influencing satisfaction and job satisfaction of people with disabilities must be provided the last part of the material essential to the development of business management concepts employing people with disabilities. These are the observations of the author, who is deaf. She worked in a company employing mainly disabled workers and on this basis held out some useful proposals to develop a new concept of management. Based on the observations noted many shortcomings and abuses disincentives significantly disabled people to work. They require careful review and refinement. Thus, the development of the concept of management for a company employing people with disabilities seems to be necessary.

On the basis of observations can extract important factors shaping which is essential for the proper organization of the company, which are:

- the importance of adapting jobs to the needs of people with disabilities,
- relations between management and employees,
- relationships with colleagues,
- a change in the role of manager to coach,
- organization "learner",
- the atmosphere at work.
  The company recorded a noticeable lack of:
- group work,
- appropriate techniques for motivating employees (among others. Opportunities for promotion),
- continuous improvement – kaizen,
- rejection of errors at the source,
- stability of employment,
- stimulate creativity in employees,
- knowing and applying all provisions specific to people with disabilities.

3. Personnel management with the use of Disability Management

The effectiveness of the system of personnel management in any enterprise depends primarily on the application of appropriate management concepts. Developing the optimal adjustment involves a number of factors to employed personnel. Pursuing the development of the concept for the company employing people with disabilities the means to adapt the concept of factors to their needs.

Attempt to develop a concept could be called Disability Management (Disabilities). By facilitating the development factors should be divided into two groups: factors specific to disability and factors unrelated to the disability. In enterprises employing disabled people managers should base their concept on the developed inside the company pyramid needs of employees. On this basis, managers can tell which of the factors that play a preponderant role, and that descend into the background. Factors foreground are actions that require immediate adjustments so. factors for working people with disabilities (Plan A). After completing their secondary factors should be adjusted, *i.e.* organizational factors (Plan B) (Fig. 2). Often the reality of the employment of people with disabilities indicate an opposite tendency. This is caused by the fact that entrepreneurs do not always employ people with disabilities from the start of business. Most businesses already created position adapts to the needs of people with disabilities after their employment.

To these factors for working people with disabilities include:
- adapting jobs to the needs of workers,
- knowledge and application of all provisions specific to the employment of people with disabilities.

In contrast, organizational factors include:
- relations between management and employees,
- relationships with colleagues,
- a change in the role of manager to coach,
- support the organization on a continuous "learning",
- suitable atmosphere at work,
- organization based on group work,
- the use of effective employee motivation techniques (among others. Opportunities for promotion),
- help workers make proposals for improvement – kaizen, by stimulating creativity in employees,
- accuracy in finding the causes of defects and eliminate errors at the source,
- employment stability, which enhances the company with loyal employees.

Figure 2. The effect of internal and external factors on the management concept

Source: own work.

4. Conclusion

The optimal approach to managing staff in a company employing disabled persons called Disability Management (Disabilities) should be based on elements of existing management concepts. Elements of the concept, which can be used are benchmarking and Lean Management and the appropriate techniques of motivation. Comparing with the best employees become more capable by the acquisition of new skills and abilities. The assumptions of Lean Management in its structure have many ingredients to improve the organization of the enterprise and stimulate its competitive advantage through high quality services and thus customer satisfaction. The continuous flow of material without the need for inventory prevents freezing of capital and unnecessary extravagance and waste. In contrast, delegation of tasks and responsibilities for labor groups to stimulate their independent decision-making and control limits, and thus triggers greater autonomy. Greater autonomy group triggers motivation and willingness to work group members. In addition, job satisfaction, and thus motivation is triggered in workers using appropriate motivational techniques, which include even adapt the workplace to the needs of disabled people.

Developing the concept of management seems to be justified, as a result of observation of managers improperly managing people with disabilities. Incorrect management of employees with disabilities stems from ignorance of the concept of disability management in the workplace.

Bibliography

1. *Strategic Analysis* (2014), Wroclaw, Wroclaw University of Technology, http://www.ioz.pwr. wroc.pl/z9/Rozdzia%C5%82%207.pdf.

2. Gendo F., Konschak R. (1999), *Mythos Lean Production. Die wahren Erfolgskonzepte japonischer Unternehmen*, Essen, Verlag Betrieb & Wirtschaft.
 3. Griffin R.W. (2005), *Fundamentals of Managing Organizations*, Warsaw, PWN.
 4. The Need for Greater Autonomy of the Workers (1993), Warsaw, *Management World*, No. 4.
 5. Martyniak Z. (1996), *Methods of Organizing Work Processes*, Warsaw, Polish Economic Publishing House.
 6. Martyniak Z. (1997), Lean Management System [in:] *Management Instruments in the Modern Enterprise*, (ed.) Z. Martyniak, Poznan.
 7. Pieske R. (1994), Benchmarking: das Lernen von anderen and seine Begrenzungen, *Management Zeitschrift*.
 8. Sprow E.E. (1995), Benchmarking: A Way for Our Times?, *Problems of Quality*, No. 5, Warsaw.
 9. Stabryła A. (1996), *Managing the Development of the Company*, Krakow, Cracow University of Economics.
10. Stoner J., Freeman R., Gilbert D. (2011), *Management*, Warsaw, Polish Economic Publishing House.
11. Sussmann F., Kraus P. (1994), Lean Management in Mittelstandsunternehmen, *Management Zetschrift*, No. 12.
12. Wang K.L., Wang Y., Yao J.T. (2014), *A Comparative Study on Marketing Mix Models for Digital Products*, China, Canada, School of Management, Xi'an Jiaotong University, PR China, Department of Computer Science, University of Regina, Canada.
13. Zimniewicz K. (2009), *Contemporary Management Concepts and Methods*, Warsaw, Polish Economic Publishing House.

Chapter **18**

Influence of Organizational Culture on Human Resource Management at the Enterprise. Trying to Assess the Organizational Culture from the Perspective of the Employee

Monika Zasadnia

1. Introduction

This paper aims to show the importance of human resource management in organizations to identify the type of organizational culture that prevails in it. Each type of organizational culture has its own rules and idea of leadership that facilitate sappropriate management of people and their selection at the recruitment stage. Not every organizational culture is positively evaluated by the staff because of lack of some important possibilities such as self-development in the organization and another control and relaxed atmosphere at work. One organization can be perceived both positively and negatively by employees.

The study attempts to identify the most and least from the point of view of the employee culture.

2. Definitions and types of organizational culture

In the literature you can find many definitions of organizational culture. One of the most popular belongs to Edgar H. Schein who suggested that organizational culture is a pattern of shared basic assumptions learned by the group in the course of solving problems of external adaptation of its internal integration, working well enough to be considered valuable, thereby instilled new members as correct way to perceive, think and feel in relation to those problems (Schein, 1986, p. 12). Another equally accurate definition formulated by A.L. Kroeber and C. Kluckhohn. In their view, culture is reduced to schematic ways of thinking, feeling and reacting, acquired and transmitted mainly by symbols, which are creations of groups of people and contain concretizations in the form of artifacts. "Both of these definitions are considered as one of the most widespread in the literature" (Krupski, 2001, p. 66).

Definitions of culture are different from each other, for example G. Hofstede defines it as the collective programming of the mind which distinguishes the members of one organization from another (Hofstede, 2000, p. 267). According to E. Jacques organizational culture is, however, customary and traditional way of thinking and action that must get to know new members and at least partially accept it if they want to be accepted as members (Jaques, 1951, p. 18).

A more practical definition of culture offered R. Deshapande and R. Parasurman to whom organizational culture is based on unwritten rules, often unconsciously perceived that fill the gap between what is formal and what is actually happening (Deshapande, Parasurman, 1987, p. 6).

Summarizing above presented definitions the most accurate term for the organizational culture for this study can be a statement that organizational culture is a system of informally established in the social organization of patterns of thought and action, which are important for the realization of the formal goals of the organization (Sikorski, 2002, p. 4).

Just as many different ways of defining the organizational culture, so there are as many types of its divisions and typology. In the literature, the most commonly cited is a division of G. Hofstade.

Dimensions of organizational culture according to G. Hofstede (1984, p. 24):
- distance to power,
- individualism,
- masculinity,
- avoidance of uncertainty.

Another distinction proposed by Ch. Hampden-Turner and A. Trompenaars (1998, p. 14):
- universalism – particularism,
- analysis – synthesis,
- individualism – collectivism,
- succession – synchronization,
- Develops position – receiving position,
- equality – hierarchy.

Often in the literature can also be found division proposed by E. Schein (1986, p. 33):
- visible, conscious,
- partially visible and conscious,
- invisible, usually unconscious.

For the examination of the division of K. Cameron and R. Quinna who differentiates the culture of the organization of the following four categories: clan, hierarchy, and market adhocracy (Cameron, Quinn, 2006, p. 48).

Figure 1. Types of organizational culture by Cameron and Quinn
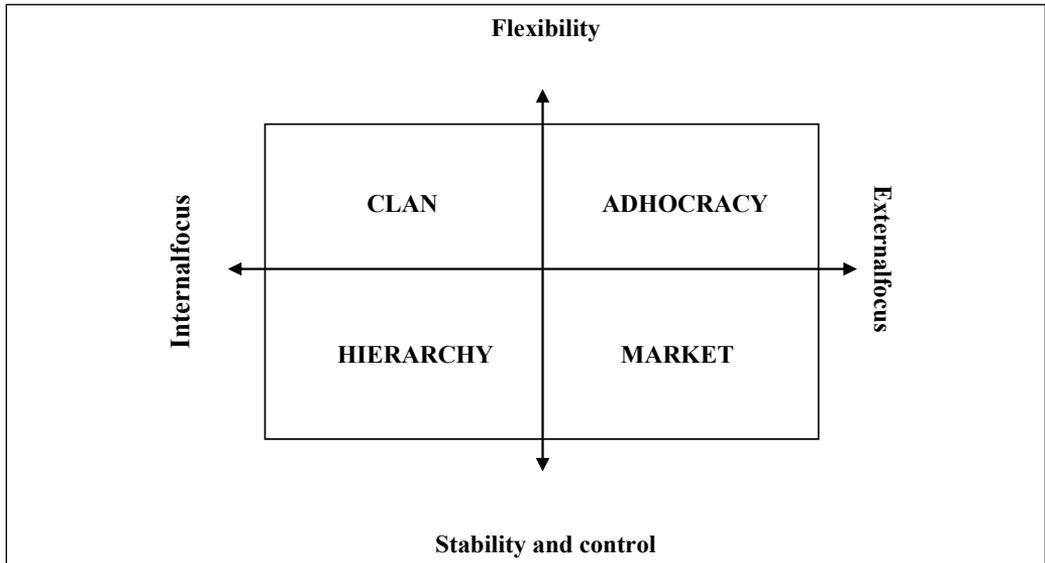
Source: Cameron, Quinn, 2006.

3. Organizational culture and human resource management

Each organization develops its own easily recognizable culture of the organization, which provides a unified system of rules, creates a social order, builds identity of a group and commitment of the people. Each participant of organization has its own idea of what it is and what it reveals. This culture is the result of both deliberate and intentional actions, as well as random actions, contains elements of both formal and informal actions.

Diagnosis of organizational culture allows description of the key aspects of the company, allowing support of the process of building a positive image and enhance the awareness of employers to create a uniform culture. Diagnosis of individual dimensions of organizational culture also allows to specify an existing profile and target culture. If the employer is looking for increased efficiency, wants to prepare and carry one's company through the process of change, should take a look at your business through the prism of the dominant culture. Next step is to determine what cultural profile would be the most desirable and plan activities that will help to introduce modification of it (Bratnicki, Kryś, Stachowicz, 1988, p. 67).

The human resource management and organizational culture are interrelated. It is emphasized that the policy of human resource management should promote an organizational culture where this is possible, or replace it with a better, where it is considered to be imperfect. On the other hand, a strong organizational culture is crucial to support human resources management system (Pawlak, Kudelska, 2011, p. 162).

Identification of the organizational culture of the company can manage employees more efficiently. It has an impact on aspects such as (Srokowski, 2011, p. 22):

- accurate identification of all elements of organizational culture conducive to the formation of an effective system of incentives, tailored to the needs of the company and expectations of employees;
- the use of methods and techniques of recruitment, taking into account cultural values, increases the likelihood of acquiring new employees for desired due to the requirements of specific jobs and employers' expectations;
- strongly oriented enterprise customer must also firmly orient to your surroundings and taking place in it changes. Thus, their organizational culture and management style should be based on openness, entrepreneurship, competitiveness, tolerance, preference for risk, *etc.*;
- Cultural norms, setting a framework for employee behavior, shape the relationships between superiors and subordinates, thus allowing the principles of conduct periodic evaluations of employees and managers, and the proper use of the results of these assessments include the training needs analysis, promotion system, firing and motivating;
- Standards, symbols and rituals facilitate communication between employees, as well as a line worker – the employer relation and also to support business decisions;
- Compliance by the employees and managers to values and norms increases the sense of security and stability, and supports the integration and facilitates change.

Understanding the norms, values and artifacts allows guests to discover the motives of behavior and attitudes of employees and managers. This allows proper alignment methods and instruments used to shape the behavior and attitudes, especially tools and systems motivation, methods of training and development, and systems periodic evaluations of employees (Nogalski, 1998, p. 104). Organizational culture can be regarded as a substrate on which the whole process of human resource management in the enterprise is mounted, and in the same time as tool that allows managers to integrate employees around key goals and objectives. Recognition of and compliance with these rules by employees and managers can standardize most in operations of practical solutions used in the operations of enterprises (Listwan, 2000, pp. 44-45).

4. Testing methodology

The study was conducted on a group of 100 people – employees of various levels in large enterprises of different industries.

The research method was conducted in a form of an anonymous survey, consisting of two stages. In the first part of the respondents on the basis of thematic areas that characterizes the company in which they work, identify their organizational culture by allocating them to the appropriate number of points. For this purpose, was used template proposed by K. Cameron, R. Quinn, covering such items as: the general characteristics of the organization, leadership styles, the criteria for success in the organization, the management of employees and their priorities.

The study assumed that the results will confirm the following statements: the most friendly organization for the employee is the culture of the clan and its employees most appreciate the stability of employment and work atmosphere. The least desirable culture is the culture of the market, and it is one where employees most often think about changing employer.

Verification indicated assumptions will be made on the basis of the second part of the study – a survey consisting of ten questions which aim to evaluate the ratio of employees to various elements of organizational culture in which they work.

5. Test results

The study involved 100 respondents, among them emerged roses type of organizational cultures are summarized in Table 1.

Table 1. Types of organization culture

Type of organization culture	CLAN	MARKET	HIERARCHY	ADHOCRACY
The number of correctly completed questionnaires	33	15	33	19

Source: own work based on research.

In the second part of the survey respondents' answers to the ten anonymous questions, indicated by their answers are listed in the charts.

The first survey question concerned the level of job satisfaction by respondents of different types of organizational cultures. Figure 2 shows the response of the respondents.

Figure 2. Are you happy with your job?
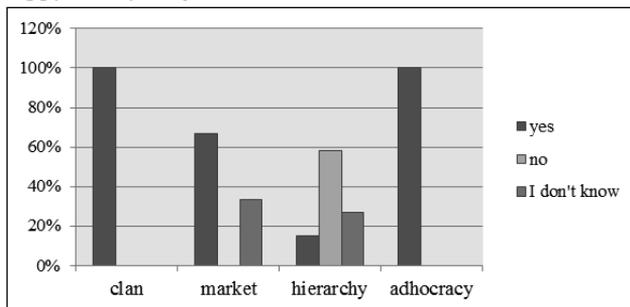
Source: own work based on research.

All the respondents in the culture of the clan are satisfied with their jobs, the same respondents adhocracy culture. By far the largest is 58% dissatisfied with their work is of cultural hierarchy.

The next question concerned the satisfaction of employees with positions occupied by them in the company. The results of the study are presented in Figure 3.

Figure 3. Are you happy from his position?
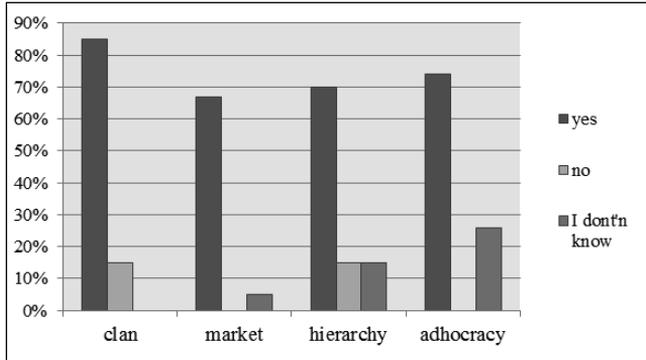
Source: own work based on research.

Most satisfied with their position in the company employees working in the culture of the clan, the most unhappy and in enterprises about the culture of hierarchy.

The third question respondents were asked about the level of satisfaction with their earnings. The results are shown in Figure 4.

Figure 4. Are you happy of your earnings?
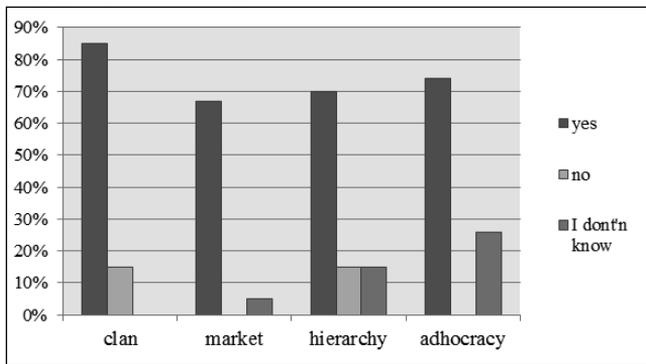
Source: own work based on research.

The most dissatisfied with their earnings are cultural workers Market, 100% response. While respondents were most satisfied with the adhocracy culture.

In another question, respondents were asked about whether pursuing a professional in their work. The results are shown in Figure 5.

Figure 5. Have you realized at work?
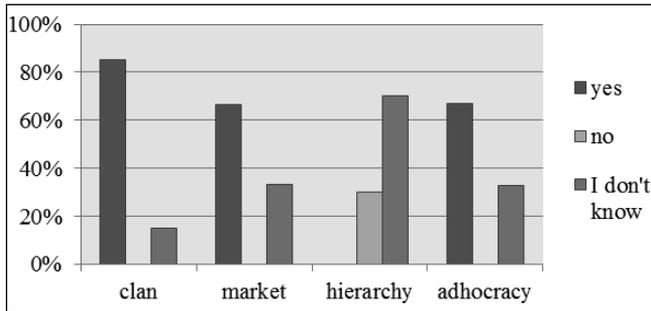
Source: own work based on research.

Employees of the clan culture in the vast majority said they realized in their work. The only group in which a negative response was dead culture of hierarchy in the group also stated that no job allows him to pursue professionally.

In the next question, respondents were asked to name the three most important elements for them, who appreciate the work, the results are illustrated in the Figures 6 and 7.

Figure 6. What elements and behavior affect best to increase the quality of work in relation to your opinion? Please select the 3 most important – culture of clan and market
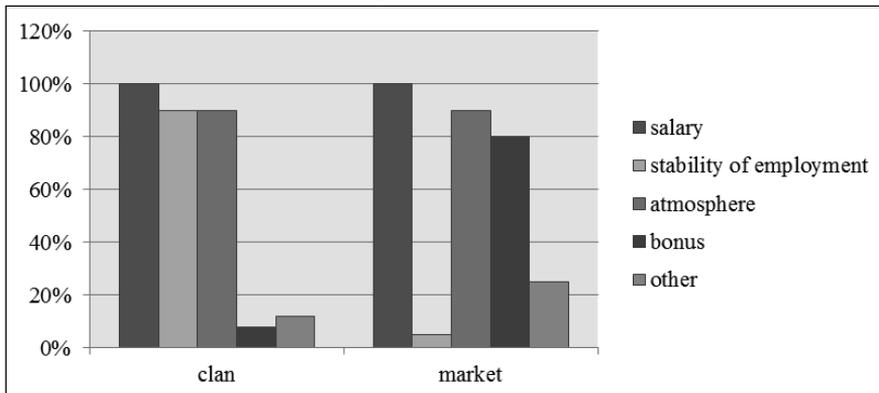
Source: own work based on research.

Figure 7. What elements and behavior affect best to increase the quality of work in relation to your opinion? Please select the 3 most important – culture of adhocracy and hierarchy
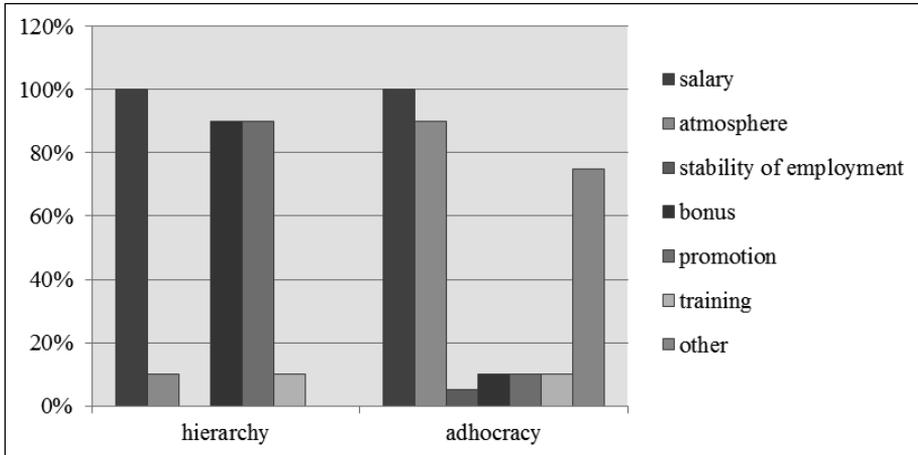
Source: own work based on research.

In the culture of the clan have proven to be the most important consideration, the atmosphere at work and job stability. In the culture of the market wage, the atmosphere at work and additional profits from work. Employees cultural hierarchy indicated as the most important salary, bonuses and the possibility of advancement. The adhocracy culture indicated salary, atmosphere and other perks of the job.

Another question concerned the well-being in the workplace, the results shown in Figure 8.

Figure 8. How do you feel in your workplace?
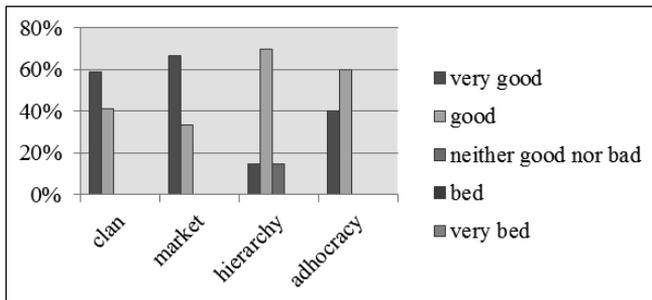
Source: own work based on research.

The best in workplace feel employees clan culture and the market. The biggest indecision in this matter showed a hierarchy of cultural workers.

The next question concerned the relationship with colleagues. Indications of the respondents are summarized in the Figure 9.

Figure 9. What is your relationships with colleagues?
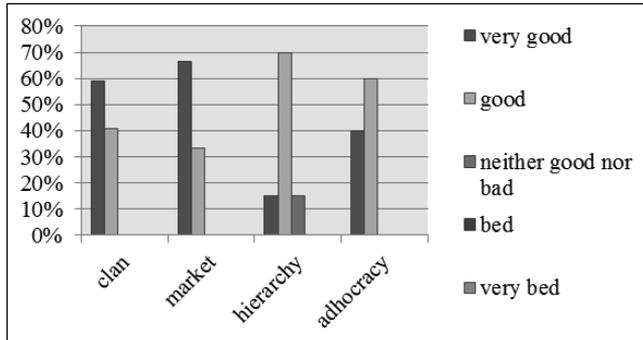
Source: own work based on research.

Again, the most positive about the relationship with co-workers spoke clan culture and the market, and most were undecided representatives of the hierarchy.

Another important element of the test were the relations with the boss. The results are shown in Figure 10.

Figure 10. What are your relationship with the chief?
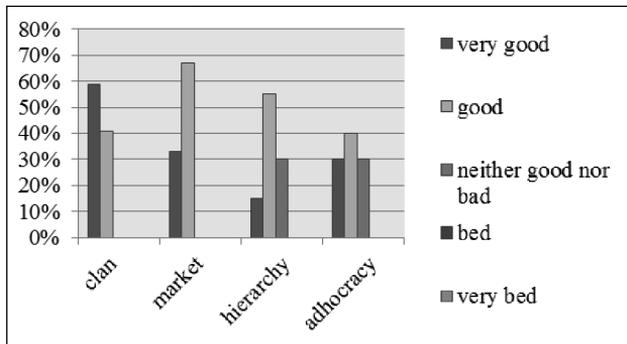
Source: own work based on research.

In this case, the relationship with your supervisor is best evaluated employees clan culture and the market. Cultural hierarchy and adhocracy have shown indecision as to the choice of a definite answer.

In question 9 respondents were asked about whether their boss cares about their professional development. Their responses are presented in the Figure 11.

Figure 11. Do you think that the chief takes care of your professional development?
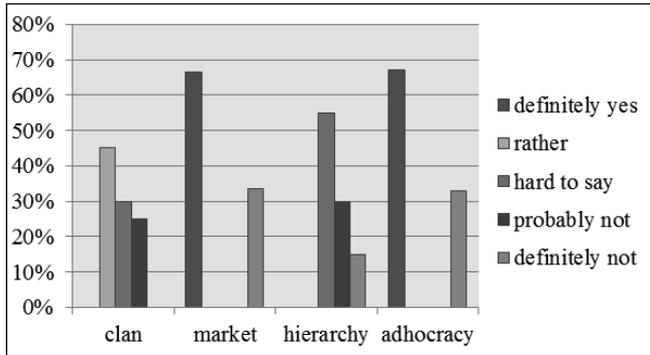
Source: own work based on research.

The most extreme response to this question occurred in the market and adhocracy cultures, the respondents in this group responded in the most – definitely yes, but there were also many negative responses. The most negative were evaluated superiors in the hierarchy culture.

The last question concerned the consideration of the possibility of changing jobs. The results are summarized in the Figure 12.

Figure 12. Do you think about changing the job?
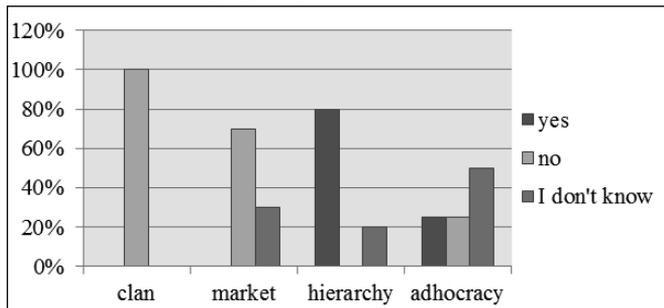
Source: own work based on research.

In the culture of the clan, none of those interviewed showed no willingness to change jobs. Most respondents are thinking about changing jobs is among the cultural hierarchy.

6. Conclusion

Organizational culture is a phenomenon that has a profound impact on daily functioning of any business. Is often created unwittingly by employees and its source is the impact of the environment, the structure of the company and the technology available. Despite the fact that each company has a culture, not everyone is aware of this fact and moreover only some know how properly to take advantage of this fact.

The study partially confirmed the raised assumptions The most positively perceived culture by an employee was the culture of the clan, the least popular, despite earlier assumptions that the culture of hierarchy In this group of workers there is also frequent ideas about changing of an employer. In the culture of the clan under the premise of the employee are important atmosphere at work and job stability, but equally important, what is not assumed in the study is the salary.

As you can see organizational culture can take many forms and each employee can be assessed in different ways depending on what is expected from the position where the work is to be done and the people who are to be his/hers colleagues and superiors. As the survey revealed it is difficult to assume that culture is negatively perceived by the employee, as it assesses the individual preferences and priorities. Research may be a pilot study for further diagnosis of employee behavior in different types of organizational cultures and can help to diagnose properly the type and derive from this diagnosis as much benefit, both from the point of view of the employee and the employer.

Bibliography

1. Bratnicki M., Kryś R., Stachowicz J. (1988), *Kultura organizacyjna przedsiębiorstw*, PAN, Ossolineum.
2. Cameron K., Quinn R. (2006), *Kultura organizacyjna – diagnoza i zmiana*, Kraków, Oficyna Ekonomiczna.
3. Deshapande R., Parasurman R. (1987), Linking Corporate of Strategic Planning, *Organizacja i Kierownictwo*, No. 6.
4. Hampden-Turner Ch., Trompenaars A. (1998), *Siedem kultur kapitalizmu*, Warszawa.
5. Hofstade G. (1984), *Culture's Consequences. International Differences in Work-Related Values*, Beverly Hills–London–New Delhi, Sage.
6. Hofstede G. (2000), *Kultury i organizacje*, Warszawa.
7. Jaques E. (1951), *The Changing Culture of Factory*, London.
8. Krupski R. (2001), *Zarządzanie strategiczne. Koncepcje – metody*, Wrocław, Wydawnictwo Akademii Ekonomicznej im. Oskara Langiego we Wrocławiu.
9. Listwan T. (red.) (2000), *Zarządzanie kadrami. Podstawy teoretyczne i ćwiczenia*, Wrocław, Wydawnictwo Akademii Ekonomicznej we Wrocławiu.
10. Nogalski B. (1998), *Kultura organizacyjna. Duch organizacji*, Bydgoszcz, Oficyna Wydawnicza Ośrodka Postępu Organizacyjnego.
11. Pawlak N., Kudelska I. (2011), *The Culture in Global Organizations* [in:] *Knowledge Management and Organizational Culture od Global Organization*, (eds.) K. Grzybowska, M.K. Wyrwicka, Poznań, Publishing House of Poznan University of Technology.
12. Schein E.H. (1986), *Organizational Culture and Leadership*, San Francisco – London, Jossey-Bass.
13. Sikorski C. (2002), *Kultura organizacyjna*, Warszawa, Wydawnictwo C.H. Beck.
14. Srokowski Ł. (2011), *Zmienić myślenie o firmie. Zarządzanie kultura organizacyjna w Polsce*, Warszawa, Wydawnictwo Poltext.

Chapter **19**

Leadership in Entrepreneurial Organizations

Magdalena Gorzelany-Dziadkowiec

1. Introduction

Modern companies, so that they can survive and even thrive must be flexible and innovative. The ability to change is a factor in determining the success of the organization. Very high importance innovation and entrepreneurship both organizations and individuals who are in it. The changing environment and competition conditions necessitated the emergence of entrepreneurial organizations in the economy. These organizations are characterized by their ability to take up and solve in innovative ways to new problems, the ability to exploit emerging opportunities, and flexible adaptation to the changing conditions of the economy. Entrepreneurial organization is also open to knowledge.

The purpose of this article is to indicate the nature and characteristics of an entrepreneurial organization, to identify ways of shaping the internal entrepreneurship, as well as to identify the challenges posed by the leadership in entrepreneurial organizations. The added value of the article will be recommendations and advice for entrepreneurs in the field of leadership. This article will attempt to create a model of leadership in entrepreneurial organizations. Certain errors are possible actions to be taken and those managers municipalities.

This article will attempt to create a model of leadership in entrepreneurial organizations. Research will be conducted in small businesses. The study will use interview and questionnaire with five-point Likert scale. Results of this study will form the basis for attempts to create a model of leadership in entrepreneurial organizations.

2. Organizations entrepreneurial – nature and importance

Entrepreneurial organizations seek to introduce new products and reforming the existing state of things. Innovation is the tool by which entrepreneurs can use the change as an opportunity to take up a new business. In the entrepreneurial organization an important role play shaping entrepreneurial attitudes, as well as stimulating innovation and creativity of employees. It requires the managers of the company to create an appropriate organizational culture, shaping the struc-

ture, as well as the adoption of appropriate management style. Take action in the field of culture, structure and leadership should favor of making changes.

The most convincing way to characterize the entrepreneurial organization is to contrast the traditional bureaucratic organization. The move from a bureaucratic organization into an entrepreneurial organization model is made by the action of two groups of factors (Koźmiński, 2004, p. 168):

- individual interests, ambitions and intentions resulting from the collision of individual fate and individual characteristics with changes in socio-economic and cultural, which determine entrepreneurship,
- competitive constraints that make traditional patterns of doing business are losing the market and disappear loose forms of entrepreneurship.

The phenomenon of entrepreneurship is not only the fact that there are new initiatives and new businesses created by entrepreneurs, but also that the changing patterns of functioning enterprises. Gradually they become more and more saturated with elements of entrepreneurship, which is a response to the crisis rigid, bureaucratic organization. Pictorial scene of traditional and entrepreneurial organizations is shown in Figure 1.

Figure 1. Pictorial scene of traditional and entrepreneurial organizations
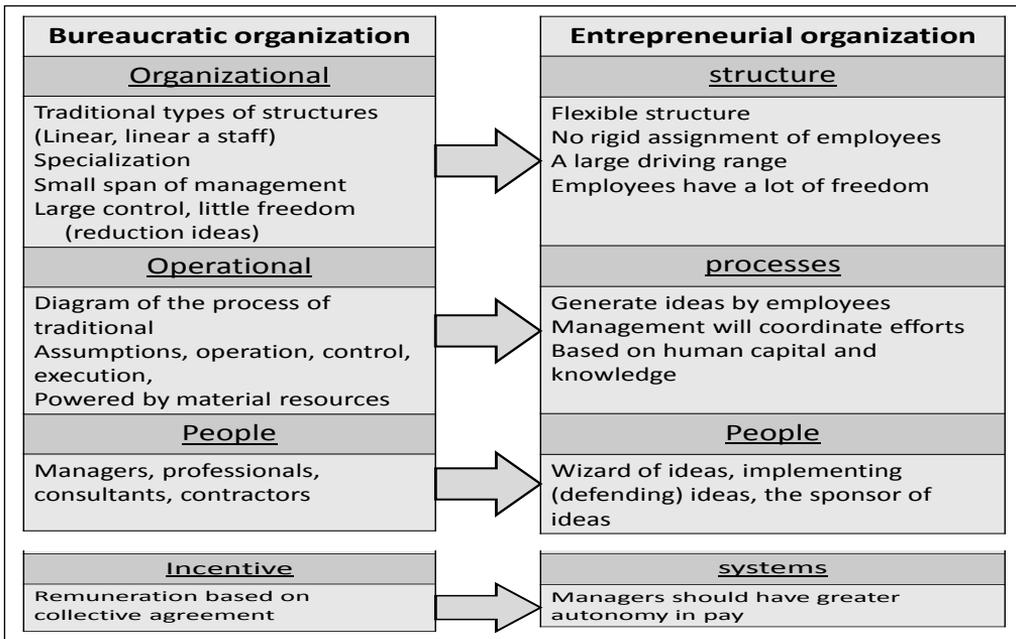
Source: own work based on conducted research.

Making analysis of Figure 1 it is possible to state, that implementing changes and going towards the enterprising organization requires making the organizational structure more flexible, diverging from stiff subordinating employees, leaving the great freedom of action for employees from the bureaucratic organization. Visible changes in investigation processes should be also,

which they should be directed for generating ideas as well as one should base them on the human capital and the knowledge.

However, human capital in the enterprising organization should be a wizard of ideas. It is also important to know how to implement created ideas. Motivation systems, which still are based on a large extent on the remuneration are also changing. A greater autonomy is being left to managers in rewarding. In the bureaucratic organization cultural patterns, a tradition, businesses of elites acted the great importance. Undergoing from the model of the bureaucratic organization in direction to enterprising one, was extorted to a large extent by the competition, the globalization, progress of the knowledge and the development of information- communications techniques. Surroundings, which became fast and stormy caused, that organizations had had to start accommodating themselves to the changes, to adopt to them and had to become elastic. Distinctive features characterized enterprising organization are: changeability, flexibility, adaptive-ness drove the permanence and the stability of bureaucratic organizations.

It is worth to notice, that the transition from traditional organizations towards entrepreneurial organizations is very much dependent on the managers (owners) of these organizations. Although entrepreneurial organization at first glance may not seem like a separate context of leadership, taking the leadership in such an organization associated with specific challenges. The person who creates the organization and is an entrepreneur must possess certain skills, including the ability to identify market opportunities, the resources needed to invest in the market given the chance to make it a profitable investment, as it needs a management team that will implement the plans.

Context of entrepreneurial organization reveals the leader – the entrepreneur as a person who has to convince investors, suppliers, customers and vendors for their vision (Palmer, 2013, pp. 120-121). Leadership in such a organizations is characterized by autonomy in decision-making, freedom, reliance on teams. People in entrepreneurial organizations are aware that they operate within business structures in order to achieve success. Starting with changes in the organization should be remembered, that in any organization if they fail to convince the new idea of a critical mass of its members, the acceptance of the idea will spread like an epidemic (Kim, Mauborgne, 2004, pp. 68-70).

In no enterprising organizations not much attention is paid to the conceptual skills (abstract thinking) and the ingenuity of the members of the organization, but the focus is on strategy, structure and objectives of not seeing the possibilities inherent in the team. For an organization to be entrepreneurial, innovation and entrepreneurship of its employees should be visible at all levels of the organization. Organizational entrepreneurship should therefore be implemented by all members of the organization, regardless of the level at which the unit is located, as well as entrepreneurship should be visible in teams and on the level of the organization as a whole.

3. Characteristics of entrepreneurial leadership in the organization

As mentioned earlier, entrepreneurial leadership in the organization is different than other types of organizations (eg bureaucratic), but it should be noted that leadership is not the same as management. Very often the "leadership" and "management" is considered synonymous but these concepts are not identical. Leadership is the ability to lead the organization into the future, lies in finding new opportunities that appear and use the best one. Leadership refers to the vision,

the people who realize this vision, empowering others, and above all, initiating positive change. Leadership is not based on attributes but on specific behaviors. In a rapidly changing environment, leadership is increasingly sought after and looked forward to it since more and more people, no matter what place occupy in the hierarchy (Kotler, 2014).

Already twenty-five years ago, J. Gabarro and J. Kotler proposed a completely new look at the relationship between superiors and subordinates, paying attention to the interdependence of partners in these relationships. It should be noted that the heads of many companies in need of cooperation, integrity and honesty on the part directly subordinate managers who are dependent on their superiors in establishing contacts with the rest of the company, prioritizing and acquiring the necessary resources. For many people the concept of relationship management of your own boss may sound suspiciously. You should pay attention then to the fact, that in businesses dominated by traditional, top-down model of building relationships, for many people it is difficult to understand why it is worth todirect relationship from the bottom up. Well, own boss relationship management means a conscious cooperation with the supervisor in order to obtain the best results. Anyway, we should be aware of the fact that the leader as each person is neither perfect nor infallible. Do not have unlimited time, encyclopedic knowledge, or extrasensory perception ability, it is also a dangerous enemy (Gabarro, Kotter, 2006, pp. 130-134).

It should be noted, that the role of managers is to develop relationships, behaviors, and actions taken by the organization. Therefore of, crucial importance in the organization play managers, whose task is to encourage all members of the organization for entrepreneurship, openness to change and willingness to learn. Managers need to take action trigger with employees desire to do new things, that they were willing to look for areas of change, as well as to were eager to introduce these changes. Managers managing organization must pay attention to all areas of management that you need to improve by making changes, include: organizational structure, organizational culture, decision making, motivation, leadership, training, planning (the pursuit of a common vision), Information Systems. To make people in the organization to react to changes and new challenges willingly taken, should provide them with access to information, encourage cooperation (team work and support), leave the freedom to choose and solve problems, to tolerate risk, as well as securing financial resources, material and human (Czekaj, 2007, p. 24).

In the entrepreneurial organizations borders between superiors and subordinates are open. The basic idea is to experience both sides were mutually accessible and communicated to the other interested parties. In an organization of this type the lines between the team and management, customers and suppliers, the organization and the environment are disappearing. Structure of such an organization is flexible and conducive to intensify the flow of information.

Managers in organizations should cultivate entrepreneurial "culture of different sentences", so should be deeply convinced that the clash of ideas enriches the experience of the staff and thus increases the potential of their knowledge and creates in them a friendly attitude towards experimentation and the possibility of errors. In such an organization criterion for the selection of staff is not possessed knowledge and ability to learn. In that area there is great potential that management should use (Ziemniewicz, 2001, p. 79).

Just as there are differences between bureaucratic organization and entrepreneurial, so also there are differences in leadership in these two types of organizations. Differences in leadership in the organization of the bureaucratic and entrepreneurial shown in Table 1.

Table 1. Leadership in bureaucratic and entrepreneurial organization

Bureaucratic organization	Entrepreneurial organization
Punishing mistakes	Learning from mistakes
Training and the using fixed procedures	Continued staff training, providing employees with the freedom of thought
Manager allocates tasks, monitors and controls personnel	Management appreciates innovative solutions, promote the exchange of ideas and opinions
Autocratic leadership style	Delegation of decision-making powers with responsibility
The lack of effective information systems	Creation and use of information systems in effective communication
The use of best practices	Implementation of innovation and appreciation of innovative solutions

Source: own work.

When analyzing the statement presented in Table 1, it can be concluded that the entrepreneurial leadership of the organization is similar to the factors that determine the effectiveness of managers by P. Drucker. He claims, that excellent managers may be charismatic or dull, generous or stingy, focused on the vision or fascinated by numbers. However any effective manager uses eight simple ways of proceeding (Drucker, 2004a, pp. 48-52):

- ask the question "what should I do?",
- ask the question "what is good for the company?",
- develop action plans,
- take responsibility for decisions,
- take responsibility for communication,
- focus attention on occasions and not on problems,
- able to conduct meetings,
- think and say "we" and not "I".

The first two practices ensure acquire the necessary knowledge, while four others to help transform knowledge into effective action. The last two mentioned by P. Drucker practices mean that everyone in the organization feel co-responsible for the company. The use of the eight indicated by P. Drucker practices can be regarded as a source of efficiency and effectiveness of entrepreneurial leadership in the organization. Indicated by P. Drucker determine leadership practices different than in bureaucratic organizations (traditional). Leadership in entrepreneurial organizations should therefore be based on the principle that smart managers do not take the decision or action in areas in which they are incompetent but communicate them to others and are aware that everyone has their weaknesses. Also, it is very important not to punish mistakes because only the one who does nothing makes no mistakes, and everyone who works is exposed to those who commit them. The last practice of conduct entrepreneurial leadership in the organization is Do not think, or do not say "I" just a thought and say "we". Successful managers know that they shoulder the responsibility that can not be shared, nor that they can not pass on to others. They have, however, authority, and these reasons are trusted. This means that the first successful managers meet the needs of enterprises and standing in front of her chances before they start thinking about their own needs and opportunities. Ostensibly, this practice is simple, but extremely difficult to comply with (Drucker, 2004b, p. 53). Managers

in organizations are required to led to what is expected, which means that they are expected effectiveness (Drucker, 2007, p. 13). Its effectiveness, entrepreneurial managers in organizations as learning organizations, can increase by changing their behavior. As P. Senge wrote, managers in learning organizations have to "change the way they think and must see the world in a new way", need to think systemically (Senge, 2004, p. 86). Systems thinking is the art of view the relationship, rather than as separate objects, the nature of change over time, rather than static snapshots. In systems thinking sees the whole. Systems thinking is a cornerstone in the concept of learning organizations. This concept becomes necessary to change the way of thinking denoting the transition from view to view parts of a whole, the perception of people as passive puppets to view them as active participants in shaping reality, of action in view of today to create the future (Senge, 2004, pp. 89-91).

4. Model recognition of leadership in small businesses – the results of research

In order to accomplish the purpose of this article studies were conducted in small enterprises operating in the Malopolska province. Surveyed were 11 small businesses operating in various industries such as catering, bakery and confectionery, dentistry, cosmetology. Selected for the companies that have been tested for innovative governance and intraenterprising (Gorzelany-Dziadkowiec). Based on the survey examined the company should be considered entrepreneurial organizations. Study was made to answer the following questions: what characterizes leadership in entrepreneurial organizations, which are the challenges of leadership in front of managers in entrepreneurial organizations.

The study has been used a questionnaire with five-point Likert scale, asked the owners of the surveyed companies to specify the extent to which activities are undertaken in their company where 1 meant that they are not completely taken, two are taken occasionally, 3 sometimes are taken, 4 are taken, 5 are taken to a very large extent. The test results are shown in Table 2.

Table 2. Leadership in entrepreneurial organizations – the results of research

Leadership	Grading Scale				
	1	2	3	4	5
Is the company punished for mistakes?	80%	20%	0	0	0
Is held staff training?	0	0	25%	60%	15%
Is there ongoing training of staff?	0	0	0	80%	20%
Is the decision-making powers delegated with the responsibility to lower levels?	0	10%	30%	40%	20%
Is there information systems to facilitate communication?	10%	10%	70%	0	0
Is the company urged the people to cooperate?	20%	20%	40%	20%	0
Is in the company visible teamwork?	10%	20%	30%	40%	0
Do you use (catches up) opportunities?	30%	40%	30%	0	0
Are employees encouraged to generate ideas?	0	20%	40%	40%	0
Do you leave your employees a lot of freedom of action?	0	20%	30%	40%	10%

Source: own work.

When analyzing the results, which are illustrated in Table 2, it should be noted that in the surveyed enterprises are activities that are consistent with the entrepreneurial leadership in organizations, but also visible actions that are not taken or are being taken to a very small extent, and is characterized by leadership entrepreneurial organizations. In all the surveyed enterprises management does not apply penalties for making mistakes, 75% of the surveyed companies stated that it trains staff and all the surveyed companies indicated that a large or very large extent ensure continuous training of personnel. Other activities in the area of leadership in the surveyed enterprises require changes. And so delegating decision-making powers with responsibility is seen in 60% of the surveyed companies, 30% of the surveyed companies, takes the view that the decision-making powers with responsibilities are delegated in part, and 10% of companies say they do not delegate decision-making powers. Therefore, it should be noted that in the investigated enterprises more attention should be paid to delegate decision-making powers with responsibility. Such actions on the one hand relieve management, on the other hand, managers do not delegate powers because they feel that there is no such need, and that they, as owners are familiar with all the best. Lack of information systems to facilitate communication, lack of teamwork and lack of motivation to it largely inhibits entrepreneurship surveyed organizations. 70% of the surveyed companies stated that it does not trap the emerging opportunity, and 30% of the surveyed companies stated that it sometimes catches occasions. Also not a big interest (only 40%) of surveyed enterprises encourages employees to generate ideas and 50% of the surveyed companies allowed employees a lot of freedom of action.

From the study it can be concluded that although the organizations studied could call it entrepreneurial, leadership in them is an area that needs to change. Model recognition of changes in the leadership of the surveyed companies is illustrated in Figure 2.

Figure 2. Model recognition of leadership in entrepreneurial organizations
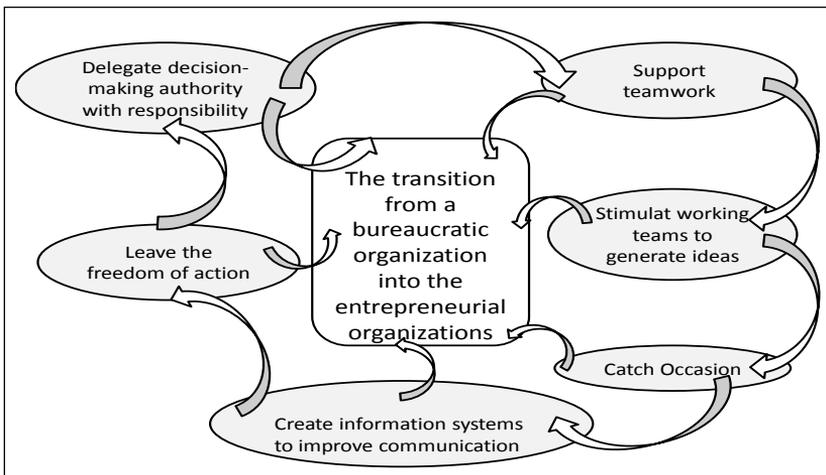
Source: own work based on conducted research.

When analyzing Figure 2, it should be noted that the changes in leadership in the surveyed enterprises relying on questing towards teamwork, catching the opportunities, creating information systems, leaving the freedom of action, generating ideas and delegating decision-making powers with the responsibility of businesses, will pass the test of bureaucratic behavior towards a more entrepreneurial.

5. Conclusion

Leadership, to be effective must be adapted to the circumstances and groups of people with whom managers have to deal, and which have lead. The article indicates the important role of leadership in organizations and then equally from management. Organizations that wish to be enterprising require a completely different style of leadership than the one to which accustomed over the period of their durations. Entrepreneurship can and even should be stimulated through effective leadership. Leadership in entrepreneurial organization is a continual process that starts from noticing the necessary changes in managers, to induce a willingness to change attitudes among all members of the organization.

Bibliography

1. Chan W., Mauborgne K. (2006), Przywództwo które prowadzi do przełomu, *HBR – Polska*, wrzesień.
2. Czekaj J. (2007), *Methods of Organization and Management*, Krakow, AE in Krakow.
3. Drucker P. (2004a), What Determines the Effectiveness of a Manager?,*HBR – Polska*, September.
4. Drucker P. (2004b), Od czego zależy skuteczność menedżera?, *HBR – Polska*, Wrzesień.
5. Drucker P. (2007), *Effective Manager*, Krakow, MT Biznes.
6. Gabarro J.J., Kotter J.P. (2006), Learn How to Manage Your Boss, *HBR – Polska*, May.
7. Gorzelany-Dziadkowiec M. (2014), *Intraprzedsiębiorczość jako determinant konkurencyjności małych i średnich przedsiębiorstw*, Studia Ekonomiczne Regionu Łódzkiego, (w druku).
8. Kotler J.P. (2014), Management Is Not Leadership, *Harvard Business Review Polska*, www.hbrp.pl [15.04.2014].
9. Koźmiński A. (2004), *Management under Uncertainty*, Warszawa, PWN.
10. Palmer R.E. (2013), *Przywództwo doskonałe*, Warszawa, Oficyna a Wolters Kluwer business.
11. Senge P. (2004), *The Fifth Discipline*, Kraków, Oficyna Ekonomiczna.
12. Ziemniewicz K. (2009), *Modern Management Concepts and Methods*, Warszawa, PWE.

20

Flexicurity – A New Tool for Human Resources Management

Katarzyna Cymbranowicz

1. Introduction

The point of the concept of *flexicurity* is to try the simultaneous combination of flexibility and security in the labor market. Although the term *flexicurity* is more often appearing in the public debate, the idea of *flexicurity* is not so widely known. One of the main pillars on which the concept of *flexicurity* is embedded is not the privileged position of any of the participants in the labor market, but on the contrary – equal treatment of the representatives of both the demand and the supply side of the labor market. This concept is not just the simple art of compromise between flexibility and security, based on the principle of 'something in exchange for something', but the process of searching for the optimal combination of these two categories, leading to increasing the efficiency and effectiveness of the functioning of the labor market.

The idea of *flexicurity* conception is based on the process of simplified hiring and firing workers by the employer, while ensuring a high level of employee's social security. Support for the dismissed employee must be high enough, so that in the period of unemployment he would have relevant financial security that will allow him to find a new job. This idea also assumes the access of workers and the unemployed to lifelong learning, enabling the acquisition of knowledge and new skills, which will eliminate the problem of inadequacy of competencies to available jobs. Moreover, the aim of the *flexicurity* conception is to eliminate poverty, social exclusion and unemployment, especially long-term. In this context, a particularly important aspect is the active labor market policy.

The concept of *flexicurity* is successfully implemented in the framework of the national labor market and employment policies in certain Member States of the European Union (the greatest notoriety gained the solutions used in Denmark and the Netherlands). The potential attractiveness of the idea of *flexicurity* itself and the lack of a universal model constitute a major reason for its popularization.

The aim of this paper is an attempt to explain the origin of the concept of *flexicurity* and to identify the abilities to meet the challenges of the modern labor market, thanks to its implementation into national employment policies. From the perspective of participants in the labor market – employers and employees, the solutions a model of flexible employment and social security proposes, consist a specific tool of human resource management.

The study adopted the research supposition, stating that the effectiveness of the solutions proposed within the framework of the concept of *flexicurity*, is particularly determined by the level of perception and acceptability of the idea itself and its tools. Without the proper understanding, the policy development and implementation of *flexicurity* model, corresponding economic and social conditions in the country, is doomed to fail.

2. Theoretical aspects of flexicurity conception

The concept of *flexicurity* emerged from the combination of two seemingly contradictory terms, *i.e*., *flexibility* and *security*. In the literature, both the concept of flexibility and security is multidimensional (Tab. 1).

Table 1. Types of *flexibility* and *security* in the labor market

TYPES OF FLEXIBILITY	
External numerical flexibility	Adjustment of employment by means of an exchange with the external labour market, including layoffs, temporary employment and fixed-term contracts
Internal numerical flexibility	Temporary adjustment to the amount of work in the enterprise, including such practices as atypical working hours and working time settlement systems
Functional flexibility	Organizing flexibility within company through training, multitask works, rotation in the workplace, based on the ability of staff to perform various tasks and activities
Wages flexibility	Changes in basic and extra wages depending on the outcome of a particular person or company
TYPES OF SECURITY	
Work security	Security arising from the provisions relating to the protection of employment *etc.*, restricting the employers' possibility to fire workers according to their own wishes
Employment security	Adequate chances of employment thanks to the high level of skills acquired, for example through training and education
Income security	Protection of appropriate and stable level of income
Combined security	Employees' sense of safety that they can combine work with responsibilities or activities other than paid work

Source: Klimek, 2010, p. 58.

The term that arose from their merging – *flexicurity*, does not have its counterpart in the Polish language. Lack of clear and precise translation which would capture its essence, in consequence often leads to interpretational confusion[1]. In an attempt to resolve what is meant by the concept of *flexicurity*, it turns out that in the literature most frequently is quoted the defi-

---

[1]   The best example may be associating this term primarily with the flexibility of the labor market, while ignoring the issue as important – safety. This interpretation is erroneous, because the main idea of flexicurity is the complementarity of its components.

nition by T. Wilthagen and F. Tros. In the publication 'The concept of flexicurity. A new approach to regulating employment and labour markets', the concept of *flexicurity* is defined as a policy within which an attempt is made, on the one hand – to have a more flexible labor markets as well as organization and labor relations, and on the other - to improve employment security and social security (Wilthagen, Tros, 2003, p. 4). According to T. Wilthagen and F. Tros, the idea of *flexicurity* assumes that the labor market should be as flexible, as safe. Thus, we are slowly moving away from the traditional perception of the interests of the various actors in the labor market as opposite[2]. Under this new approach to the needs of the modern economy, finding the balance between the category of labor market flexibility and the category of security, guarantees the mutual benefits both for the employer and the employee (Rymsza, 2005, pp. 13-15).

Policies that guarantee a high level of employment and social security are only possible due to the co-existence and mutual complementarities of the four pillars of the labor market, the so-called components of *flexicurity*, which include (European Commission, 2007, p. 6):

1. Flexible and predictable forms of employment and working time arrangements (*contractual arrangements*) achieved through modern labor law, collective agreements and work organization.
2. Active labor market policies (ALMP), that make it easier to change work, help employees adapt more easily to changes in the market, and acquiring he ability to work for those who for various reasons are inactive.
3. Reliable systems of lifelong learning (LLL), providing the constant ability of workers to adapt to changes in the market and to be employed.
4. Modern social security systems that provide adequate financial security to people in a difficult financial situation that, on the one hand promote the professional reactivation, on the other – allow to reconcile career and obligations associated with private life.

By concept of flexible and predictable forms of employment and working time arrangements should be understood the broad catalog of unusual, non-standard forms of employment, which correspond to the needs of the modern labor market. Reaching to the literature on the subject, one can see that there is a distinction between flexible forms of employment and the flexible organization of working time, although it is ambiguous division. The flexible forms of employment include (Kryńska, 2003, pp. 56-80; Sadowska-Snarska, 2006, pp. 23-32): fixed-term employment, contracting work, casual work, work on call, civil contracts (contract to perform specific task or mandate agreement), self-employment, telecommuting, working part-time job, working on a replacement, temporary work, work at home, job sharing. Among the flexible organization of working time are distinguished (Sadowska-Snarska, 2007, pp. 36-42): task-oriented working hours, equivalent working time, interrupted working time, flexible working hours, variable hours of starting work, individual work schedule, the system of shortened work week, work on the weekend, reduction of working time instead of using parental leave, individual working time accounts. Experiences with the increasing use of available flexibilities in the labor market indi-

---

[2] Labour market flexibility is primarily tied to the interests of employers, because it allows to lower the cost and makes it easier to carry on business. From the point of view of employees, flexible forms of employment cause lower employment stability, reducing the impact on the working conditions and time, greater risk of unemployment, lower levels of social protection, as well as lower income and its uncertainty. According to the concept of flexicurity is possible to reconcile the flexibility of the labor market and social protection in such a way that flexibility does not cause excessive reduction in the level of social protection and solutions in the field of social security would support economic activity.

cate that the use of atypical forms of employment can have both the positive and negative effects (Sadowska-Snarska, 2007, pp. 77-82). Among the benefits are among others: bigger chances of finding a suitable job, better reconciliation between work and private life, better career opportunities, greater motivation to work, elimination of the stress connected with the need to apply ad hoc solutions, reducing the risk of losing work. Among the costs stand out among others: the lack of separation between work time and free time, limited contact with the working environment, limited access to information, limited access to training, promotion and employee benefits, less job security. Each of flexible solutions generates the appropriate positive and negative effects. Due to the presence of many variants of flexible forms of employment or organization of working time, it is not possible to indicate all positive nor negative sides of each of the possible solutions.

Active labor market policy and modern social security system are the two components of *flexicurity*, which complement each other. In other words, they are effective solutions mainly in the field of *security*, but also fit into the issues of *flexibility*. Active labor market policy focuses primarily on activation of the unemployed and restoring them to the labor market. In turn, modern social security system concerns the support of unemployed in the so-called transitional period, *i.e.* between consecutive periods of employment, rather than during the passive remaining outside the labor market. In this sense, increasing the level of social protection is focused on restoring to the labour market as soon as possible those who have lost their work.

Lifelong learning is an important component of the concept of *flexicurity*, due to the increasing problem of mismatch between the educational offer to the needs and requirements of the labor market[3]. From the employee's perspective the idea of learning throughout life allows the flexible response to the needs of the labor market, which at the same time is a prerequisite for protection against long-term unemployment. From the point of view of the employer, investing in themselves, as well as the staff, through participation and sending for training, allows flexible adjustment of the entire company to the changing economic and social conditions, as well as maintaining, and sometimes developing the competitiveness and innovation potential by offering products and services meeting the needs of the customers. Unfortunately, economic realities suggest that investing in human capital is still very often only a slogan, not a conscious attitude of the labor market participants. Training of the employees with the task of raising their skills and qualifications are still seen through the prism of additional costs rather than increase of competitiveness, and hence – the profitability of the company. Therefore, even though the employer is obliged to help the employees in raising their professional qualifications, self-development issues are in fact left left to the discretion of the employee (Otala, 1994, p. 155).

According to E. Kryńska "simultaneous, joint use of these four components improves employability, enhancing human capital and reducing the risk of poverty" (2009, p. 14). This is confirmed by the results of economic analyzes prepared and published in the reports concerning the employment, made by the European Commission (Komisja Europejska, 2007, pp. 92-144). Describing the current situation on the labor market, you can say either about a high degree of flexibility and a low level of social security, or a low degree of flexibility and mobility of employees while providing them with high social protection. The results

---

[3] In this situation, the loser is both employer and employee. First one due to problems with obtaining properly trained staff, and the other in finding a job in their profession. The remedy for this situation is supposed to be the development of solid and flexible adjusting of participants in the labor market – both workers and employers, to changes in the labor market.

of the OECD analysis suggests that stringent regulations in the field of employment have a limited impact on the overall level of employment and unemployment. However, in relation to specific social groups, such as women, youth and the elderly, the same regulations make their labor market situation less favorable in terms of flexibility and security (OECD, 2007, pp. 69-72). This situation leads to the phenomenon of labor market segmentation, consisting on the presence of many employees working on the basis of atypical forms of employment, which, in comparison to traditional forms, do not fully protect their rights. The *flexicurity* model is supposed to counteract such negative trends in the labor market, balancing the needs of employees and employers. By providing a flexible and secure employment, on the one hand the employee will have the ability to easily and quickly respond and adapt to changing working conditions, while on the other, the employer will have qualified staff, ready to acquire new skills, open to diverse forms of employment, mobile in terms of place and working time.

Provisions for the employment and social protection can be seen as two different ways to protect workers from the labor market problems. Empirical studies suggest that workers feel better protected by the social security system (Komisja Europejska, 2007, pp. 123-126). In this context, the issue of benefits for the unemployed, and more specifically the problem of rules for their allocation, emerges. The relatively high benefits for the unemployed usually combine with longer periods of remaining unemployed, due to the reduced intensity of the activities undertaken by the unemployed to find work and quick return to the labor market. The rate of income replacement by the relevant social provision is particularly high for people with long work experience, low qualifications and not very high wages. Most often it is these people that fall into the trap of long-term unemployment and need immediate help and support to re-enter the labor market. The implementation of effective activation strategies that would coordinate the administration of the social security system with active labor market policy, could prevent those negative trends.

Another important issue in the context of the functioning of the modern labor market is the need for lifelong learning. Investing in human capital has increasing importance both from the point of view of the individual and the society. Currently, to be able find yourself in the labor market, in addition to the education it is equally important to continuously improve skills and qualifications. This investment brings benefits to both parties – the employee as it increases his chances of staying employed or finding a new job, and the employer, because qualified staff increases the chances of the company to adapt to changing economic conditions. As economic analyzes show, high rate of participation in activities in the field of lifelong education, has impact on the employment rate and the decrease of the (long-term) unemployment (Komisja Europejska, 2007, p. 108).

To recapitulate, few words should be mentioned about an extremely important element of *flexicurity*, which so far was not discussed, i.e. the social dialogue[4] and the role the social partners (employers organizations and trade unions)[5] play in it. Their activity plays a key role in the cre-

---

[4] The International Labour Organization defines social dialogue as any form of negotiation, consultation and regular exchange of information between representatives of government, employers and workers, on issues related to social and economic policy. In turn, the European Commission under the concept of social dialogue understands a process of constant interaction between the social partners to reach agreements on the control of activities in economic and social spheres, both at macro and micro level (Towalski, 2007, p. 14; *Social Dialogue in Europe – Partnership for Change*, Brussels, 9 September 2004, MEMO/04/211).

[5] This term is mostly used in relation to the representatives of employers and workers, *i.e.*, employers' organizations and trade unions. "The social partners act as builders of social and economic order, representing the in-

ation of *flexicurity* model. In this context, a crucial issue is the mutual trust between the social partners and the confidence in the public authorities, which determines and without which it is not possible to effectively implement the model of a flexible labor market and social security. The involvement of the social partners really guarantees achieving the benefits of implementing the principles of this conception into practice by all participants in the labor market.

3. The concept of flexicurity as a response to the European Union for the challenges of the modern labor market

The concept of *flexicurity* and the related ideas of reconciling the interests of employers and employees in terms of flexibility and security are undertaken in international forums. This concept has found understanding in the European Union already in the 90s of the XX century, when the adequate records concerning the idea of an integrated strategy of simultaneous increase of the flexibility and security in the labor market, were reflected in documents such as the White Book by J. Delors (1993) and the European Employment Strategy (1997). The concept of *flexicurity* has also appeared in the long-term strategies for economic and social development, such as the Lisbon Strategy (2000-2010) and the "Europe 2020" (2010-2020), as a response to the challenges facing the labor market nowadays: fostering competitiveness, employment growth and job satisfaction by maintaining a balance between flexibility and security (Rusewicz, 2011, pp. 10-13).

In the European Union the *flexicurity* conception is successfully implemented within the framework of national employment policies in many countries, however the level of progress related to the development and implementation of the flexible and secure labor market model is different[6]. However, all derive from the rich experience of the Danes and the Dutch, who are considered to be leaders in the implementation of the *flexicurity*. The solutions adopted in Denmark were based on three main elements, namely: high level of flexibility in both hiring and firing workers, as well as social protection and active labor market policy (Lang, 2006, pp. 4-5; Bredgaart et al., 2005, pp. 28-30). This means that the Danish labor market is characterized by high fluency between employment and unemployment, with a high level of professional activation of the unemployed at the same time.

---

terests and concerns of the world of work in a broad sense, ranging from working conditions to the promotion of lifelong learning, including the issue of wages. In particular, on behalf of its members they are entitled to pursue a dialogue that can be concluded with collective agreements. This means that they do not only represent the interests of employers and employees. They can also oblige their members to undertake certain activities in the negotiations. This differs social dialogue, which is more complex process of collective bargaining and consultation, whether it is bilateral between autonomic social partners or tripartite with public bodies, from the broader civil dialogue with other interested organizations" (Kacprzak, 2010, pp. 85-86).

[6] The Member States of the European Union individually implement the concept of *flexicurity* in the form and to an extent, which is allowed by specificity of national labor market. This is mainly due to the lack of a common employment policy pursued at EU level, which prevents the creation and implementation of a uniform strategy, bound to achieve the objectives of the concept of *flexicurity* in all Member States of the European Union. Despite this, the EU institutions are actively working to popularize the concept of *flexicurity*, although their role is only resolved to supporting reforms in the individual Member States labor market aimed at increasing the quality and quantity of jobs while modernizing social protection systems.

Table 2. Danish model of *flexicurity*

Forms of flexibility	Policy focus	Direction	Direction	Policy focus	Forms of security
Numerical-external	+	+		-	Job security
Numerical-internal			+	+	Work security
Functional/internal	+			+	Income security
Wage flexibility		+	+	+	Combination security

Source: Wilthagen et al., 2003, p. 11.

The Netherlands instead developed a slightly different model of *flexicurity*, which is most of all characterized by high levels of working time flexibility while enhancing social protection for atypical forms of employment (Bovenberg, Wilthagen, 2008, pp. 330-335).

Table 3. Dutch model of *flexicurity*

Forms of flexibility	Policy focus	Direction	Direction	Policy focus	Forms of security
Numerical-external	+			+	Job security
Numerical-internal	+		+		Work security
Functional/internal		+		+	Income security
Wage flexibility		+	+		Combination security

Source: Wilthagen et al., 2003, p. 19.

The closest to the implementation of the concept of *flexicurity* are therefore those countries, which are characterized by: moderate employment protection, high levels of participation in life-long learning, high levels of expenditure on labor market policy, as well as the high employment rate, low unemployment rate and low rate of poverty risk and social exclusion (Tab. 4).

Table 4. Selected indicators for monitoring flexicurity in the Member States of the EU-27 in 2012 (in %)

Category	The rate of employment (15-64 years)	The rate of unemployment (15- 64 years)	The rate of long-term unemployment (15-64 years)	Part-time work	Fixed-term work	The risk of poverty and social exclusion	Participation in training (25-64 years)	Expenditure on the active labor market policy
Austria	75.6	4.3	1.1	24.9	9.3	18.5	14.1	0.57
Belgium	67.2	7.6	3.4	24.7	8.1	21.6	6.6	1.38
Bulgaria	63.0	12.3	6.8	2.2	4.4	49.3	1.5	0.13
Cyprus	70.2	11.9	3.6	9.7	15.1	27.1	7.4	0.31
Czech Republic	71.5	7.0	3.0	5.0	8.3	15.4	10.8	0.18
Denmark	75.4	7.5	2.1	24.8	8.6	19.0	31.6	1.54
Estonia	72.1	10.2	5.5	9.2	3.5	23.4	12.9	0.15
France	69.3	10.2	4.1	17.7	15.0	19.1	5.7	0.68
Finland	74.0	7.7	1.6	14.1	15.5	17.2	24.5	0.86
Greece	55.3	24.3	14.4	7.6	10.0	34.6	2.9	b.d.
Spain	59.3	25.0	11.1	14.6	23.7	28.2	10.7	0.71
Netherlands	77.2	5.3	1.8	49.2	19.3	15.0	16.5	0.73
Ireland	63.7	14.7	9.1	23.5	10.1	b.d.	7.1	0.71
Lithuania	68.5	13.4	6.6	8.9	2.6	32.5	5.2	0.18
Luksemburg	71.4	5.1	1.6	18.5	7.6	18.4	13.9	0.46
Latvia	68.1	15.0	7.8	8.9	4.7	36.2	6.9	0.33
Malta	63.1	6.4	3.0	13.2	6.8	23.1	7.0	0.05
Germany	76.7	5.5	2.5	25.7	13.9	19.6	7.9	0.45
Poland	64.7	10.1	4.1	7.2	26.8	26.7	4.5	0.33
Portugal	66.5	15.9	7.7	11.0	20.7	25.3	10.6	0.46
Romania	63.8	7.0	3.2	9.1	1.7	41.7	1.4	0.03
Slovakia	65.1	14.0	9.4	4.0	6.7	20.5	3.1	0.22
Slovenia	68.3	8.9	4.3	9.0	17.0	19.6	13.8	0.25
Sweden	79.4	8.0	1.5	25.0	15.9	15.6	26.7	0.93
Hungary	62.1	10.9	4.9	6.6	9.4	32.4	2.8	0.35
United Kingdom	74.2	7.9	2.7	25.9	6.2	24.1	15.8	b.d.
Italy	61.0	10.7	5.7	16.8	13.8	29.9	6.6	0.31
EU-27	68.5	10.5	4.6	19.2	13.7	24.7	9.0	0.49

Note: The data concerns the year 2012, except for the level of expenditure on the active labour market policy (data from 2011, in % PKB).

Source: personal study based on the Eurostat and OECD databases.

The key indicators of the labor market and employment listed in the table above show the specificities of national circumstances. With visible success, the concept of *flexicurity* is implemented, aside from Denmark and the Netherlands, also in Austria, Germany and Sweden. The weakest results among all members of the European Union are reached in the Mediterranean countries (mainly Italy and Greece) and most of the new Member States (including Poland).

4. Conclusion

The concept of *flexicurity* is a clear response to the challenges facing the modern economy. In the face of increasing competitive and innovation pressure, being the result of an unprecedented growth of globalization and integration processes, technological progress and the large-scale phenomenon of the aging of population that is being observed, the problem of stability and sustainable development of the labor market becomes extremely important. The solution to this problem seems to be impossible without ensuring relatively balanced development of the components of the labor market, supporting on the one hand the supply, on the other the demand for labor.

In a sense, the solutions brought by the concept of *flexicurity* are analogous to those proposed 2,400 years ago by one of the most well recognized and respected Greek philosophers – Aristotle of Stagira. His concept of the "golden mean" in every respect resembles the philosophy of *flexicurity*. Flexible and predictable contractual arrangements, comprehensive lifelong learning systems, active labor market policies and modern social security systems can be effective against the challenges of the modern labor market. It seems that the term *flexicurity* only (or even) highlights the importance of the combined application of the above mentioned items. A productive dialogue and social partnership are considered the general conditions for the effective functioning of the individual components of the model (Wilthagen, 2008, p. 11). By analogy to the Aristotle's theory, the need for a conscious withdrawal from extreme solutions and search for the "golden mean" is pointed out.

Bibliography

1. Bovenberg L., Wilthagen T. (2008), On the Road to Flexicurity. Dutch Proposals for a Pathway towards Better Transition Security and Higher Labour Market Mobility, *European Journal of Social Security*, Vol. 10, No. 4.
2. Bredgaart T., Larsen F., Madsen P.K. (2005), The Flexible Danish Labour Market – A Review, *CARMA Research Papers*, No. 1, Aalborg University.
3. European Commission (2007), *Towards Common Principles of Flexicurity. More and Better Jobs through Flexibility and Security*, Brussels, 27 June 2007, COM(2007) 359 final.
4. Kacprzak T. (2010), Znaczenie dialogu społecznego i postaw partnerów społecznych dla budowania polskiego modelu "flexicurity" [in:] *Flexicurity jako recepta na wyzwania współczesnego rynku pracy*, (ed.) A. Tomanek, Białystok, Libra s.c.
5. Klimek J. (2010), Bezpieczeństwo i elastyczność na rynku pracy [in:] *Flexicurity jako recepta na wyzwania współczesnego rynku pracy*, (ed.) A. Tomanek, Białystok, Libra s.c.
6. Komisja Europejska (2007), *Zatrudnienie w Europie 2006: raport*, Warszawa, Urząd Komitetu Integracji Europejskiej.

7. Kryńska E. (2009), *Flexicurity w Polsce diagnoza i rekomendacje. Raport końcowy z badań*, Warszawa, Oficyna Wydawnicza ASPRA-JR.
8. Kryńska E. (2003), *Elastyczne formy zatrudnienia i organizacji pracy a popyt na prace w Polsce*, Warszawa, Instytut Pracy i Spraw Socjalnych.
9. Lang D. (2006), Can the Danish Model of „flexicurity" be a Matrix for the Reform of European Labour Markets*?*, *Cahiers du GRES*, No. 18.
10. Madsen P.K. (2002), The Danish Model of Flexicurity: A Paradise with Some Snakes [in:] *Labour Market and Social Protection Reforms in International Perspective: Parallel or Converging Tracks?*, (eds.) H. Sarfati, G. Bonoli, Ashgate.
11. OECD (2007), *Employment Outlook 2007*, http://www.oecd.org/els/emp/oecdemploymentoutlook.htm [15.05.2014].
12. Otala L. (1994), Trends in Lifelong Learning in Europe [in:] *Human Capital Creation in an Economic Perspective*, (ed.) R. Asplund, Heidelberg, Physica-Verlag.
13. Rusewicz M. (2011), Flexicurity – mit czy szansa na rozwój [in:] *Flexicurity. Dobre praktyki. Nowe podejście do pracy*, Warszawa, Wyd. Lewiatan.
14. Rymsza M. (2005), W poszukiwaniu równowagi między elastycznością rynku pracy i bezpieczeństwem socjalnym. Polska w drodze do flexibility? [in:] *Elastyczny rynek pracy i bezpieczeństwo socjalne*, (ed.) M. Rymsza, Warszawa, Instytut Spraw Publicznych.
15. Sadowska-Snarska C. (2007), *Szkolenia pracowników z zakresu elastycznych form pracy. Poradnik dla instytucji szkoleniowych*, Białystok, Wydawnictwo Wyższej Szkoły Ekonomicznej w Białymstoku.
16. Sadowska-Snarska C. (2006), *Elastyczne formy pracy jako instrument ułatwiający godzenie życia zawodowego z rodzinnym*, Białystok, Wydawnictwo Wyższej Szkoły Ekonomicznej w Białymstoku.
17. *Social Dialogue in Europe – Partnership for Change*, Brussels, 9 September 2004, MEMO/04/211.
18. Towalski R. (2007), Dialog społeczny – próba definicji [in:] *Dialog społeczny. Najnowsze dyskusje i koncepcje*, (ed.) R. Towalski, Warszawa, Centrum Partnerstwa Społecznego Dialog.
19. Wilthagen T. (2008), Mapping out Flexicurity Pathways in the European Union, Tilburg University, *Flexicurity Research Paper*, No. 14.
20. Wilthagen T., Tros F. (2003), The Concept of "Flexicurity". A New Approach to Regulating Employment and Labour Markets, Tilburg University, *Flexicurity Research Paper*, No. 3.
21. Wilthagen T., Tros F., Lieshout H. (2003), Towards "flexicurity"?: Balancing Flexibility and Security in EU Member States, Tilburg University, *Flexicurity Research Paper*, No. 3.

PART III

IT TOOLS AND QUANTITATIVE METHODS IN CONTEMPORARY ORGANIZATIONS

Chapter **21**

Portfolio Rebalancing Based on Minimization of VaR Using Genetic Algorithm[1]

Vladimir Ranković, Mikica Drenovak

1. Introduction

Portfolio allocation is about choosing optimal mix from the opportunity set of securities to achieve maximal level of expected return while minimizing risk. Defining market risk as variance of portfolio returns has been standard for decades. Since the seminal work of Markowitz (1952) the problem of portfolio allocation is conventionally formulated as a bi-criteria mean-variance optimization problem. Until now, many robust optimization techniques are developed to improve estimation errors and cope with the dynamics of asset return distributions[2]. However, most of these improvements still follow conventional mean-variance framework.

Variance is sufficient risk metric for dispersion only if the distribution of returns is elliptically symmetric. However, empirical distributions of risk factor returns, typically, are skewed and lepto-kurtic implying that part of the risk is hidden in the higher moments of distribution. This challenges the eligibility of variance as a risk measure. With the ongoing liberalization of cross-border capital flows financial institutions faced growing exposure to increased market volatility and exogenous and endogenous shocks with unprecedented portfolio losses. As a result, both investors and regulators became primarily concerned about the risk of extreme quantiles. The risk of extreme quantiles is defined with the aim to estimate the extent of unfavorable and highly improbable occurrences. Despite its unfavorable mathematical properties (Szego, 2002; Artzner, 1999), Value at Risk (VaR) is a predominantly used risk measure of extreme quantiles, in particular upon the introduction of new banking regulations in 1996. (see: The 1996 amendment to the Capital Accord[3]).

[2] For the out-of-sample performance of Markowitz mean-variance model and its extensions across different empirical datasets see, *e.g.*, DeMiguel et al., 2009. For different concepts of portfolio allocation and robust portfolio optimization using highly efficient algorithms see, *e.g.*, Fabozzi et al., 2008, For the great review of linear programming solvable models for portfolio optimization see Mansini et al., 2014.

[3] The 1988 Basel Capital Accord created first risk-based capital adequacy requirement for banks while 1996 amendment to the Capital Accord brought some improvements to the original accord regarding market risk.

Mathematically, $100\alpha\%$ h-day VaR is the loss amount that would be exceeded with only a small probability α when holding portfolio static during a period of h days. In order to estimate VaR one needs to find the α-quantile of portfolio return (or profit and loss) distribution. Since Bank for International Settlements (Basel Committee on Banking Supervision 1995, 1996) introduced VaR as the reference measure for assessing banks market risk exposure and capital requirements, great contributions have been made in developing and testing VaR methodologies.

By regulation, bank's internal VaR estimates are translated into a capital charge which aims to provide sufficient buffer for cumulative losses arising from extreme market conditions (Bank for International Settlements, 2009). In 1996, BIS amendment allowed banks, for the first time, to use their own internal models for calculating market risk exposures and capital requirements for the trading book (as an alternative to standardized approach proposed by regulators (Hendricks, Hirtle, 1997)). Internal risk models are subject to supervisory approval based on qualitative and quantitative standards. Regulator validates the bank's VaR model through the process of backtesting. An accurate VaR model should not result in large number of violations, that is, actual losses which exceed the estimated, over the evaluation period.

Regarding internal VaR models, majority of banks apply historical simulation VaR approach. Perignon and Smith (2007) report that almost 75% of banks prefer to use historical VaR rather than alternative VaR models.

Replacing variance with VaR as risk measure in the portfolio allocation model prevents classical optimization methods from being efficiently applicable. In Danielsson et al. (2007), the authors demonstrated that the set of feasible portfolios under VaR constraint need not to be connected or convex, while the number of local optima increases exponentially with the number of securities. In order to overcome drawbacks of classical optimization methods, several researchers applied metaheuristics, either single or multiobjective, for solving portfolio optimization problems in the VaR context (Dallagnol, 2009; Rankovic et al., 2014; Anagnostopoulos, Mamanis, 2011; Iscoe et al., 2012). All enumerated research results of VaR optimization consider standard historical simulation VaR approach.

In practice, the common issue that investors have to deal with is the management of existing portfolio of securities. Active portfolio management implies rebalancing (adjusting) of the existing portfolio by buying and/or selling assets in response to changing market conditions. The aim of rebalancing is to improve performance of existing portfolio. Depending on chosen objectives different portfolio strategies may be applied. However, portfolio adjusting implies transaction costs associated with buying and/or selling of assets. Transaction cost is one of the main concerns for portfolio rebalancing. Therefore, it must be considered when the aim is to develop active portfolio management models which perform satisfactorily under real market conditions (Choi et al., 2007; Kozhan, Schmid, 2009; Yu, Lee, 2011). Incurred transaction costs depend on portfolio turnover (trading volume) in a nonlinear way.

In this paper, we analyze portfolio rebalancing strategy based on minimization of risk measured using historical simulation Value at Risk (VaR) model. For this research we exploit sample composed of 40 constituents of S&P 100 index. The proposed rebalancing strategy has been performed for the period of 2 years, in the following manner: for each day we perform portfolio optimization minimizing VaR, if rebalance condition (trigger) is satisfied portfolio is rebalanced, otherwise existing portfolio remains unchanged. In this research we employed different rebalance triggers, turnover based and/or risk based. Proposed portfolio strategy is compared to the performance of 1/n portfolio strategy in the context of risk-return and turnover performance.

The remainder of this paper is organized as follows. In section 2 we introduce VaR model. Optimization model is introduced in section 3. Multiobjective evolutionary algorithms and implementation details are introduced in section 4. In section 5 we provide empirical results. Our conclusions and suggestions for future research are presented in section 6.

2. Models

2.1. VaR model

VaR is a quantile metric of market risk. For a given portfolio, significance level α (equivalently, 1-α is confidence level) and time horizon h, VaR can be interpreted as a portfolio loss that will be exceeded only in α ×100% of the time. In mathematical terms, VaR is α-quantile of distribution. If expressed in value terms, VaR is the α-quantile of profit and loss distribution, while if expressed as a percentage of portfolio's value it is the α-quantile of return distribution. We focus on the α-quantile of return distribution.

For the h-day return r_α such that $p(r < r_\alpha) = \alpha$ percentage h-day α× 100%VaR is formally defined as[4]:

$$VaR_{h,\alpha} = -r_\alpha \tag{1}$$

Minus sign is needed since VaR is defined as positive value (the loss). Given the distribution function of returns *F(α)*, *α*-quantile is calculated as $r_\alpha = F^{-1}(\alpha)$.

3. Optimization Model

Using definition of VaR (formula), the portfolio optimization problem can be defined as follows:

$$\min \ VaR(\mathbf{w}) = -r_\alpha \tag{2}$$

$$subject\ to \qquad \sum_{i=1}^{N} w_i = 1 \tag{3}$$

$$0 \le w_i \le 1, \qquad i = 1,...,N \tag{4}$$

where **w** denotes the vector of weights w_i, *VaR*(**w**) denotes the value at risk of a portfolio and *N* is total number of assets.

Eq. (2) minimizes VaR of the portfolio. Eq. (3) describes the standard budget constraint which requires that weights must sum up to 1.

Eq. (4) describes the constraint that no short sales are allowed, which means that none of the weights can be negative.

---

[4]   We analyze only daily returns and exclude *h* when denoting VaR later in the text.

It is very important to emphasize that VaR of portfolio is calculated using time series of realized portfolio returns (static portfolio). Accordingly, percentage one-period return of portfolio is defined as:

$$r_{p,t} = \sum_{i=1}^{N} w_{i,t-1} r_{i,t} \tag{5}$$

where $r_{i,t}$ denotes percentage one-period return of asset i at time t, while $w_{i,t}$ denotes proportion of capital invested in asset i at time t, given as:

$$w_{i,t} = \frac{n_i p_{i,t}}{P_t}, \qquad i = 1,...,N \tag{6}$$

where n_i is the number of shares of asset i and $p_{i,t}$ is the price per share of asset i at time t.

Expression (5) is fundamental relationship in portfolio mathematics (Alexander, 2008).

For static (buy-and-hold) portfolio, number of shares n_i remains the same for each asset i over the observed period. Consequently, the proportion of capital invested in each asset $w_{i,t}$ changes over time, whenever the price of any asset in portfolio changes. Because of that, for calculating time series of static portfolio returns daily recalculations of $w_{i,t}$ weights are needed.

4. Genetic Algorithms

Genetic algorithm is a stochastic optimization technique invented by Holland based on the Darwin principle that in the nature only "the fittest survive" (Holland, 1975). The main idea of Holland's theory is the application of the basic phenomena of the biological evolution such as inheritance, crossover and mutation, in order to find (generate) a solution that fits best. In the case of the portfolio optimization problems, term "the fittest" corresponds to the optimal portfolio.

So, in GA there is a set of individuals often called population. Each individual from population presents candidate solution of optimization problem. The individuals are usually referred to as chromosomes. Each chromosome, *i.e.* candidate solution, represents a decision vector made of decision variables. In the vocabulary of genetic algorithms each decision variable in the chromosome is called a gene.

In this research, each individual (chromosome) presents one weight vector **w**. Therefore, each gene corresponds to weight w_i defined by expression (6).

Generally, genetic algorithm consists of the following steps:

1. Initialization of population with random individuals,
   Initial population with the stated dimension of randomly chosen individuals is generated with the aim to uniformly cover the solution space.
2. Fitness evaluation of the individuals in the population,
   Fitness value is assigned to each individual from the population defined by adopted fitness function.
3. Generation of a new population, using crossover and mutation,
   Population of offspring is generated by applying crossover and mutation operators to population of parents.

4. Selection of individuals according to their fitness using some strategy,
   The aim of the selection process is to provide a set of offspring which "survived" and will be transmitted to the next generation.
5. Stop if terminating condition is satisfied (*e.g.*, a fixed number of iterations), otherwise go to step 2.
   Initialization of population is performed as suggested in (Ranković et al., 2014). For the breeding of offspring population we applied the uniform crossover operator. Two individuals are randomly selected and are recombined with predefined crossover probability. If the two individuals undergo recombination, every allele is exchanged between the pair of randomly selected chromosomes with a certain probability, known as the swapping probability (we set the swapping probability to be 0.5, as is usually the case). Otherwise, the two offspring are simply copies of their parents (Sastry et al., 2005).
   We employed uniform mutation operator (uniform replacement). When applying uniform mutation, each allele is selected with predefined mutation probability and replaced with a realization of a random variable, uniformly distributed in the range defined by the lower and upper domain bounds for the gene.
   In this research we set crossover probability equal to 0.9 and mutation probability equal to 0.1. For the selection process we applied elitistic Roulette wheel selection.

5. Data and research results

In this section, we present the computational results obtained by performing experiments on a historical data set. For this research we exploit 40 constituents of S&P 100 index with the highest market capitalization as of Sept 6th 2013[5].

Rebalancing has been performed within the period of 2 years (504 days), starting on a March 12th 2009 and ending on a March 10th 2011, with the rolling window of 300 daily observations. We considered 1% 1-day historical percentage VaR of static long-only portfolios.

Portfolio characterized by minimal VaR on the first day of sample period (as of March 12th 2009) is adopted as actual portfolio to be managed. Minimal VaR portfolio is defined by the set of weights w_i (proportion of capital invested in asset i). We transform these weights into portfolio holdings using assumption that initial portfolio value is equal to 1 million $.

For each following day within rebalancing period we determine portfolio with minimal VaR. If rebalancing condition (trigger) is satisfied rebalance is performed so that minimal VaR portfolio becomes actual portfolio to be managed in the future. Otherwise existing portfolio remains unchanged. Capital weights of managed portfolio are transformed daily into capital charge which is expressed as a percentage of portfolio value for the corresponding day.

As rebalance trigger we introduced the following rule: if turnover is less than 50% (total selling plus buying) of portfolio and 1-day ahead VaR estimation of alternative portfolio is at least 1% lower than VaR estimation of actual portfolio than rebalancing is applied.

---

[5] We included in the sample first 40 S&P 100 constituents with data available on Dec 3rd 2007.

Turnover is calculated using the formula:

$$Turnover(t) = \sum_{i=1}^{N} \left| w_{i,t} - w_{i,t-1} \right| \qquad (7)$$

where $w_{i,t}$ denotes proportion of capital invested in asset i at time t, while $w_{i,t-1}$ denotes proportion of capital invested in asset i at time t-1.

In order to evaluate performances of proposed portfolio strategy we compare it to the 1/n portfolio. DeMiquel et al. (2009) evaluated the out-of-sample performance of Markowitz model of optimal asset allocation and its various extensions (in total 14 different models). The authors demonstrated that naïve optimization rule 1/n of assets in portfolio is good proxy of optimal portfolio and can be challenged against more sophisticated portfolio designs.

Regarding that the proportion of capital invested in each asset w_i changes over time, whenever the price of any asset in portfolio changes, 1/n portfolio strategy implies that rebalancing must be performed each day. In order to avoid daily rebalancing we introduced following rebalance condition: if turnover is greater than 5% of portfolio value rebalance is realized, otherwise existing portfolio remains.

In the Figure 1 we present market value of the portfolio managed applying portfolio minimal VaR strategy and 1/n portfolio strategy.

Figure 1. Market value of the portfolio managed applying portfolio minimal VaR strategy and 1/n portfolio strategy
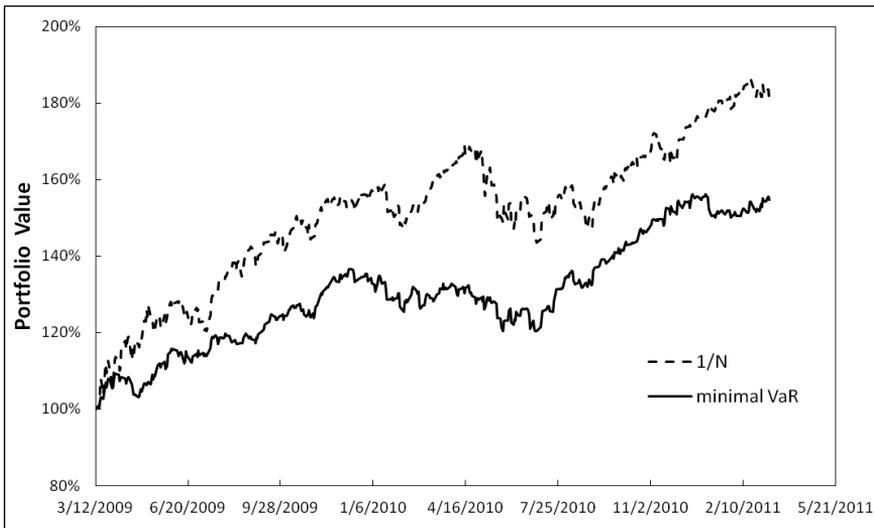
Source: own work.

In the Figure 2 we present evolution of VaR estimations over the rebalancing period for portfolio managed using minimal VaR portfolio strategy and 1/n portfolio strategy.

Figure 2. VaR estimations over the rebalancing period for portfolio minimal VaR strategy and 1/n portfolio strategy
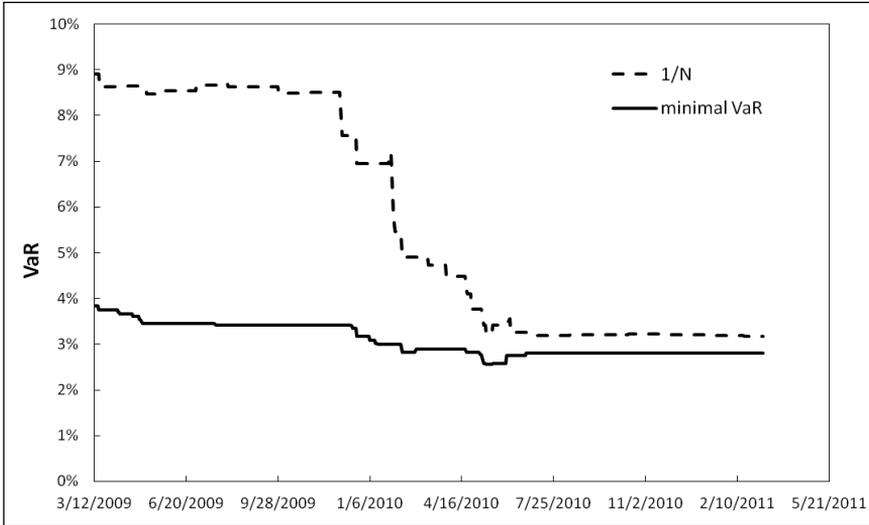
Source: own work.

It can be noticed that in the first half of rebalancing period minimal VaR strategy provides more than two times lower estimation of VaR than 1/n strategy. In the second half of rebalancing period VaR estimation for 1/n portfolio significantly decrease and become comparable to VaR estimations for minimal VaR portfolio. These results are in the line with our expectations. As consequence, these results should lead to lower capital charge for portfolio managed using minimal VaR approach, regarding that the capital requirements are proportional to portfolio VaR estimations.

In the Table 1 we present final portfolio market value, average portfolio return, average VaR, number of rebalances and turnover for minimal VaR portfolio strategy and 1/n portfolio strategy.

Table 1. Market value, average portfolio return, average VaR, number of rebalances and turnover for minimal VaR and 1/n portfolio strategy

	Final portfolio value	Average portfolio return	Average VaR	Number of rebalances	Turnover
Minimal VaR	155%	0.09%	3.08%	11	261%
1/n	180%	0.1%	5.69%	21	111%

Source: own work.

It can be noticed that market value of portfolio managed using 1/n strategy is significantly higher than market value of portfolio managed using minimal VaR strategy (180% of initial portfolio value in opposition to 155% of initial portfolio value). The same conclusion stands for the average of portfolio returns (0.1% in opposition to 0.09%). On the other hand, average VaR of minimal VaR portfolio is significantly lower than average VaR of portfolio returns of 1/n

portfolio. These results are in fact expected, since lower portfolio risk leads to lower return and vice versa. Rebalancing frequency is significantly lower for the minimal VaR strategy as opposed to 1/n strategy, 11 versus 21. However, total turnover over the observed period for the minimal VaR strategy is much higher, 261% compared to 111% for the 1/n portfolio.

6. Conclusion

Nowadays, both investors and regulators became mostly concerned about the risk of extreme quantiles. The risk of extreme quantiles is typically measured by value at risk (VaR) and conditional value at risk (CVaR). VaR is a predominantly used risk measure of extreme quantiles, in particular upon the introduction of new banking regulations in 1996. By regulation, bank's internal VaR estimates are translated into a capital charge which aims to provide sufficient buffer for cumulative losses arising from extreme market conditions. Hence, minimization of portfolio VaR became important objective in portfolio management. In this paper, we presented portfolio management strategy based on minimization of VaR and compare it to the benchmark, 1/n portfolio strategy.

Results show that proposed portfolio strategy provides better portfolio performances in the context of portfolio VaR comparing to 1/n portfolio strategy. On the other hand, 1/n portfolio strategy provides higher final market value and lower turnover than minimal VaR strategy.

Bibliography

1. Alexander C. (2008), *Quantitative Methods in Finance (1th ed.)*, England, John Wiley & Sons Ltd, (Chapter 1).
2. Anagnostopoulos K.P., Mamanis G. (2011), Multiobjective Evolutionary Algorithms for Complex Portfolio Optimization Problems, *Computational Management Science*, 8, pp. 259-279.
3. Artzner P., Delbaen F., Eber J.M., Heath D. (1999), Coherent measures of risk, *Mathematical Finance*, 9(3), pp. 203-228.
4. Basel Committee on Banking Supervision (1995), *An Internal Model-based Approach to Market Risk Capital Requirements*, Bank for International Settlements.
5. Basel Committee on Banking Supervision (1996), *Amendment to the Capital Accord to Incorporate Market Risks*, Bank for International Settlements.
6. Bank for International Settlements (2009), *Revisions to the Basel II Market Risk Framework*, Basel Committee Publications, Bank For International Settlements.
7. Choi U.J., Jang B.G., Koo H.K. (2007), An Algorithm for Optimal Portfolio Selection Problems with Transaction Costs and Random Lifetimes, *Applied Mathematics and Computation,* 191, pp. 239-252.
8. Dallagnol V.A.F., Van den Berg J., Mous L. (2009), Portfolio Management Using Value at Risk: A Comparison between Genetic Algorithms and Particle Swarm Optimization, *International Journal of Intelligent Systems*, 24, pp. 766-792.
9. Danielsson J., Jorgensen B., Casper G., Yang X. (2007), *Optimal Portfolio Allocation Under the Probabilistic VaR Constraint and Incentives for Financial Innovation*, http://www.riskresearch.org/files/BJ-CdV-JD-01-8-11-997520309-11.pdf [26.5.2014].

10. DeMiguel V., Lorenzo G., Raman U. (2009), Optimal Versus Naive Diversification: How Inefficient is the 1/N Portfolio Strategy?, *The Review of Financial Studies*, 22(5), pp. 1915-1953.

11. Fabozzi F., Kolm P., Pachamanova D., Focardi S. (2008), *Robust Portfolio Optimization and Management*, New Jersey, John Wiley & Sons Ltd.

12. Hendricks D., Hirtle B. (1997), Bank Capital Requirements for Market Risk: The Internal Models Approach, *Economic Policy Review*, 3, pp. 1-12.

13. Holland J.H. (1975), *Adaptation in Natural and Artificial Systems: An Introductory Analysis with Applications to Biology, Control, and Artificial Intelligence*, University of Michigan Press.

14. Iscoe I., Kreinin A., Mausser H., Romanko O. (2012), Portfolio Credit-Risk Optimization, *Journal of Banking & Finance*, 36, pp. 1604-1615.

15. Kozhan R., Schmid W. (2009), Asset Allocation with Distorted Beliefs and Transaction Costs, *European Journal of Operational Research*, 194, pp. 236-249.

16. Markowitz H.M. (1952), Portfolio Selection, *Journal of Finance*, Vol. 7, pp. 77-91.

17. Pérignon C., Smith D. (2007), *The Level and Quality of Value-at-Risk Disclosure by Commercial Banks, Working paper*, Simon Fraser University.

18. Ranković V., Drenovak M., Stojanović B., Kalinić Z., Arsovski Z. (2014), The Mean-Value at Risk Static Portfolio Optimization Using Genetic Algorithm, *Computer Science and Information Systems*, 11(1), pp. 89-109.

19. Sastry K., Goldberg D., Kendall G. (2005), Genetic Algorithms [in:] *Search Methodologies: Introductory Tutorials in Optimization and Decision Support Techniques*, (eds.) K.B. Edmund, K. Graham, New York, NY 10013, USA, Springer Science+Business Media, LLC, 233 Spring Street.

20. Szego G. (2002), Measures of Risk, *Journal of Banking & Finance*, 26, pp. 1253-1272.

21. Yu J.R., Lee W.Y. (2011), Portfolio Rebalancing Model Using Multiple Criteria, *European Journal of Operational Research*, 209, pp. 166-175.

Chapter **22**

A Combination of *Localdepth* and *SVM* Algorithms in Automatic Identification and Prediction of a Market State

Daniel Kosiorowski[1], Mateusz Bocian, Artur Bujak

1. Introduction

During the last twenty years the one could observe significant changes of the way in which the global economy works and the economic agents interact and cooperate. The changes are in a great part caused by a huge increase of a role of the electronic economy, and the Internet. An online credit scoring, an algorithmic trading, credit cards frauds, social networks *etc.* are phenomena which dramatically changed the Economy and which were not present in the past.

In this paper we focus our attention on a certain aspects of the modern economy called **algorithmic trading (AT).** The AT is widely used by investment banks, pension funds, mutual funds, and other buy-side (investor-driven) institutional traders, to divide large trades into several smaller trades to manage market impact and risk. Although one sometimes claims that automatic forecasting algorithm must determine an appropriate time series model, estimate the parameters and compute the forecast with prediction intervals – we focus our attention only on an automatic market state detection. The issue may be considered within a certain multiregime time series model – then our aim is to detect which regime actually generates the data. Although there are many ways for defining a market state, we understand the state of the market in terms of unconditional distribution of the data generating mechanism. In the present paper, we study usefulness of two classification rules for predicting the market state, namely the support vector machine classifier and local depth classifier. We assume we are given a training sample consisting of observations from all regimes of the process. It should be stressed however that in the context of the automatic trading, the training sample should be updated because of frequent changes of a vocabulary of the market states. Figure 1 presents 5-min quotations for five stocks belonging to the Dow Jones Industrial Average Index quoted from 2008 to 2013. Figures 2-4 present estimated unconditional densities for a price of one of the considered stocks – Catepillar Inc. Proper-

ties of the densities can be used for defining the market state as well as numerical characteristics of the data generating mechanism.

Figure 1. 5-min quotations, stocks from DJ Ind. 2008-03 to 2013-03
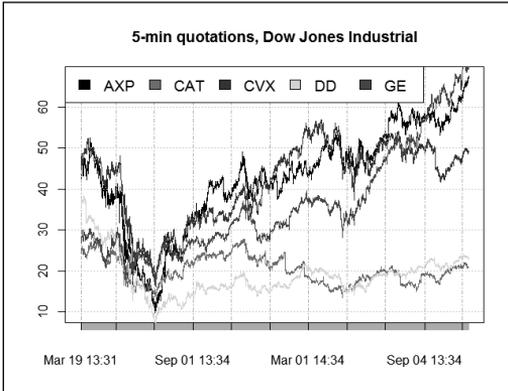
Figure 2. Estimated density of the Catepillar Inc. 2008-2009
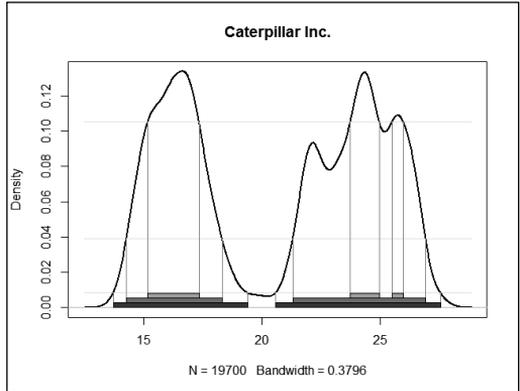
Figure 3. Estimated density of the Catepillar Inc. 2009-2010
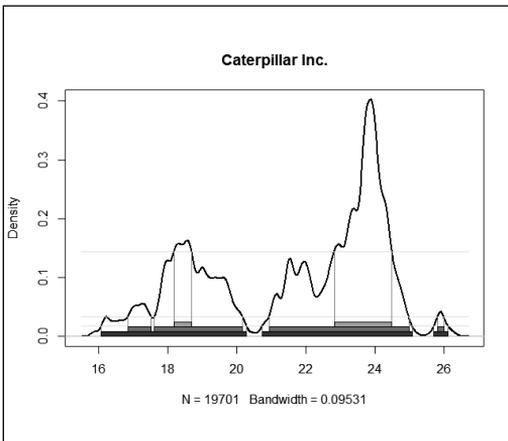
Figure 4. Estimated density of the Catepillar Inc. 2010-2011
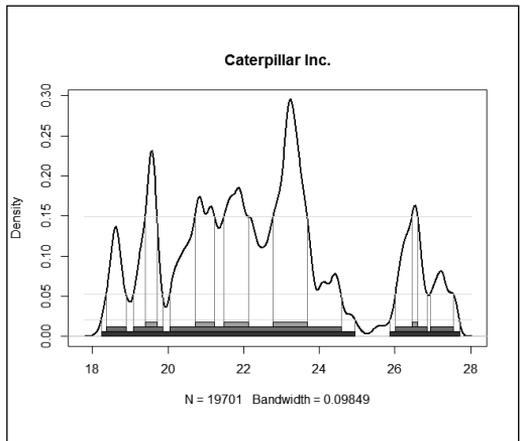
The rest of the paper is organized as follows. In Section 2, the support vector machine classifier is briefly presented. In Section 3, the local depth classifier is introduced. In Section 4, our proposal for a market state detection is proposed. In Section 5, selected properties of the proposal are reported. The paper ends with conclusions and references.

2. SVM classification rule

Support Vector Machines (SVM) originally introduced for a classification issues, is up to now one of the most powerful statistical machine learning method. Let us assume that we are given data $(\mathbf{x}_1, y_1), \ldots, (\mathbf{x}_m, y_m) \in \mathcal{X} \times \{-1, 1\}$ where $\mathbf{x}_i$ denotes an observation and y_i is its label. In machine learning, we would like to generalize information obtained by inspecting the data to unseen data points. Given some new observation $\mathbf{x} \in \mathcal{X}$ we want predict the corresponding label $y \in \{-1, 1\}$. We choose y such that $(\mathbf{x}, y)$ is in some sense similar to the observed data (to a training sample).

Figure 5. Illustration of the SVM classification
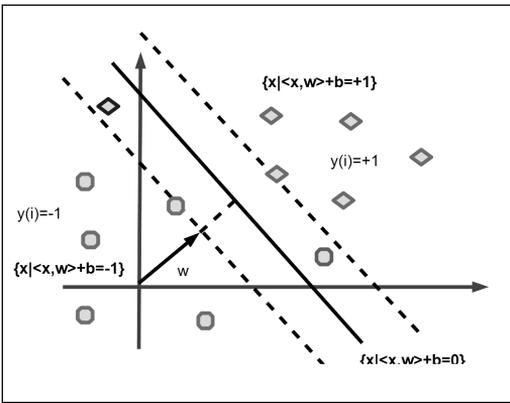
Figure 6. An idea of the kernel trick in SVM classification
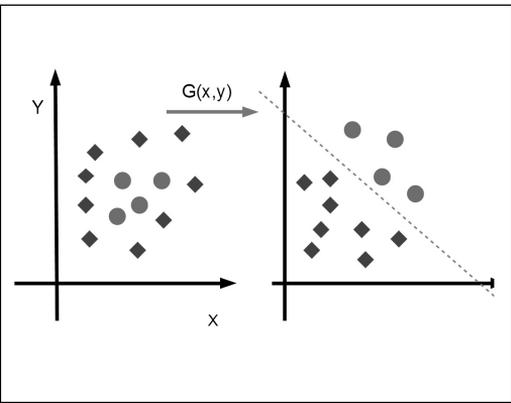
Vapnik et al. (1998) considered SVM in a context of hyperplane classifiers.

$$\langle \mathbf{w}, \mathbf{x} \rangle + b = 0, \tag{1}$$

where $\mathbf{w} \in \mathcal{H}$, $b \in \mathfrak{R}$, $\mathcal{H}$ denotes certain Hilbert space, $\langle \cdot, \cdot \rangle$ denotes a dot product.

The corresponding decision function takes a form

$$f(\mathbf{x}) = \mathrm{sgn}\big(\langle \mathbf{w}, \mathbf{x} \rangle + b\big). \tag{2}$$

The idea of hyperplane classifiers consists in finding an optimal hyperplane, which is that one with maximum margins between all training data points and hyperplane. Figure 5 presents an illustration of the problem. It is the solution of the following problem (solved via quadratic programming algorithm):

$$\max_{\mathbf{w} \in \mathcal{H}, b \in \mathfrak{R}} \min \big\{ \|\mathbf{x} - \mathbf{x}_i\| \mid \mathbf{x} \in \mathcal{H}, \langle \mathbf{w}, \mathbf{x} \rangle + b = 0, \ i = 1, \ldots, m \big\}. \tag{3}$$

For finding the separating hyperplanes we need to find a normal vector $\mathbf{w}$ that leads to the largest margin between the classes.

We have to solve:

$$\underset{w \in \mathcal{H}, b \in \Re}{\text{minimize}} \, \tau(w) = \frac{1}{2} \|w\|^2$$

subject to $y_i \left(\langle w, x_i \rangle + b \right) \geq 1$ for all $i = 1, \ldots, m$. $\hspace{2cm}$ (4)

The problem is solved using method of Lagrange multipliers $\alpha_i \geq 0$ by introducing a Lagrangian:

$$L(\mathbf{w}, b, \boldsymbol{\alpha}) = \frac{1}{2} \|\mathbf{w}\|^2 - \sum_{i=1}^{m} \alpha_i \left(y_i \left(\langle \mathbf{x}_i, \mathbf{w} \rangle + b \right) - 1 \right) \, . \hspace{1.5cm} (5)$$

From Karush-Kuhn-Tucker condition we know that at the saddle point, the derivatives of L with respect to the primal variables must vanish, which leads to $\sum_{i=1}^{m} \alpha_i y_i = 0$ and the solution $\mathbf{w} = \sum_{i=1}^{m} \alpha_i y_i \mathbf{x}_i$. By the KKT condition $\alpha_i \left(y_i \left(\langle \mathbf{x}_i, \mathbf{w} \rangle + b \right) - 1 \right) = 0$ for all $i = 1, \ldots, m$ so we can distinguish a vectors with non-zero α_i, which are called **Support Vectors** and lie on the margin. The result of this is that the optimal hyperplane is constructed by the observations from training set closest to it. The above considerations lead to the dual optimization problem, which solution of the problem

$$\underset{\boldsymbol{\alpha} \in R^m}{\max} \, W(\boldsymbol{\alpha}) = \sum_{i=1}^{m} \alpha_i - \frac{1}{2} \sum_{j=1}^{m} \alpha_i \alpha_j y_i y_j \langle \mathbf{x}_i, \mathbf{x}_j \rangle,$$

subject to $\alpha_i \geq 0$ for all $i = 1, \ldots, m$ and $\sum_{i=1}^{m} \alpha_i y_i = 0$. $\hspace{1.5cm}$ (6)

The hyperplane classifiers was extended to nonlinear Support Vector Machines by using so called **kernel trick.** The nonlinear SVM is especially interesting for the datasets which are not separable by the hyperplanes – see Figure 6. In this case the decision functions are of the form:

$$f(\mathbf{x}) = sgn \left(\sum_{i=1}^{m} y_i \alpha_i k(\mathbf{x}, \mathbf{x}_i) + b \right), \hspace{1.5cm} (7)$$

where α_i are obtained as a solution of the following problem

$$\underset{\boldsymbol{\alpha} \in \Re^m}{\max} \, W(\boldsymbol{\alpha}) = \sum_{i=1}^{m} \alpha_i - \frac{1}{2} \sum_{j=1}^{m} \alpha_i \alpha_j y_i y_j k(\mathbf{x}_i, \mathbf{x}_j)$$

subject to $\alpha_i \geq 0$ for all $i = 1, \ldots, m$ and $\sum_{i=1}^{m} \alpha_i y_i = 0$, $\hspace{1.5cm}$ (8)

where $k(\cdot,\cdot)$ denotes a kernel expressing similarity between points, *i.e.*, *e.g.*, polynomial kernel $k(\mathbf{x},\mathbf{x}') = \langle \mathbf{x},\mathbf{x}' \rangle^d$ or gaussian kernel $k(\mathbf{x},\mathbf{x}') = \exp\left(-\|\mathbf{x}-\mathbf{x}'\|^2 / 2\sigma^2\right)$.

In practice, there are a lot of data sets where separating hyperplane may not exist. There may be many reason for noise, outliers or inliers in data, for example measurement inaccuracies, miscoding or overlap of the classes. In those cases we seek a hyperplane which provide the upper bound on the number of trainings errors. We can manage to do it by introducing slack variable to the above constrained optimization problem. Now the objective function is of the form: $\tau(w,\xi) = \frac{1}{2}\|\mathbf{w}\|^2 + C\sum_{i=1}^{m}\xi_i$ and the inequality constrains of the form $y_i\left(\langle w,x_i \rangle + b\right) \geq 1 - \xi_i$ for all $i = 1,\dots,m$, where the constant $C > 0$ determines the trade-off between margin maximization and training error minimization. The hyperplane computed using this approach is called **soft margins hyperplane**. In this sense we can claim that SVM method is robust because it is able to handle with a small amount of noisy data. Moreover soft margins hyperplane helps us to avoid an overfitting phenomena. Further theoretical details concerning SVM can be found in Vapnik et al. (1998), Schölkopf and Smola (2002), Christiani and Shawe-Taylor (2004), Christmann (2010).

We construct SVM classification models with using a program R and the "e1071" package. We use three different type of kernel: radial basic functions, polynomial (the linear type of kernel is special kind of polynomial) and sigmoid. We choose parameters of kernel functions and C-constant by using a grid search (for details see Mayer, 2014).

2. Local depth classification rule

Data depth concept was originally introduced as a way to generalize the concepts of median and quantiles to the multivariate framework. A depth function $D(\cdot,F)$ associates with any $\mathbf{x} \in \mathfrak{R}^d$ a measure $D(\mathbf{x},F) \in [0,1]$ of its centrality w.r.t. a probability measure $F \in \mathcal{P}$ over $\mathfrak{R}^d$ or w.r.t. an empirical measure $F_n \in \mathcal{P}$ calculated from a sample $\mathbf{X}^n = \{\mathbf{x}_1,\dots,\mathbf{x}_n\}$. The larger the depth of $\mathbf{x}$, the more central $\mathbf{x}$ is w.r.t. to F or F_n. The most celebrated examples of the depth known in the literature are Tukey and Liu depth. Data depth concept offers a variety of powerful and user friendly tools for multivariate exploratory analysis and inference involving multivariate quantile-quantile plots, multivariate skewness or kurtosis measures or multivariate Wilcoxon tests. A detailed presentation of the concept can be found in Kosiorowski (2012) and Kosiorowski (2014).

In the online prediction context, we propose to focus our attention on an example of the depth function called the **weighted L^p depth**. The weighted L^p depth $L^p D(\mathbf{x},F)$ of a point $\mathbf{x} \in \mathfrak{R}^d$, $d \geq 1$ generated by some d dimensional random vector $\mathbf{X}$ with distribution F, is defined as:

$$L^p D(\mathbf{x};F) = \frac{1}{1 + Ew(\|\mathbf{x}-\mathbf{X}\|_p)}, \tag{9}$$

where w is a suitable is non-decreasing and continuous on $[0,\infty)$ weight function, and $\|\cdot\|_p$ stands for the L^p norm (when $p = 2$ we have the usual Euclidean norm).

The weighted L^p depth from sample $\mathbf{X}^n = \{\mathbf{x}_1,...,\mathbf{x}_n\}$ is computed as follows:

$$L^p D(\mathbf{x}; \mathbf{X}^n) = \frac{1}{1 + \frac{1}{n} \sum_{i=1}^{n} w\left(\left\|\mathbf{x} - \mathbf{X}_i\right\|_p\right)}. \tag{10}$$

The weighted L^p depth in a point is not robust (has unbounded influence function) but induced by this depth multivariate location estimator (the L^p median – point in which depth takes maximal value) is very robust (has very high breakdown point) – for details see Kosiorowski (2012), (2013). This combination of robustness characteristics seems to be especially important in the context of the DSA.

Figures 7-8 presents sample depths for samples drawn from mixture of two 2D normal distributions. Figures 9-10 presents sample local L^2 depths for correspondingly locality parameter 0.2 and 0.3. The figures were obtained using *DepthProc* R package (see Kosiorowski et al., 2013).

Figure 7. Sample projection depth for mixture of two 2D normal distributions

Figure 8. Sample L^2 depth for mixture of two 2D normal distributions
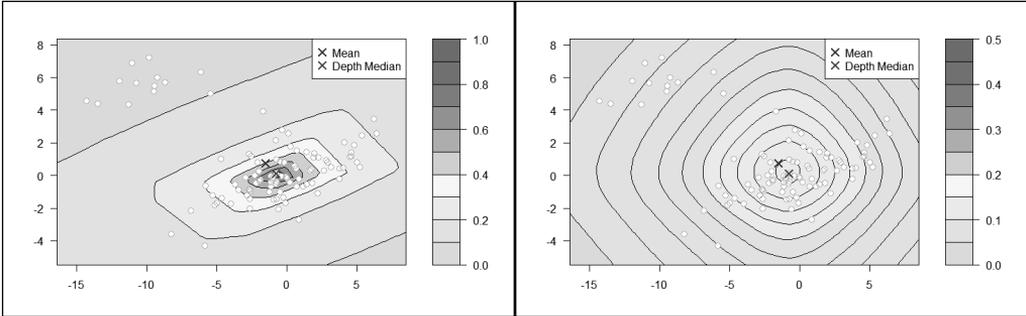
Figure 9. Sample local L^2 depth for mixture of two 2D normal distributions, β = 0.2

Figure 10. Sample local L^2 depth for mixture of two 2D normal distributions, β = 0.3
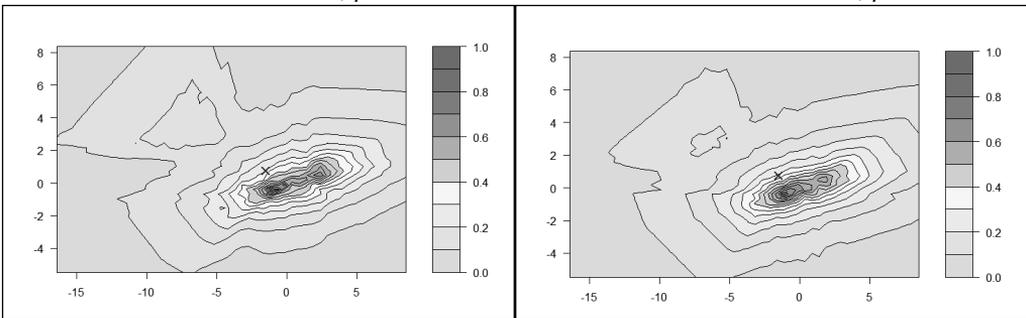
In an opposition to the probability density function, the depth function has a global nature. This fact is a limitation of the concept in the context of its applications in discrimination analysis. For defining a **local depth** we need a notion of a neighborhood of a point. In Paindaveine and Van Bever (2012a, 2012b) authors proposed to use an idea of symmetrisation of a distribution (a sample) with respect to a point $\mathbf{x}$, for defining the local depth. In their approach instead of using an "original" distribution P^X we use $P_{\mathbf{x}} = 1/2 P^X + 1/2 P^{2\mathbf{x}-X}$. Please note, that any sample

depth provides a center outward ordering of the observations w.r.t. to the corresponding deepest point $\hat{\mathbf{m}}_n^i$, *i.e.*, we can order a sample in such a way that $D(\mathbf{x}_{(1)}, P_n) \geq ... \geq D(\mathbf{x}_{(n)}, P_n)$. Neglecting possible ties, it means that, in the depth sense, $\mathbf{x}_{(1)}$ is the nearest neighbor to $\hat{\mathbf{m}}^{(n)}$, $\mathbf{x}_{(2)}$ the second nearest closest *etc*. Statistical depth functions can be used to define neighbors of the deepest point $\hat{\mathbf{m}}_n^i$. However, in the context of well known *k-nearest neighbors rule* we require defining neighbors of any point $\mathbf{x} \in \Re^d$ (the statistical depth has a global nature). Following ideas presented by Paindaveine and Van Bever we can obtain this by *symmetrization* with respect to $\mathbf{x}$, *i.e.*, we consider depth of a point $\mathbf{x}$ with respect to the empirical distribution $P_n^{\mathbf{x}}$ associated with the sample obtained by adding to the original observations $\mathbf{X}_1, ..., \mathbf{X}_n$ their reflections $2\mathbf{x} - \mathbf{X}_1$, ..., $2\mathbf{x} - \mathbf{X}_n$ w.r.t. $\mathbf{x}$. Formally, for any $\beta \in [0,1]$, consider the smallest depth region bigger or equal to β,

$$R^\beta(F) = \bigcap_{\alpha \in A(\beta)} D_\alpha(F),$$
(11)

where $A(\beta) = \left\{ \alpha \geq 0 : P\left[D_\alpha(F) \right] \geq \beta \right\}$.

Then for a **locality parameter** β we can take a **neighbourhood** of a point x as $R_x^\beta(P)$.

Let $D(\cdot, P)$ be a depth function. Then the **local depth** with the locality parameter β and w.r.t. a point x is defined as

$$LD^\beta(z, P) : z \to D(z, P_x^\beta),$$
(12)

where $P_x^\beta(\cdot) = P\left(\cdot \mid R_x^\beta(P) \right)$ is cond. distr. of P conditioned on $R_x^\beta(P)$.

A construction proposed by Paindaveine and Van Bever can be used with any depth function. The approach ensures equivariance on each locality level β. For $\beta = 1$ we obtain usual depth function.

Any depth function can induce **a classification rule**. We assign a point $\mathbf{x}$ to a population in which the point is the most central. Let $\mathbf{Z}$ denotes $n \times d$ a training sample, representing a population $\Pi_1, ..., \Pi_k$ in d dimensions. Let $\Pi_j = \left\{ x_1, ..., x_{nj} \right\}, j = 1, ..., k$ be $n_j \times d$ submatrix $\mathbf{Z}_j$ of the matrix $\mathbf{Z}$ related to n_j observations from Π_j. In the classification issue our main aim is to assign a new observation $\mathbf{y}$ that is independent from $\mathbf{Z}$ to one of the populations $\Pi_1, ..., \Pi_k$. The **maximal depth classifier** was introduced by Liu (1999). We assign a point $\mathbf{x}$ to the population for which the point has maximal depth. We can write a classification rule as

$$L(\mathbf{y} \mid \mathbf{z}) = \arg \max_j D(\mathbf{y} \mid \Pi_j).$$
(13)

Paindaveine and Van Bever (2012b) have shown that the global depth classifiers performs pourly in case of nonconvex data sets. In order to cope with this problem they introduced **maximal local depth classification rule**, which may be defined as

$$L(\mathbf{y} \mid \mathbf{z}) = \arg \max_j LD^\beta(\mathbf{y} \mid \Pi_j),$$
(14)

for a certain β-local depth LD^β.

The locality level $\beta \in (0,1]$ is chosen using cross-validation, so that it would minimize a classification error for the training sample.

4. Our proposal

A need of forecasting of a large number of univariate time series is faced very often in a present business and the Economics. For many companies it is common to have over thousand product lines that need forecasting at least weekly. Automatic forecasting algorithm originating from the classical econometrics must determine an appropriate model to produce them, estimate the parameters and compute the forecast. Generally speaking good algorithm dedicated for the automatic forecasting should be robust to unusual time series patterns, applicable to large number of series without user intervention and be equipped with certain adaptation mechanism. With appearance of new phenomena related to very big data sets, online inference and data processing – a computational complexity of the procedure is pointing on the foreground of scientific researches. Due to existence of outliers in the economic data sets, robust statistical procedures are used more and more often. Unfortunately, a great part of robust estimators of the multivariate location and scatter are computationally and/or memory very intensive.

In this context we focused our attention on two classification rules namely very powerful and popular support vector machine classifier and local depth classifier. Both classifiers are based on (to our knowledge) the best robust clustering algorithm proposed in the literature up to now – namely on the k-trimmed means (see: Garcia-Escudero, 1999; Garcia-Escudero et. al., 2010; Kosiorowski, 2013).

PROPOSAL: Assume we observe time series $\mathbf{x}_1, \mathbf{x}_2, \ldots$, which exhibit regimes (states) $r_1, \ldots, r_h$. Let $L(\hat{r}, r)$ denotes a loss function describing a loss related to taking an action when a procedure indicates the state $\hat{r}$ and true state is r.

1. Collect a sample S_k consisted of the first k observations $\mathbf{x}_1, \ldots, \mathbf{x}_k$.
2. Perform trimmed k-means clustering algorithm in order to distinct certain number of clusters, say, l.
3. Build a training sample TS_k by assigning the labels obtained in the step 2 to the observations in S_k.
4. Estimate the classifier (*i.e.*, *e.g.*, SVM or local depth classifier).
5. For i = k+1 to i = k+N

Predict the state of the series $\hat{r}(i)$, take action and calculate the loss $L(\hat{r}(i), r(i))$ if sum of losses $\sum_{i=k+1}^{k+N} L(\hat{r}(i), r(i))$ exceed a prefixed threshold λ then go to the step 1 with $x_1 := x_{k+1+N}$ and $x_k := x_{2k+1+N}$ else go to step 5.

The above algorithm is equipped with an adaptation mechanism thanks to repeating the clustering procedure and estimation of the classifier when the loss calculated over a horizon of length N exceeds the threshold λ.

The properties of the scheme depend crucially on the properties of its elements *i.e.*, from the clustering algorithm, the classification, the loss function and frequency of its checking.

5. Simulation study

Multivariate robust statistical procedures are in general computationally very intensive. For many well known classical classification procedures including SVM classifier exist effective algorithms for their fast calculation. A robustness of the SVM is in a great part an unexplored issue. For checking properties of the fast and effective SVM classifier in comparison to computationally very intensive but very robust both to inliers and outliers local depth classifier we performed extensive simulation studies. The samples were generated by means of {*Dynamic Systems Estimation*}, {DSE}, R package. We used VCHARME (this is a general scheme for random switching multiregime time series – see Stockis et al., 2010) model consisted of two VAR(1) models with specifications

$$\mathbf{M1}: \begin{bmatrix} x_{1t} \\ x_{2t} \end{bmatrix} = \begin{bmatrix} m_1^{(1)} \\ m_2^{(1)} \end{bmatrix} + \begin{bmatrix} 0.9 & 0 \\ 0 & 0.9 \end{bmatrix} \cdot \begin{bmatrix} x_{1,t-1} \\ x_{2,t-1} \end{bmatrix} + \begin{bmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \end{bmatrix} \times C_1$$

$$\mathbf{M2}: \begin{bmatrix} x_{1t} \\ x_{2t} \end{bmatrix} = \begin{bmatrix} m_1^{(2)} \\ m_2^{(2)} \end{bmatrix} + \begin{bmatrix} 0.9 & -0.4 \\ 0 & 0.5 \end{bmatrix} \cdot \begin{bmatrix} x_{1,t-1} \\ x_{2,t-1} \end{bmatrix} + \begin{bmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \end{bmatrix} \times C_2$$

for various values of the trends $(m_1^{(i)}, m_2^{(i)})$, various values of scale C_i and various error specifications and various probabilities of switching between the submodels M1 and M2.

We estimated SVM classification models using a program R and its "e1071" package. We used three different type of kernel: radial basic functions, polynomial (the linear type of kernel is special kind of polynomial) and sigmoid. We choose parameters of kernel functions and C-constant by using a grid search. We estimated SVMs classification model with dataset containing 1000 observations. We divided this data set to training set (2/3 patterns) and test set (1/3 patterns). After that we build three models with three different kernels: RBF, polynomial and sigmoid. To choose function parameter s and C-constant we use grid search. Finally we select this model which has the best accuracy on the test set, however there is possible situation that two or all have the best accuracies. In this case we choose model with kernel which has the least parameters to estimate.

In the same setting we tested the local depth classifier using *DepthProc* package and simple R script. We used relatively the L^2 depth and locality parameter β optimized by means of cross-validation procedure.

Figure 10. Example trajectory generated from the VCHARME model
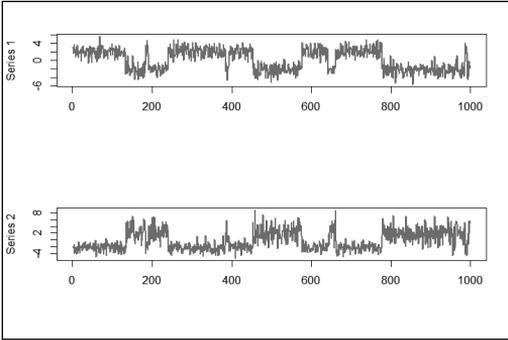
Figure 11. Example trajectory generated from the VCHARME model, data with inliers
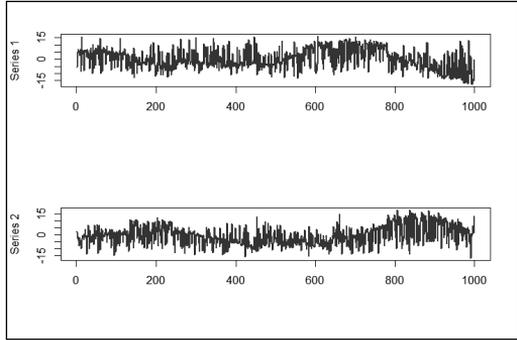
We applied our proposal several times to the simulated trajectories from the model consisting additionally up to 15% of the additive outliers or inliers.

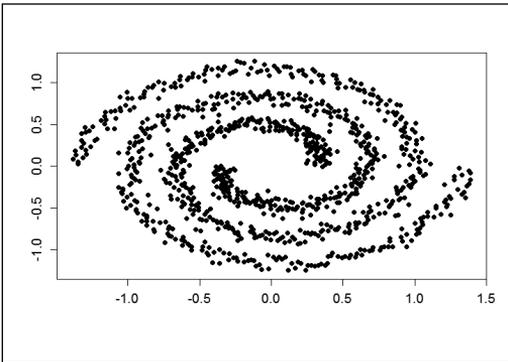Figure 12. Data generated from the inliers model used within the simulations

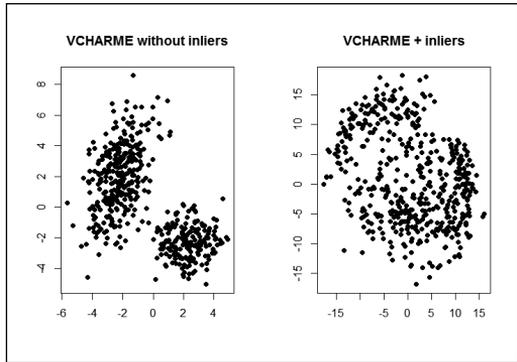Figure 13. Data generated from the VCHARME model with and without inliers

Figure 14. The classification results for SVM classifier and data without inliers
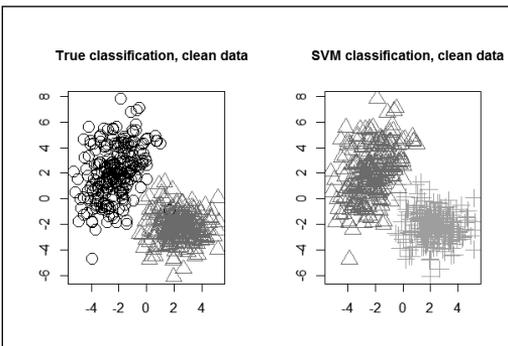
Figure 15. The classification results for SVM classifier and data without inliers
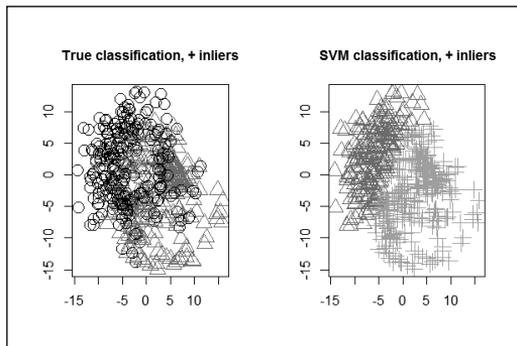
Figure 16. The classification results for local depth classifier and data without inliers
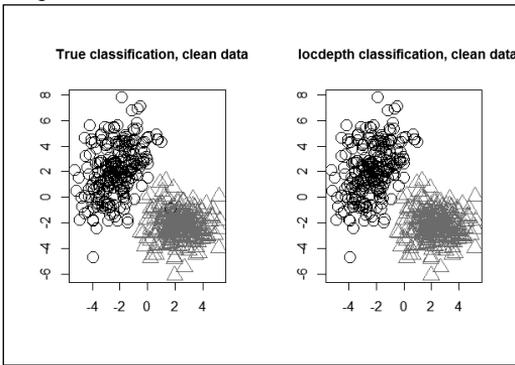
Figure 17. The classification results for local depth classifier and data with inliers
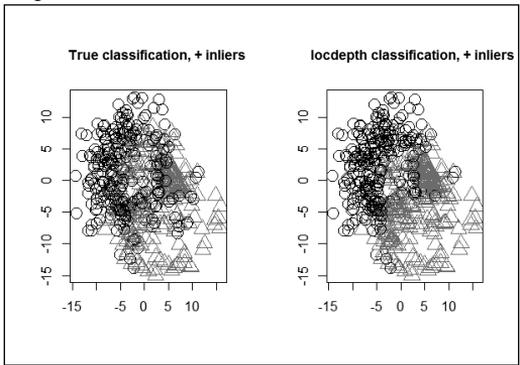
Figures 10-11 present example trajectory generated from the VCHARME model representing the market correspondingly without inliers and with inliers. Figure 12 presents data generated from the model representing inliers. Figure 13 presents data generated from the considered model and the same data but with inliers added. Figures 14-17 present example datasets with and without inliers classified by means of SVM classifier and by means of local classifier. It is easy to notice that in both cases we have to do with a classification error however the output obtained by means of local depth classifier seems to be qualitative better. Figures 18-19 presents sample local depth for the VCHARME generated data correspondingly for data without inliers and for data with inliers.

Figure 18. The sample local L2 depth for data generated from VCHARME, data without inliers
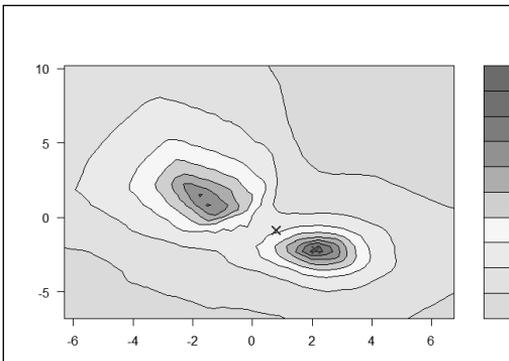
Figure 19. The sample local L2 depth for data generated from VCHARME, data with inliers
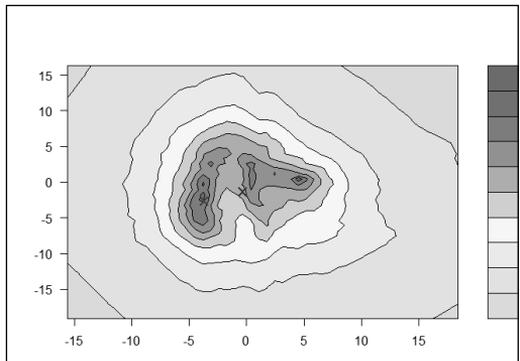
The results of the simulations may be summarized in the following points:
1. SVM classifier crucially depend on a quality of the training sample. An application of the {tl-cust} clustering technique significantly decreases a speed of the proposal.
2. Local depth classifier is computationally very intensive but performs well even for contaminated training samples – it can cooperate with very fast and popular k-means technique.

3. For clean training samples both techniques cope with a moderate fraction of outliers. The local depth classifier performs better than SVM in case of inliers.
4. The local depth classifier cannot compete with SVM classifier in terms of the computational complexity.

5. Conclusion

Algorithms for automatic detection of a market state are especially important in the context of their application to algorithmic trading, the social network monitoring or electricity consumption management. SVM or local depth based classifiers seem to be very promising in this context. The SVM approach for its computational properties and the local depth classifiers for its robustness to a contamination of a training sample. Both methods however depend on the procedure used to read a market vocabulary, *i.e.* used for finding the market states. The proposed procedure seems to be appropriate for situations when data consist of a moderate fraction of rather mild inliers. More malicious cases need further studies.

Bibliography

1. Bocian M. (2013), *Wybrane zagadnienia koncepcji głębi danych w dyskryminacji obiektów ekonomicznych*, praca magisterska, Wydział Zarządzania UEK w Krakowie.
2. Cristianini N., Shawe-Taylor J. (2004), *An Introduction to Support Vector Machines*, Cambridge University Press.
3. Garcia-Escudero L.A., Gordaliza A. (1999), Robustness Properties of k-Means and Trimmed k-Means, *Journal of the American Statistical Association*, 94(447), pp. 956-969.
4. Garcıa-Escudero L.A., Gordaliza A., Matrian C., Mayo-Iscar A. (2010), A Review of Robust Clustering Methods, *Advances in Data Analysis and Classification*, 4(2-3), pp. 89-109.
5. Kosiorowski D. (2012), *Statystyczne funkcje głębi w odpornej analizie ekonomicznej*, Kraków, Wydawnictwo Uniwersytetu Ekonomicznego w Krakowie.
6. Kosiorowski D. (2014), *Two Depth Based Strategies For Robust Estimation of Predictive Distribution of a Data Stream*, arXiv:1405.0131.
7. Kosiorowski D., Zawadzki Z., Bocian M., Węgrzynkiewicz A. (2013), Depthproc Package in Multivariate Time Series Mining, *Acta Universitatis Lodziensis – Folia Oeconomica*, 286, pp. 243-251.
8. Maronna R.A., Martin R.D., Yohai V.J. (2006), *Robust Statistics – Theory and Methods*, Chichester, Wiley.
9. Meyer D. (2014), *Support Vector Machines: The Interface to Libsvm in Package e1071*, Wien, FHT.
10. Paindaveine D., Van Bever G. (2012a), *Nonparametrically Consistent Depth-Based Classifiers*, Technical report.
11. Paindaveine D., Van Bever G. (2012b), *From Depth to Local Depth: A Focus on Centrality*, Working Papers ECARES 2012-047, Universite Libre de Bruxelles.
12. R Development Core Team (2012), *R: A Language and Environment for Statistical Computing*, Vienna, Austria, R Foundation for Statistical Computing, http: //www.R-project.org/.
13. Schölkopf B., Smola A.J. (2002), *Learning with Kernels*, MIT Press.

14. Stockis J-P., Franke J., Kamgaing J.T. (2010), On Geometric Ergodicity of CHARME Models, *Journal of the Time Series Analysis*, Vol. 31, pp. 141-152.
15. Vapnik V.N. (1998), *Statistical Learning Theory*, Wiley.
16. Zuo Y., Serfling R. (2000), General Notions of Statistical Depth Function, *The Annals of Statistics*, Vol. 28, pp. 461-482.

Chapter 23

A Multi-Agent System for Transaction Decision Making in Financial Markets

Janusz Morajda

1. Introduction and literature background

Effective trading activity in contemporary financial markets requires advanced tools for information processing and for determining sufficient forecasts that lead to direct transaction recommendations (investment decisions). It is worth mentioning that more and more transaction orders are generated automatically by dedicated algorithms based on artificial intelligence methods (in certain markets, the percentage of such automatic orders exceeds 50%). Consequently, researches into development and into effectiveness of such tools are definitely the matter of great interest of both scientists and practitioners.

As financial markets are considered as extremely complex, non-linear, nonstationary systems driven by mainly unknown or poorly identified rules affected additionally by significant noises, the principal direction of research should be focused on intelligent techniques that can successfully deal with modeling of such objects (Tadeusiewicz, 2010; Tadeusiewicz, 2011). Actually, there is a great number of publications documenting researches and practical applications of artificial intelligence methods (mostly neural networks, evolutionary algorithms, fuzzy systems and their hybrids) in financial markets (see *e.g.* McNelis, 2005; Morajda, 2003; Refenes, 1995). The advantages and limitations of such methods have been widely examined and discussed. A relatively new direction of research into financial markets modeling concerns applications of multi-agent systems (Ferber, 1999; Luck et al., 2001) to market simulation and to transactions strategies generation (Hoffmann et al., 2006; Chiu et al., 2007; Chen et al., 2008; Tirea et al., 2012). Multi-agent tools are often supported by methods based on neural networks and/or genetic algorithms (Morajda, 2007; Tirea et al., 2012).

Many researchers using multi-agent methods concentrate on the problem of possibly accurate simulation of a financial market with application of a multi-agent system. Particular agents represent real investors; it can be assumed that all agents operate in the same way (Morajda, 2007) or agents (investors) are divided into classes (*e.g.* fundamentalists, chartists, social investors, *etc.*) according to preferred investment strategies (Hoffmann et al., 2006; Chen et al., 2008; Lux, Marchesi, 2000).

A hybrid multi-agent system proposed in Chen et al. (2008) is based on traditional, quantitative economic model. The idea of agents' operation relies on following the aggregating mathematical equations by particular agents. The hybrid system integrates both rigid mathematical rules and intuitive qualitative features.

In Hoffmann et al. (2006), observation of a multi-agent dynamics lead to identification of factors that drive investors' behaviour and next – to explanation of some macro level market phenomena that result from the micro level investor operation. Simple agent rules generate nonlinear dynamics, like stock market quotations and time series of return rates. Similar effects have also been observed by the author in (Morajda, 2007).

Certain works (see *e.g.* Chiu et al. 2007), are devoted to application of multi-agent systems to simulation of investors' behaviour according to historical data. In Chiu et al. (2007) the authors have proposed a system, where an agent can find sufficient information necessary for prediction stocks that the agent would trade next week; the experimental results proved that the simulation model can effectively represent the real stock market.

Some recent works, however, contain efforts to construct multi-agent systems oriented to practical applications (*i.e.* transaction decisions supporting) rather than simulation researches, (see *e.g.* Morajda, 2007; Tirea et al., 2012). In Tirea et al. (2012) the authors developed a multi-agent recommendation system predicting the future stock trend in order to improve the profitability of investments. The proposed system utilises the Elliott wave theory, the Fibonacci numbers and some other technical analysis methods. Neural networks (multilayer perceptrons) have been used for trends prediction.

The study presented here submits an original proposition of a multi-agent system intended to supporting the buy-sell decisions in financial markets; also some experiments based on real stock data have been performed and discussed. It is a continuation and extension of the previous research presented in Morajda (2007), where the author proposed a multi-agent architecture comprised of a large number of neural decision models (agents) that can acquire information directly from the analyzed stock market and from other (selected) agents, and can make transaction decisions concerning its own stock portfolio. Now, the system has been modified, enhanced and utilized for operation on real data observed in financial market. The decision models in the system (information-processing agents) communicate and cooperate together trying to generate the best trading decisions. The best performing model (or a "committee" of models) can be regarded as the output element (set) and its signals can be used for determining real transaction orders.

Section 2 describes the architecture and the details of the proposed system. Specification of the data, the issue being investigated and applied system parameters are presented in section 3. Section 4 involves the research results concerning the system performance, as well as its effectiveness evaluation. It also contains comparative analyses. Final remarks are submitted in section 5.

2. Operation of the proposed system

The multi-agent system consists of n decision models (agents) that can observe stock quotations and can communicate reciprocally (exchange information). Each agent is equipped with its own portfolio (independent on other agents) and it can independently make buy and sell transactions concerning given stocks. Transaction decisions are based on own agent's forecasts based on input information, incoming from:

- direct market observations (values of selected input variables describing the stock quotations dynamics),
- observations of other agents activity (especially best performing ones).

It has been presumed here that each model is a single artificial neuron processing data according to the rule (1),

$$y = f\left(\sum_i x_i\, w_i\right) = f\left(\mathbf{x} \circ \mathbf{w}\right) \tag{1}$$

where: x_i – i-th input signal; input vector $\mathbf{x} = [x_0, x_1, ...]^{\mathrm{T}}$
        w_i – weight value for input i; weight vector $\mathbf{w} = [w_0, w_1, ...]^{\mathrm{T}}$
        f – transfer function
        y – output signal, representing the stock quotation forecast.

In order to learn and generate forecasts y, the models (neurons) must have an access to stock quotations; in practice they obtain values of certain selected input variables created as a result of a specific data pre-processing transformation applied to a quotation time series (see section 3). This variables (let us denote their number by m) constitute the basic part of input vector $\mathbf{x}$. However, the neurons can also communicate jointly and it has been assumed that a particular model can attain:

- signals of k best performing[1] models (from the beginning of an investment to the considered day),
- signals of l best performing models during the last (assumed) period of time[2].

Consequently the rule (1) can be expressed as:

$$y = f\left(x_0\, w_0 + \sum_{i=1}^{m} x_i\, w_i + \sum_{i=m+1}^{m+k} x_i\, w_i + \sum_{i=m+k+1}^{m+k+l} x_i\, w_i\right) \tag{2}$$

where $x_0 = 1$ (constant) and subsequent parts of expression in brackets represent particular sets of inputs described above.

The scheme of an agent is shown in Figure 1. The architecture of the whole multi-agent system is presented in Figure 2, where arrows represent flows of information (due to clarity reasons, they are shown only for a selected "black" element, however identical signals are received by all agents).

---

[1] The term "best performing" denotes the highest increase in portfolio value.

[2] As the models operate in a fixed sequence, the signal from one of the best k or l neurons is available only if this neuron was activated earlier than the receiving model; otherwise the signal connection is not taken into account.

Figure 1. Scheme of an agent and its operation
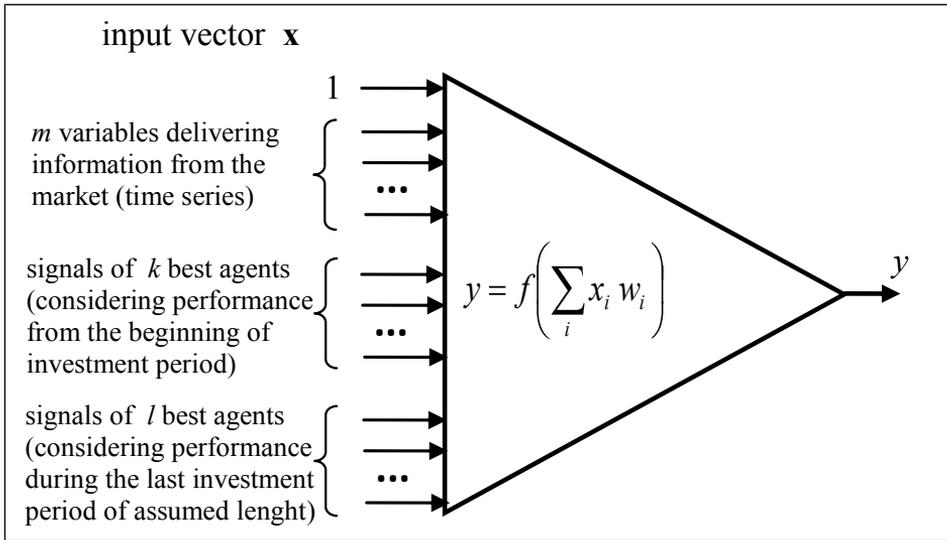
Source: own work.

Figure 2. Architecture of the multi-agent system with flows of information (concerning all the agents)
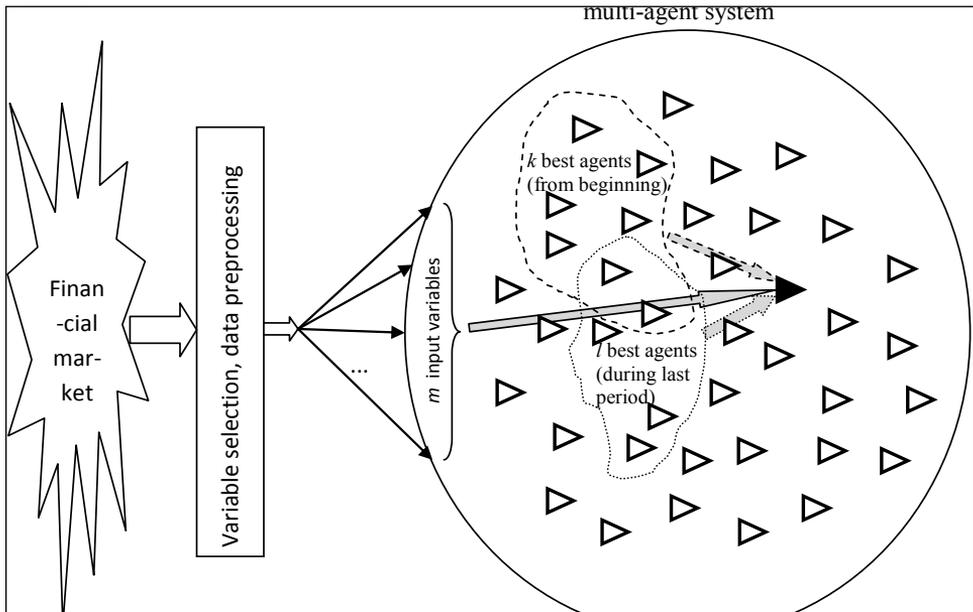
Source: own work.

The whole system is dedicated to observe quotations of one selected stock in a financial market and to make buy and sell decisions in order to make the highest possible profit with the lowest possible risk. Practical application of the system will be possible, if the system output is selected. Following its signals as buy/sell recommendations, a trader can exploit it as a transaction decision support model.

The system output can be set as signal generated by a single (best performing) agent or by a set of agents ("decision committee"). Natural main approaches to output agent(s) selection rely on:

- choosing best performing agents (according to assumed criteria) in a given (usually long) period of investment time,
- continuous selections of output agents in each time instant, on the basis of performance evaluations from the beginning up to this moment (the "leaders" can continuously vary).

As the key factor of effective model (agent) performance is to have good forecasts y (which are the basis for transaction decisions and influence agent's portfolio value), each model is trained to predict the nearest logarithmic one-day return rate (rr) for the considered stock, given by (3):

$$rr_d = \ln(q_d) - \ln(q_{d-1})$$ (3)

where q_d – quotation of the given stock in the session day d.

The training process is performed independently for all models (neurons) in each time instant (day) according to the classic neural training DELTA rule (4) that utilizes the errors of predictions for weights modification:

$$\Delta \mathbf{w} = \eta \cdot (rr - y) \cdot \mathbf{x}$$ (4)

where: $\Delta \mathbf{w}$ – the weight modification vector,
$\quad\quad$ η – the learning coefficient ($0 < \eta < 1$).

The learning algorithm leads to minimisation of errors $|rr - y|$ and consequently performs agents' weights optimization, so the models learn how to trade effectively.

Each neuron is equipped with its own portfolio that can contain cash or stocks and each neuron autonomously tries to increase its portfolio value (to make a profit). The current state of the portfolio for the given neuron is determined by the *binary* value p that can be equal to 1 or 0. The value $p = 1$ represents 100% stocks in the portfolio, while $p = 0$ indicates no stocks and 100% cash. The value p (portfolio contents) depends on current forecast (present output signal y generated by the neuron) according to the rule (5):

$$p = \begin{cases} 1 & if \quad y \geq y_{av} \\ 0 & if \quad y < y_{av} \end{cases}$$ (5)

where y_{av} is the average of all the previous model forecasts.

The rule (5) has an obvious interpretation: if the model (neuron) predicts an increase of stock quotations (above the average) – it buys stocks, otherwise it sells stocks to keep safe cash.

As the stock quotations fluctuate, the portfolio value (denoted by P) also varies (increases or decreases) during the trading activity[3] according to the formula (6):

$$P_d = P_{d-1}(1-p) + P_{d-1}\, p\, \frac{q_d}{q_{d-1}} \tag{6}$$

where P_d – portfolio value (expressed in currency units) at the instant (session day) d.

Let us note that the first addend of equation (6) represents the cash part of the portfolio (independent on changes of q), whilst the second one concerns the stocks.

As a result of postulations given above, the whole set of models can be regarded as a multi-agent system (see: Ferber, 1999; Luck et al., 2001), operating in a given environment (stock market) and allowing exchanging information between neurons (agents) in order to reach certain goal (make a profit). It should be noted that such a system of neurons does not constitute a typical neural network, as the sets of best performing neurons continuously vary and – accordingly – information connections between neurons dynamically vary. Moreover – the output element (elements) of the system may vary.

3. Specification of the problem and system parameters selection

The problem being investigated concerns the effectiveness of active stock portfolio management with the use of proposed multi-agent system. For preliminary research, it has been assumed that the portfolio can contain only one stock (or cash), however the system can be easily developed for operation on any number of stocks. In the study, the stocks of Polish mining company KGHM (one of the biggest enterprises quoted on Warsaw Stock Exchange) has been selected as a potential portfolio component.

The KGHM close quotations from the period from 6.08.1997 to 22.03.2011 (3,416 observations taken from subsequent stock exchange session days) have been applied in the research. The observations have been arbitrarily divided into 2 phases: the basic period (for preliminary system development and assessment) that contains first 2,600 data points and the test period – the rest of the data (it also involves a significant drawdown caused by the economic crisis and subsequent increase of quotations). The data have been presented graphically in Figure 3; the vertical line separates development and test periods.

In order to determine input variables delivering information from the quotation time series, the data have been pre-processed in a specific, arbitrarily selected, way. The $m = 4$ input variables x_1, x_2, x_3, x_4 have been created as follows:

$$
\begin{aligned}
&x_1(d) = \ln(q_d) - \ln(q_{d-1}) \quad \text{(current logarithmic return rate)}\\
&x_2(d) = x_1(d) - x_1(d\text{-}1) \quad \text{(difference of logarithmic return rates)}\\
&x_3(d)\text{: slope of 5-day trend calculated for } \ln(q_d), \ln(q_{d-1}), ..., \ln(q_{d-4})\\
&x_4(d)\text{: slope of 20-day trend calculated for } \ln(q_d), \ln(q_{d-1}), ..., \ln(q_{d-19})
\end{aligned}
\tag{7}
$$

where d is the number of considered day and q_d – close quotation of KGHM stocks in day d. The slope of a trend has been calculated as a proper coefficient of linear regression.

---

[3] For the purpose of presented research, no transaction costs have been assumed.

Figure 3. Quotation of KGHM in a considered research period (divided into basic and test phases), expressed in PLN

Source: own work.

The following system parameters have been assumed:
- number of agents (neurons): $n = 10,000$,
- $k = 100$ (see equation (2)),
- $l = 100$ (see equation (2)),
- time period for evaluation of l currently best performing neurons: 1 day,
- learning coefficient $\eta = 0.1$,
- transfer function – hyperbolic tangent, given as:

$$y = f(x) = \alpha \cdot \text{tgh}(\beta x) \tag{8}$$

- transfer function coefficients: $\alpha = 0.2$, $\beta = 2.6$,
- initial weights w_i – set as random numbers form range [-0.2, 0.2],
- initial portfolio values equal 1.

It should be indicated that although certain parameters can be set arbitrarily, a number of them have significant influence on system effectiveness. As no clear rules were observed, such optimization should be performed heuristically by sufficient experimental procedures. Probably each problem requires separate analysis, however searching for universal rules can be an interesting research direction.

Here it has been noticed that the coefficients α and β (equation (8)) considerably affect the system effectiveness, so their values were roughly evaluated by experiments. It has also been observed that the parameters k and l ("responsible" for amount of information being exchanged between agents) should not be too small. It turned out that if these values are not big enough, agents operate less effectively.

Another extremely important (and difficult) problem concerns the selection of the system output. This issue is briefly discussed in next sections.

4. System effectiveness

4.1. Effectiveness in transaction decision-making

The simulation of operation for the constructed multi-agent system was performed with the use of a computer program written by the author in C++ (the source code is available on http://neur.uek.krakow.pl/2013/multiag.cpp). The basic analysis of results involves financial criteria, especially final portfolio values of models (agents).

Let us analyze here selected strategies based on the selection of the particular model as a system output:

- **strategy S1** based on the best (the most profitable) model at the end of whole research period[4];
- **strategy S2** – based on the best model in the basic period – at the end of this period, *i.e.* on 2,600 day (directly before the test phase) this model generated the highest portfolio value that equals to 26.0885 (with return rate over 2,500%);
- **strategy S3** "current best model" – relies on continuous changes of the system output, based on selecting – on a given day – a model that had generated the best profit directly before this day.

As a benchmark – the passive "buy and hold" investment **strategy S4** (p = const. = 1) was appointed. It is worth noting that in the whole period 4,152 agents out of 10,000 generated lesser profits than the passive strategy, whilst 5848 brought final profits better than the passive investment. The final portfolio values at the end of the whole considered period for particular strategies have been indicated in Table 1. The dynamics of portfolio changes for strategies S1, S2, S3, S4 has been graphically shown in the Figure 4.

Table 1. Effectiveness of selected transaction strategies expressed as final value of investment portfolio (starting portfolio value = 1)

Strategy	Final portfolio value
S1 "best in whole period"	100.0004
S2 "best in basic period"	94.9652
S3 "current best model"	27.9074
S4 "passive strategy"	8.2676

Source: own calculations.

---

[4]   Although this approach has made over 9,900% of profit, there is no way (unfortunately) to identify this model in advance (at the beginning of the investment).

Figure 4. Portfolio value changes for analyzed models (strategies). Dashed vertical line at the instant 2600 separates basic and test periods
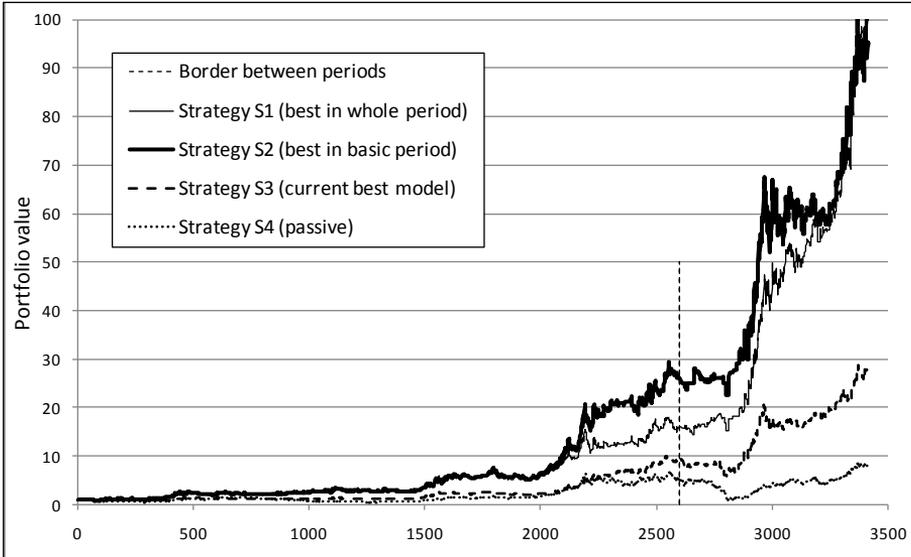
Source: own calculations.

A special attention should be paid to strategies performance in the *test* period. The visual effectiveness analysis of strategies S2, S3 and S4 in test phase is depicted in Figure 5. For better comparison, at the beginning of test phase their portfolios were equaled and set to 1.

Figure 5. Portfolio value changes for the selected strategies in the test period
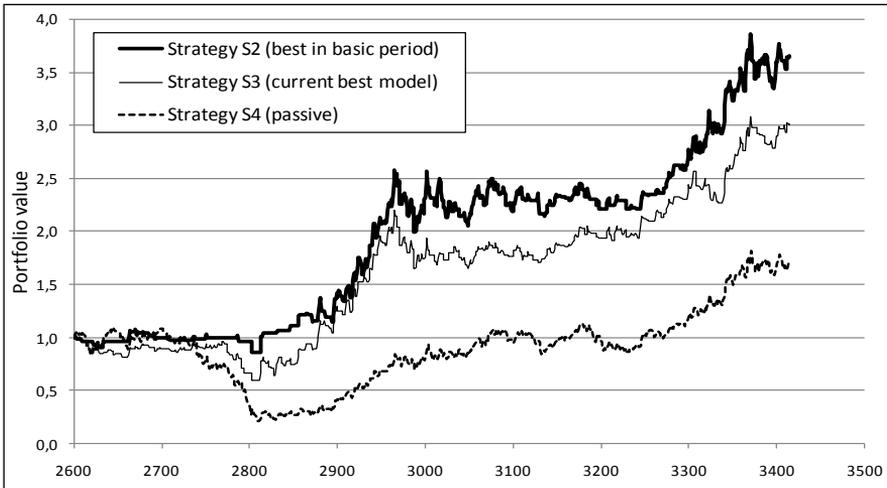
Source: own calculations.

It is worth noticing that the strategy based on the model that generated the highest profit in the basic period (strategy S2) performed very well also in testing phase and obtained better return rate than other considered strategies (so selecting this model as the system output at the beginning of the test phase would be a profitable choice). However, there is perhaps more important issue than a profit – it is a *risk* that can be expressed by a maximal drawdown (loss of capital) during the operation. The value of maximal drawdown (denoted by *MD*) is expressed here by equation (9):

$$MD = \min_{d} \left[\frac{P_d - \max_{g<d}(P_g)}{\max_{g<d}(P_g)} \right] \cdot 100\% \tag{9}$$

so it is a negative number (in %) that represents maximal relative loss of portfolio value during the investment period.

It should be noted that while stock quotations dropped (during the crisis in year 2008 – the period between 2,700 and 2,850 session day – see Fig. 5) with around 80% (and so for the passive strategy S4, $MD \approx -80\%$), the temporary decline of portfolio value based on the active system strategy S2 ("best model in the basic period") did not exceed 20% in this period. The maximal decline for S2 in total test phase was less than 23% ($MD > -23\%$, see Table 2 for details), so the strategy S2 turned out to be much less risky.

4.2. Comparative analysis related to other decision support tools

Here, the results achieved by the proposed multi-agent system have been compared with outcomes generated by other selected decision-support tools that can be applied as transaction models in financial markets. To make the comparative studies trustworthy, the following assumptions for reference models have been accepted:

- the same data series and its identical division into basic period (used for learning and validation process) and test period (used for final testing of a constructed model) – see Section 3 and Figure 3;
- the same set of input/output variables (7) and the same decision rule (5).

Regarding assumptions mentioned above, the following models have been considered in the comparative research:

- linear multivariate regression[5],
- nonlinear multilayer perceptrons[6].

Calculations have been executed with application of the software packet *Statistica* 10.

The linear regression model, constructed on the basis of 2,600 observations in the basic period, is expressed by the equation (10):

$$y = 0.000595 + 0.075419x_1 - 0.033959x_2 - 0.065758x_3 + 0.010344x_4 \tag{10}$$

---

[5] Using a simple linear method can be justified by its practical applications in technical analysis of a quotation series and by utilisation of linear trends as input variables.

[6] Neural networks, mainly nonlinear perceptrons, are widely used for modelling of complex nonlinear systems (like financial markets), especially for performing prediction/decision-making tasks.

Five most effective[7] multilayer perceptrons, obtained during the research, denoted by P1, P2, P3, P4, P5, have the following structures (numbers of neurons in layers: input-hidden-output, and transfer function in layers: hidden-output):

P1:   4-3-1, tanh-linear;
P2:   4-4-1, tanh-tanh;
P3:   4-11-1, tanh-tanh;
P4:   4-3-1, tanh-tanh;
P5:   4-7-1, tanh-tanh.

Additionally, a model comprised of all five perceptrons, operating as a "decision committee" (*i.e.* generating average outputs of all 5 elements) has been considered (let us denote it by DC).

Two effectiveness indicators have been taken into account in the comparative analysis:
- total profit (in %), *i.e.* total return rate,
- maximal drawdown (see equation (9)) as a risk determinant.

Results of the analysis are submitted in Table 2 and graphically in Figure 6.

Two strategies generated by the proposed multi-agent system (S2 and S3) have been compared with considered reference models[8]. Two effectiveness criteria are assumed: total return rate (Fig. 6, Y-axis) and maximal drawdown of portfolio value (X-axis). Best strategies are positioned in the top right-hand corner of the graph in Figure 6, whilst the worst ones are placed in the bottom left-hand corner.

Obtained results have proved the high effectiveness of strategies S2 and S3 generated by the proposed multiagent system. Particularly S2 turned out to be effective both in basic and test periods (during the test period it brought the highest return rate and lowest risk expressed as relatively small negative value of a maximal drawdown). Perceptrons sometimes generate similar level of effectiveness, however it is rather unstable (see *e.g.* performance of P3 and DC models in basic and test periods). Almost all active strategies have performed much better than the passive one (S4).

Table 2. Effectiveness indicators values (total rate of return and maximal drawdown) for investment strategies generated by considered models
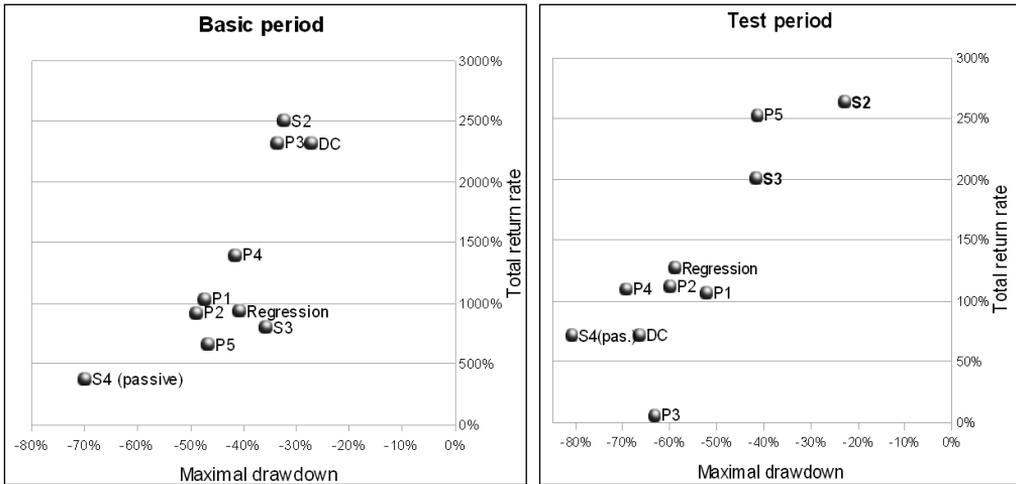
Model/Strategy	Basic period		Test period	
	Return rate	Max. drawdown	Return rate	Max. drawdown
Regression	938%	-40.92%	127%	-58.97%
P1	1,039%	-47.47%	107%	-52.25%
P2	924%	-48.93%	112%	-59.94%
P3	2,329%	-33.55%	6%	-63.14%
P4	1,397%	-41.46%	110%	-69.33%
P5	663%	-46.61%	253%	-41.40%
DC	2,324%	**-27.31%**	72%	-66.57%
S2	**2,509%**	-32.29%	**264%**	**-22.87%**
S3	806%	-35.77%	201%	-41.63%
S4 (passive)	379%	-70.06%	71%	-80.89%

Source: own calculations.

---

[7]   According to SSE criterion.
[8]   Strategy S1 "best in whole period" has been excluded due to inability of determining the optimal output element of the multi-agent system before the test period.

Figure 6. Graphical presentation of effectiveness for considered investment strategies

4.3. Forecasting of stock quotation series

Although the system has been constructed generally for transaction decision support, it can also be applied for time-series prediction. Table 3 submits the 1-day prediction effectiveness for KGHM stocks (the whole period) evaluated on the basis of output signals for strategies S1, S2, S3. As an effectiveness measure, the MAPE (mean absolute percentage error) has been appointed. The MAPE error has been calculated on the basis of differences between actual stock price (in PLN) and the model forecast made for a given day.

For a comparison – two other prediction methods: exponential smoothing and naive approach, which creates each forecast equal to current quotations, have been considered.

Table 3. Stock quotation time series forecasting effectiveness for particular strategies

Strategy	MAPE
S3 "current best model"	3.05%
Exponential smoothing ($\alpha = 0.5$)	2.55%
S1 "best in whole period"	2.26%
S2 "best in basic period"	2.22%
Naive approach (passive strategy)	2.17%

It should be noticed that system (for considered output selection strategies) generates reasonable forecasts. Although "naive" approach seems to perform slightly better than S1 and S2, it however produces only "buyandhold" or "keep cash" (*i.e.* passive) investments strategies that turned out to be rather ineffective and/or vulnerable to a risk.

5. Conclusion

The proposed multi-agent system has proved its effectiveness in transaction decision-making and it may turn out to be a promising investment support tool. Much further research work, however, must be done to enhance the system. Particularly the following issues should be considered:

- optimal selection of the system output point – the best model in a given instant does not guarantee further effective performance (however it is probable); certain solution can be based on selecting a number of best models that create a "decision committee";
- application of more advanced models as agents, for example multilayer neural networks (perceptrons or RBFs);
- optimization of system parameters;
- selection of input variables;
- application of more effective communication between models (agents).
  These problems are matters of further investigation.

Bibliography

1. Chen S., Tien J., Visano B.S. (2008), A Hybrid Multi-Agent Model for Financial Markets, *New Frontiers in Applied Artificial Intelligence of Lecture Notes in Computer Science*, LNAI 5027, pp. 531-540.
2. Chiu D.-Y., Chang F.-Y., Chen P.-J. (2007), Using Intelligent Multi-Agents to Simulate Investor Behaviors in a Stock Market, *Tamsui Oxford J. of Mathematical Sciences*, 23(3), pp. 343-364.
3. Ferber J. (1999), *Multi-Agent Systems. An Introduction to Distributed Artificial Intelligence*, Boston, Addison-Wesley.
4. Hoffmann A.O.I., Delre S.A., von Eije J.H., Jager W. (2006), Artificial Multi-Agent Stock Market: Simple Strategies, Complex Outcomes, *Advances in Artificial Economics, Lecture Notes in Economic and Mathematical Systems*, Vol. 584, pp. 167-176.
5. Luck M., Marik V., Stepankowa O., Trappl R. (2001), *Multi-Agent Systems and Applications*, New York, Springer.
6. Lux T., Marchesi M. (2000), Volatility Clustering in Financial Markets: A Microsimulation of Interacting Agents, *International Journal of Theoretical and Applied Finance*, 3(4), pp. 675-702.
7. McNelis P.D. (2005), *Neural Networks in Finance: Gaining Predictive Edge in the Market*, San Diego, Elsevier Academic Press.
8. Morajda J. (2003), Neural Networks and Their Economic Applications [in:] *Artificial Intelligence and Security in Computing Systems*, (eds.) J. Sołdek, L. Drobiazgiewicz, Boston/ Dordrecht/London, Kluwer.
9. Morajda J. (2007), System of Neural Decision Models for Stock Market Simulation and Prediction [in:] *Proc. of 16th International Conference on Systems Science*, (ed.) A. Grzech, Vol. III, pp. 350-358, Wrocław, Oficyna Wydawnicza Politechniki Wrocławskiej.
10. Refenes A.P. (1995), *Neural Networks in the Capital Markets*, Chichester, Wiley.
11. Tadeusiewicz R. (2010), Place and Role of Intelligent Systems in Computer Science, *Computer Methods in Materials Science*, Vol. 10, No. 4, pp. 193-206.

12. Tadeusiewicz R. (2011), Introduction to Intelligent Systems, chapter 1 [in:] *The Industrial Electronics Handbook – Intelligent Systems*, (eds.) B.M. Wilamowski, J.D. Irvin, pp. 1-1 – 1-12, Boca Raton, CRC Press.

13. Tirea M., Tandau I., Negru V. (2012), Stock Market Multi-Agent Recommendation System Based on the Elliott Wave Principle, *Multidisciplinary Research and Practice for Information Systems, Lecture Notes in Computer Science*, Vol. 7465, pp. 332-346.

Chapter **24**

On Robust Estimation of Pareto Models and Its Consequences for Government Aid Programs Evaluation

Daniel Kosiorowski[1], Damian Tracz

1. Introduction

The Pareto principle sometimes called the 80-20 rule claims that roughly 80% of the effects come from 20% of the causes. For the first time this regularity was observed and described over 100 years ago by an Italian economist Vilfredo Pareto when he made research on possession of land in his homeland. Nowadays it is not only rule of thumb but also rule that was backed by many academic research using so called Pareto distribution (the 80-20 rule corresponds to a value $\alpha \approx 1.161$ of its shape parameter). The Pareto distribution is suitable to model relatively high probability in the upper tail (right-skewed tail), where lower α shape parameter determine the lower probability mass at x_m point. Thank to that property of the model it is useful and relatively effective to apply in actuarial applications, risk management and Economy of Welfare.

It is undoubtedly true, that distribution of income within the nation is not only of economists' interest but also of policy makers. Correct estimation of shape parameter α in Pareto distribution and any derivative measure of income inequality like *Gini* coefficient or *Theil* Index is important from several reasons – it is source of the knowledge about a structure of income in society and also could be a base for further economic issues such as changing taxation system or government aid programs in order to redistribute some part of wealth. Underestimation of α could lead to a conclusion that inequalities are too high and trigger some corrective action like rising taxes in high income group. If there is too much severity in changing tax bracket it may have influence on productivity and investment activities among well-paid citizens. Overestimation of α could have opposite but also harmful effect for health of the economy, because when taxation is too liberal then it will be a huge probability that low-paid people get insufficient public transfers. Moreover income distribution affects economic growth, market demand, and is important factor in determining the amount of savings in a society (Kleiber, Kotz, 2003). Economic growth could be presented as a nonlinear function of income inequality, which reaches its maximum at

---

one point (different value for different countries), that could be called optimum. After reaching that point economic growth start to fall with increasing income inequality. (Pawlak, Sztaudynger, 2008). It is generally accepted and obvious, that in market economy some level of income inequality must exist, because employee with deeper knowledge, more experience or at the managerial position is remunerated better than the employee without pointed advantages. This is also source of incentives for people, because if somebody wants to earn more she should educate herself and gain new experience. Through such activities she is able to perform the same work in less time, or achieves a qualitatively better results. Described situation has favorable impact on the economy as a whole and economic growth. On the other hand when level of the inequality is to high (higher than optimum point) this leads to disapproval of the significant part of society, weakening of social capital and higher level of committed crime. All of these factors could lower economic growth. We could find some confirmation of above hypothesis when we look at income disparities data in United States before Great Depression (1930-1940) and last financial crisis (2007-2009). According to David A. Moss (Harvard Business School) disparities in that time were the greatest in approximately the last 100 years. In 1928, the top 10 percent of earners received 49.29 percent of total income, while in 2007, the top 10 percent people earned a similar percentage: 49.74 percent. (Story, 2010). Taking into account all information above we should not ask *How to redistribute wealth in order to eliminate inequalities*? (as some countries tried in history like Russia in 1917) but *How to redistribute wealth and do not stop productive effort made by some groups in society?*

We are also aware that in the economics and other social sciences it is very difficult to determine if a certain model describe particular phenomenon in the best way. It is the case because numerous and usually not constant forces exist over time and may have influence on explored field. Thus, the question *what is the most appropriate distribution of income within country?* does not have only one correct answer, so statistical literature has discussed several candidates that have similar characteristics as Pareto distribution, *i.e.*, *e.g.*, the log-normal distribution, gamma distribution, Dagum, Singh-Mandala – to list only a few.

As the latest research revealed (Brazauskas, Serfling, 2004) the standard Maximum Likelihood Estimator (MLE) of α parameter in Pareto distribution may be highly influenced by outliers both in upper and lower tail of the distribution. This influence could be reduced by estimating it in a robust manner. In our paper we focus on two robust estimators of the shape parameter in the Pareto model (the Pareto I type model) namely on the Generalized Median and the Trimmed Mean estimators proposed and carefully studied by Brasauskas and Serfling (2000, 2001, 2004) and compare them with Maximum Likelihood Estimator. Although the presented estimators are not well known to the economic community they are very useful for economic applications in our opinion and hence we present the R scripts for their calculation in the appendix.

The rest of the paper is organized as follows. In Section 2, the basic properties of the Pareto Distribution are reminded. In Section 3, robust estimators are presented. In Section 4, selected properties of the estimators are presented. The paper ends with conclusions, selected references and appendix containing R script for calculating the presented estimators.

2. Pareto distribution

Pareto's research on income distribution was related with his discussion with the French and Italian Socialists who were insisting on institutional reforms to reduce inequality in the distribution of income. Pareto studied the economic agents income distribution for tax purposes. The distribution was truncated to the left at a point x_m, the maximum non-taxable income $x_m > 0$. He found a regularity of observed income distribution obtained from tax records – a stable linear relation of the form $\log N(x) = A - \alpha \log x$, $x \geq x_m > 0$, $\alpha > 1$, where $N(x)$ is the number of economic units with income $X > x$, X being the income variable with range $[x_m, \infty)$. The Pareto type I model is the solution of that linear relationship.

Figure 1. The Pareto distribution probability density functions for different shape parameters
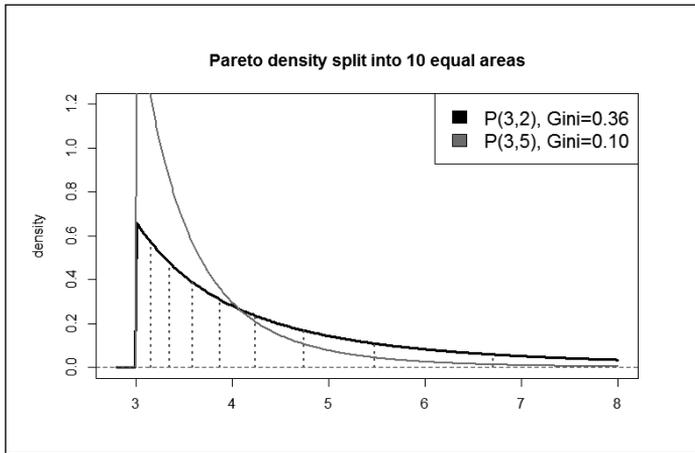
In the same context in 1898, March proposed the gamma probability density function (pdf) and fitted it to the distribution of wages in France, Germany, and the United States. Nowadays, there are over 50 models used for the income distribution modelling. The Pareto distribution for modelling high income groups and to deal with positive asymmetric distribution having heavy weight tails with either finite or infinite variance – still stands in a center of income distributions considerations however. It is mainly due to its elegance, interpretation possibilities and its relation to the popular inequality measures. For brief illustration of its relation to other asymmetric distributions we only recall that the popular lognormal distribution is between the gamma and Pareto distribution.

A simple Pareto distribution $P(x_m, \alpha)$ is given by its cumulative distribution function (cdf)

$$F(x) = 1 - \left(\frac{x_m}{x} \right)^{\alpha},$$

(1)

for $x > x_m$, where α is the shape parameter that characterizes the tail of the distribution and $x_m > 0$ is the scale parameter.

The Pareto distribution has pdf $\dfrac{\alpha x_m^{\alpha}}{x^{\alpha+1}}$ for $x > x_m$ and following formulas for the expected

value
$$E(X) = \begin{cases} \infty & \alpha \le 1 \\ \dfrac{\alpha x_m}{\alpha - 1} & \alpha > 1 \end{cases},$$

the variance
$$D^2(X) = \begin{cases} \infty & \alpha \in (1,2] \\ \dfrac{x_m^2 \alpha}{(\alpha-1)^2(\alpha-2)} & \alpha > 2 \end{cases},$$

the median $x_m \sqrt[\alpha]{2}$, and the mode x_m.

In a context the Pareto distribution estimation and computer simulation it is useful to remind an equivalence between Pareto distribution and the truncated exponential distribution $E(\mu,\theta)$ having cdf

$$G(z) = 1 - e^{-(z-\mu)/\theta}, \tag{2}$$

$z > \mu$, for $\theta > 0$ and $-\infty < \mu < \infty$.

Specifically if X has CDF, F given by (1) then variable $Z = \log(X)$ has CDF given by (2) with $\mu = \log \sigma$ and $\theta = \alpha^{-1}$.

If sample observations follow the postulated model $P(x_m, \alpha)$, then it is well known that for large data sets, MLE estimators attains the minimum possible variance among a large class of competing estimators,

$$\hat{\alpha}_{ML} = \frac{n}{\sum_{i=1}^{n} \log(X_i / x_m)}. \tag{3}$$

It can be easily found that $\dfrac{2n\alpha}{\hat{\alpha}_{ML}}$ has cdf χ_{2n}^2 (see: Brazauskas, Serfling, 2000). Although $\hat{\alpha}_{ML}$ is biased, it is easy to find its unbiased version (MLE)

$$MLE = \frac{n-1}{\sum_{i=1}^{n} \log(X_i / x_m)}, \tag{4}$$

For large sample size n, MLE is approximately $N\left(\alpha, \dfrac{\alpha^2}{n}\right)$.

3. Robust estimator of the Pareto Distribution

It should be underlined that even small relative error in estimation of α in $P(x_m, \alpha)$ may lead to a large relative error in estimated quantiles or tail probabilities based on α. Even small improvements in estimation method may lead to significantly better applications. It is easy to calcu-

late that in estimating of the quantile q_ε corresponding to upper tail probability ε, it follows that $q_\varepsilon = x_m \varepsilon^{-1/\alpha}$. For example for $\varepsilon = 0.001$ underestimation of $\alpha = 1$ by only 5% leads to overestimation of $q_{0.001}$ by 58%. From other point of view, errors in estimation of α may result in errors in estimation of basic measure of social inequity called the Gini coefficient[2] $GINI = 1/(2\alpha - 1)$ for $\alpha \geq 1$. Please note, that in practice when observing income, even up to 30% of units reports zero values. These observation can be treated as outliers in a lower tail of the distribution.

Robust estimation of income distribution parameters was extensively studied by Victoria-Fezer (2000) basing on M-estimation approach (see: Marona et al., 2006). We focus our attention on a less known approach related to works Brazauskas and Serfling.

We understand robustness of the estimator in terms of the influence function (IF) and the finite sample breakdown point (BP) – for further details see Maronna et al. (2006).

Let us recall that for a given distribution F in $\Re$ and an $\varepsilon > 0$, the version of F contaminated by an ε amount of an arbitrary distribution G in $\Re$ is denoted by $F(\varepsilon, G) = (1 - \varepsilon)F + \varepsilon G$. The **influence function** (IF) of an estimator T at a given $x \in \Re$ for a given F is defined

$$IF(x;T,F) = \lim_{\varepsilon \to 0^+} \left(T(F(\varepsilon, \delta_x)) - T(F) \right)/\varepsilon , \tag{5}$$

where δ_x is the point-mass probability measure at $x \in \Re$.

The $IF(x,T,F)$ describes the relative effect (influence) on T of an infinitesimal point-mass contamination at x, and measures the local robustness of T. An estimator with bounded IF (with respect to a given norm) is therefore robust (locally, as well as globally) and very desirable.

Let $X^n = \{X_1, ..., X_n\}$ be a sample of size n from X in $\Re$. The **replacement breakdown point** (BP) of an estimator T at X^n is defined as

$$BP(T, X^n) = \left\{ \frac{m}{n} : \left\| T(X_m^n) - T(X^n) \right\| > \delta \right\} , \tag{6}$$

where X_m^n is a contaminated sample resulting from replacing m points of X^n with arbitrary values, $\|\cdot\|$ denotes a norm, δ is certain content-related threshold, *i.e.*, for the Gini coefficient we can take $\delta = 0.3$ if for that value we face with different social politics basing on the Gini coefficient. The BP point serves as a measure of global robustness, while the IF function captures the local robustness of estimators. In the context of the simple Pareto distribution estimation it is useful to discriminate between sample contamination with lower values (**LBP**) and sample contamination with upper values (**UBP**).

For specified β_1 and β_2 satisfying $0 \leq \beta_1, \beta_2 < 1/2$, a trimmed mean is formed by discarding the population β_1 lowest obs. and the proportion of β_2 uppermost obs. and averaging the remain-

---

[2] The **Gini coefficient** is half the relative mean difference and is usually defined on the Lorentz Curve. The **mean difference** is defined as the expected value of the absolute difference of two random variables X and Y independently and identically distributed with the same unknown distribution $MD = E\left[|X - Y| \right]$. For a sample $X^n = \{x_1, ..., x_n\}$, $MD = \frac{1}{n^2} \sum_{i=1}^{n} \sum_{j=1}^{n} |x_i - x_j|$. Relative mean difference $RMD = \frac{MD}{\overline{x}} = 2 \cdot GINI$.

ing ones in some sense. In particular, for estimating α, with known x_m Brasauskas and Serfling (2000) proposed the **trimmed mean estimator**

$$\hat{\alpha}_T = \left(\sum_{i=1}^{n} c_{ni} \log\left(X_{(i)} / x_m \right) \right)^{-1},$$ (7)

with $c_{ni} = 0$ for $1 \le i \le [n\beta_i]$, $c_{ni} = 0$ for $n - [n\beta_2] + 1 \le i \le n$ and $c_{ni} = 1/d(\beta_1, \beta_2, n)$ for $[n\beta_1] + 1 \le i \le n - [n\beta_1]$, where $[\cdot]$ denotes "greatest integer part" and $d(\beta_1, \beta_2, n) = \sum_{j=[n\beta_1]+1}^{n-[n\beta_2]} \sum_{i=0}^{j-1} (n-i)^{-1}$.

Their second proposal involves **the generalized median estimator**. The generalized median (GM) statistics are defined by taking median of the $\binom{n}{k}$ evaluations of a given kernel $h(x_1, ..., x_k)$ over all $k-$ sets of the data (see: Serfling, 1994).

Brazauskas and Serfling (2002) proposed estimator for the parameter α in case of x_m known:

$$\hat{\alpha}_{GM} = MED\left\{ h\left(X_{i1}, ..., X_{ik} \right) \right\},$$ (8)

with a particular kernel $h(x_1, ..., x_k)$:

$$h(x_1, ..., x_k; x_m) = \frac{1}{C_k} \frac{k}{\sum_{j=1}^{k} \log\left(x_j / x_m \right)},$$ (9)

where c_k is a multiplicative, the median – unibasing factor *i.e.* chosen so that the distribution of $h(x_1, ..., x_k; x_m)$ has median α – values of c_k for $k = 2$, $c_2 = 1.1916$, $k = 3$ $c_3 = 1.1219$.

4. Properties of the estimators

In order to investigate properties of the considered estimators MLE, TM and GM we performed intensive simulation studies involving simulated datasets of size 500 observations from the following mixtures of distributions

1. Mixture of $P(1,5) \times 10\%$ and $P(10,5) \times 90\%$,

2. Mixture of lognormal distribution $LN(2.14,1) \times 10\%$ and $P(7,2) \times 90\%$,

3. Mixture of normal distribution $N(3300,500) \times 10\%$ and $P(2500,4) \times 90\%$,

4. Mixture of uniform $U[0,0.1] \times 10\%$ distribution and $P(2500,4) \times 90\%$ distribution.

We considered mixtures which may seem not to be especially unpleasant at a first sight but which may lead to significant errors however. We considered situations in which the x_m parameters was estimated as minimal value in a sample (classical MLE estimator), the situations where x_m was treated as known and the situations in which we estimated x_m as quantile of order

$\gamma \in (0, 0.3)$, where γ parameter was optimizes with respect to a value of the standard Kolmogorov – Smirnov goodness of fit statistics.

Figure 2. The estimated log densities for the first mixture and x_m taken as minimum

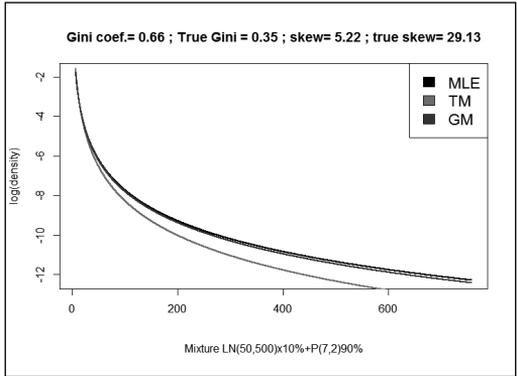Figure 3. The estimated log densities for the second mixture and x_m taken as minimum

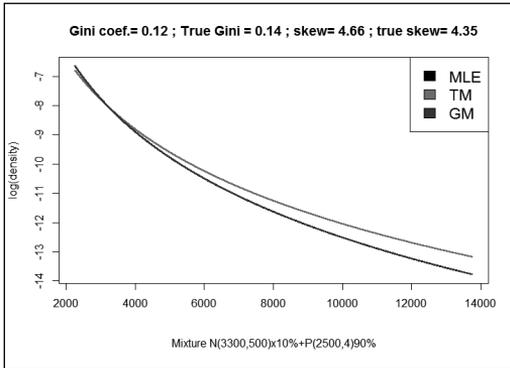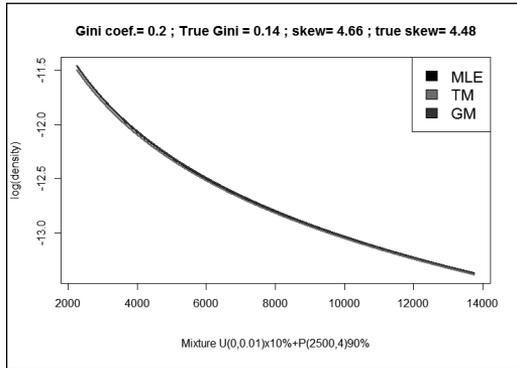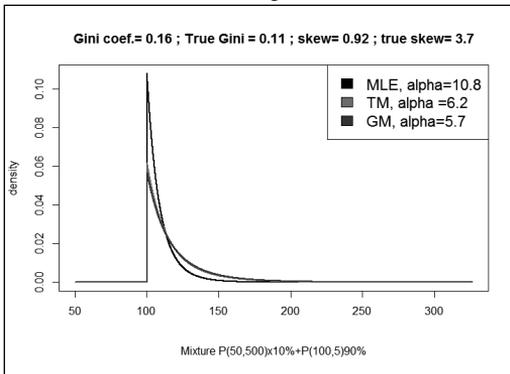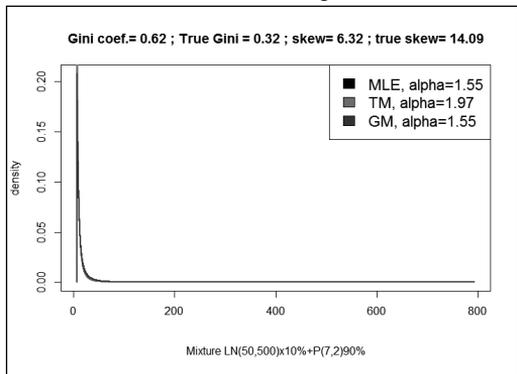Figure 4. The estimated log densities for the third mixture and x_m taken as minimum

Figure 5. The estimated log densities for the fourth mixture and x_m taken as minimum

Figure 6. The estimated densities for the first mixture and x_m taken as quantile 12%

Figure 7. The estimated densities for the second mixture and x_m taken as quantile 12%

Figures 2-5 present the estimated log densities for the mixtures and x_m taken as minimum. It is easy to notice, that the estimator of the x_m has a crucial issue for the performance of the estimators. With classical MLE estimator for the x_m, all the shape parameter estimators perform relatively poorly.

Figure 8. The estimated densities for the third mixture and x_m taken as quantile 12%
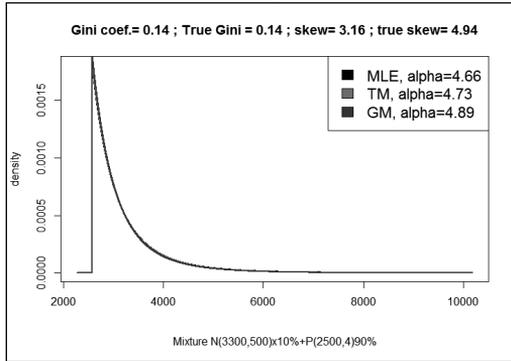
Figure 9. The estimated densities for the fourth mixture and x_m taken as quantile 12%
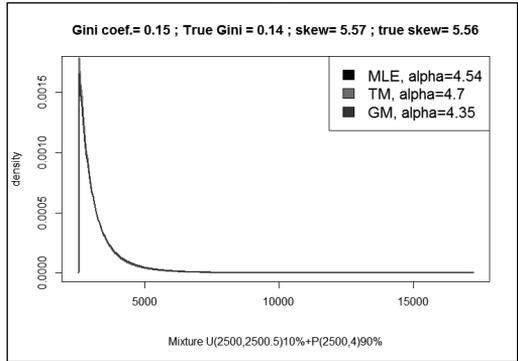
Figure 10. Comparison of estimators for the first mixture and x_m taken as minimum
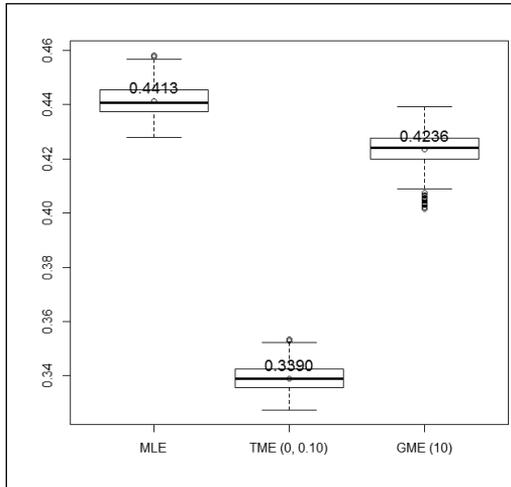
Figure 11. Comparison of estimators for the second mixture and x_m taken as minimum
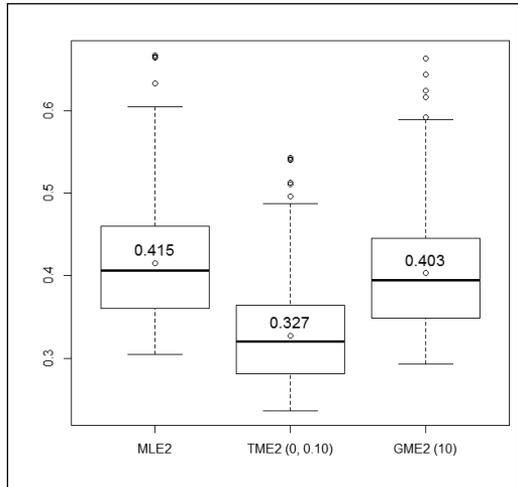
Figure 12. Comparison of estimators for the third mixture and x_m taken as minimum
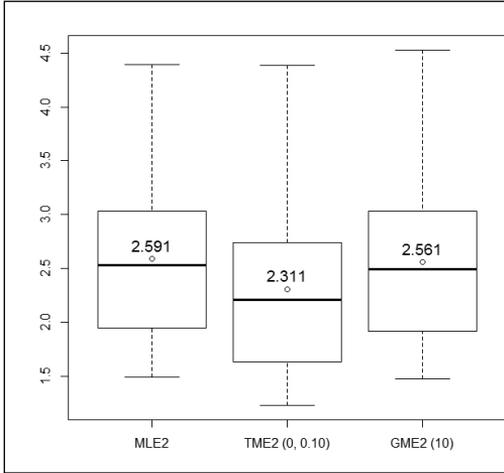
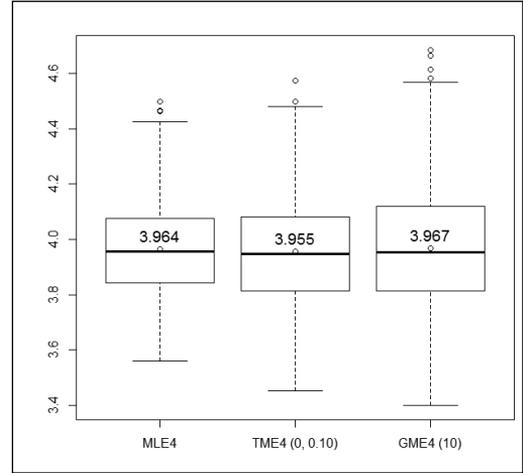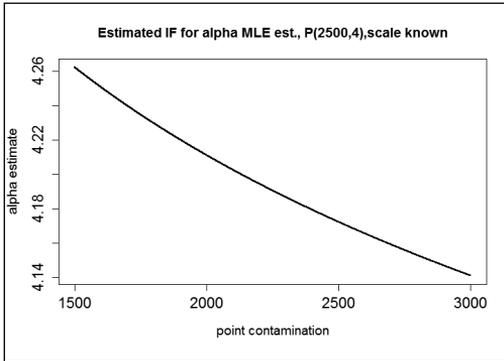Figure 13. Comparison of estimators for the clean data P(2500,4) and x_m taken as minimum

Figure 14. The estimated IF for the MLE estimator and stylized sample of 100 obs

Figure 15. The estimated IF for the MLE estimator and stylized sample of 100 obs

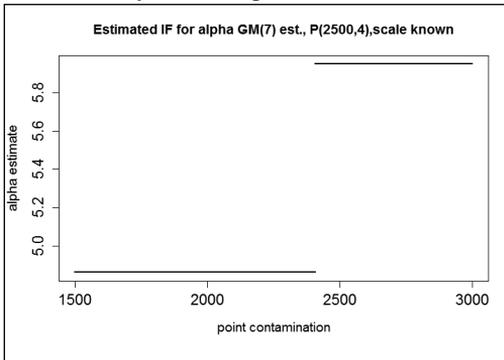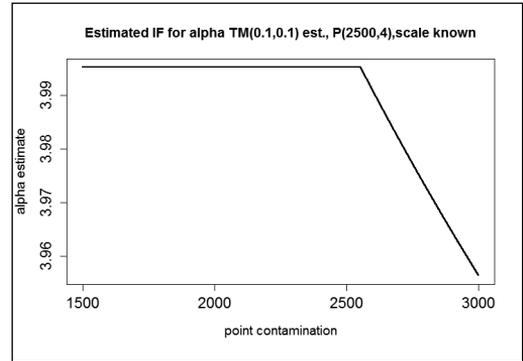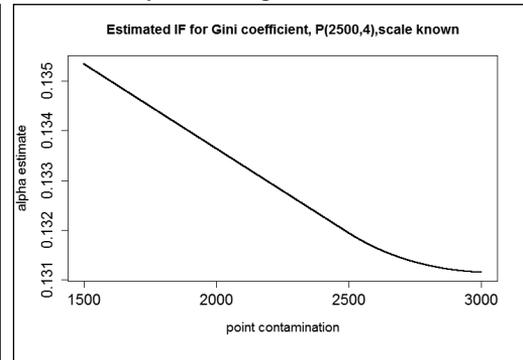Figure 16. The estimated IF for the MLE estimator and stylized sample of 100 obs

Figure 17. The estimated IF for the MLE estimator and stylized sample of 100 obs

We can notice differences in the estimates – especially for the first mixture. In this case the robust estimator should be used. Figures 10-13 show comparison of estimators with respect to their dispersion. We can say that the robust estimators exhibit comparable properties to the MLE estimator for practical purposes. Figures 14-17 present estimated influence functions (sensitivity curves) for the estimators and for the Gini coefficient (Fig. 17). For the TM and GM we have bounded IF, the GM outperforms the TM however. The estimated IF for MLE and Gini coefficient are unbounded and hence the estimators are sensitive to outliers.

In a context of conducting a social politics basing on the estimated probability distribution of the income, we studied empirical example using census data from MINESSOTA POPULATION CENTER (https://international.ipums.org/international/). We considered data on TOTAL INCOME from the USA 1960, 1970, 1980, 1990, 2000, 2005, 2010. For each case the density was estimated by means of the local linear polynomial estimator which is available within the {locfit} R package in equally spaced grid of 500 points. Next we performed calculated MLE, MTE, and GME estimator assuming Pareto distribution for the income distribution.

Figure 18. Estimated income distribution
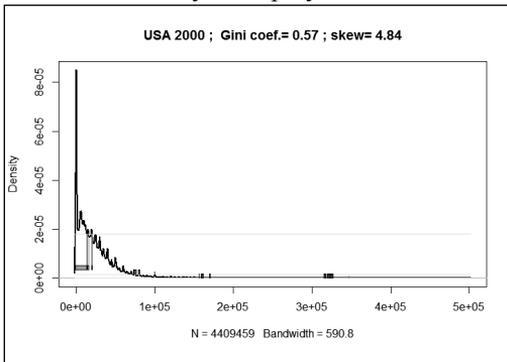in USA in 2000 by local polynomial method

Figure 19. Estimated income distribution
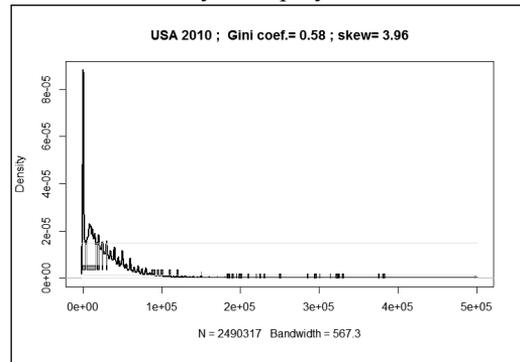in USA in 2010 by local polynomial method

Figure 20. Estimated income distribution
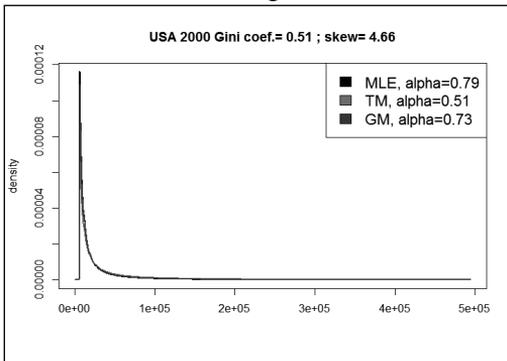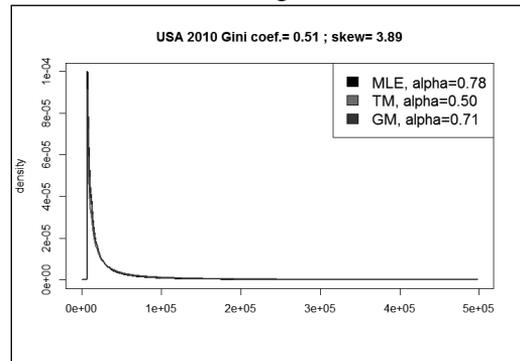in USA in 2000 assuming Pareto model

Figure 21. Estimated income distribution
in USA in 2010 assuming Pareto model

Figures 18-19 present estimated income distribution by means of local polynomial method. It is easy to notice a presence of people reporting zero value of income. Figures 20-21 present the same data but estimated using MLE, TM and GM methods assuming Pareto model.

The conducted simulations and an inspection of the empirical example lead us to the following conclusions:

1. The MLE, TM, GM crucially depend on the estimate of the scale parameter x_m. Assuming that this parameter is known, we recommend the GM estimator for k = 5-7, which is a compromise between a need of high efficiency and high robustness.
2. The MLE, TM, GM estimators strongly depend on the distributional assumption. Before the estimation certain diagnostic procedure inspecting a sample should be performed. We recommend an usage of simple Q-Q plot based procedures.
3. The GM estimator with x_m estimated as quantile of order $\gamma \in (0, 0.3)$, where γ is optimized using Kolmogorov – Smirnoff goodness of fit statistics outperform classical
4. MLE as well as TM estimator. The estimator is computationally intensive however. All the shape estimators with x_m taken as minimum across all mixtures demonstrate comparable properties in terms of their variance.
5. When handling with Gini coefficient we observed that it could be biased when there is a wrong assumption of Pareto distributed data. An usage of non-parametric estimation method could lower significance of this issue.

5. Conclusion

Pareto discovered that the distribution of income is highly skewed. In his times it was in a way unusual discovery since several decades earlier the leading statistician Quetelet and the father of biometrics Galton emphasized that many human characteristics including mental abilities were normally distributed. Nowadays awareness and need for usage of skewed and thick tails distributions are much higher than it were before, especially in finance. Our analysis highlights the importance of robust estimation of Pareto shape parameter particularly in sets of data where outliers occur and even if efficiency of TM or GM estimator could be lower than MLE. There is a need to find the balance between efficiency and robustness of potential estimator.

Bibliography

1. Brazauskas V., Serfling R. (2000), Robust and Efficient Estimation of the Tail Index of a Single-Parameter Pareto Distribution, *North American Actuarial Journal*, 4, pp. 12-27.
2. Brazauskas V., Serfling R. (2001), Robust Estimation of Tail Parameters for Two-Parameter Pareto and Exponential Models via Generalized Quantile Statistics, *Extremes*, 3, pp. 231-249.
3. Brazauskas V., Serfling R. (2004), Favorable Estimators for Fitting Pareto Models: A Study Using Goodness-of-Fit Measures with Actual Data, *ASTIN Bulletin*, 2, pp. 365-381.
4. Kleiber C., Kotz S. (2003), *Statistical Size Distributions in Economics and Actuarial Sciences*, New Jersey, Wiley.
5. Maronna R.A., Martin R.D., Yohai V.J. (2006), *Robust Statistics – Theory and Methods*, Chichester, Wiley.

6.   Pawlak W., Sztaudynger J.J. (2008), Wzrost gospodarczy a optymalne zróżnicowanie do-
      chodów w USA i Szwecji, *Annales – Etyka w życiu gospodarczym*, 1, pp. 259-271.
7.   Story L. (2010), Income Inequality and Financial Crises, *NY Times*, 22 August 2010.
8.   Victoria-Feser M.P. (2000), Robust Methods for the Analysis of Income Distribution, In-
      equality and Poverty, *International Statistical Review*, 68, pp. 277-293.

Appendix

#Function computes maximum likelihood estimator of Pareto shape parameter

pareto.MLE <-function(x){
n<-length(x)
m<-quantile(x,0.12) *#Pareto scale parameter as the minimum of vector*
a<-n/sum(log(x)-log(m))
return(c(m,a))
#Function returns minimum of vector and estimated Pareto shape parameter
}

#Function computes Pareto trimmed mean estimator proposed by Brasauskas and Serfling.

pareto.robustTM <- function(x, B1, B2){

*#Function inputs are vector of data and decimal fraction of lower (B1) and upper(B2) bound that
will be truncated*
d <- c()
g <- c()
a <- c()
n <- length(x)
m <- min(x)
#Pareto scale parameter as the minimum of vector
lowbound <- as.integer(B1*n)
upbound <- as.integer(n-B2*n+1)
sorted.x <- sort(x, decreasing = FALSE)
if (B1 < 0.5 && B2 < 0.5)
 #Neither B1 nor B2 should not be greater or equal 0.5
{
for (j in (lowbound+1):(upbound-1))
{
for (i in 1:(j-1))
{
d[i] <- 1/(n -i)
}
g[j] <-sum(d, na.rm = TRUE)+1/n
}

```
cx<- 1/sum(g, na.rm = TRUE)
for (i in lowbound:upbound)
{
a[i] <- cx*(log(sorted.x[i])-log(m))
}
est <- 1/sum(a, na.rm = TRUE )
return(c(m,est))
```
#Function returns minimum of vector and estimated Pareto shape parameter
```
}
else
{
print('B1 or B2 not ok')
}
}
```

#Function computes Pareto generalized median estimator proposed by Brasauskas and Serfling

```
pareto.robustGM <- function(x, k) {
```

#Function inputs are vector of data (x) and integer (k) that is used to divide vector into subsets
```
n <- length(x)
min <- min(x)
```
#Pareto scale parameter as the minimum of vector
```
len <- as.integer(n/k)
```
#len is defined as length of subsets
```
a = 1
b = k
suma = 0
m <- c()
h <- c()
if (k <= 10)
{
switch(k,
"1" = {print("k should not be 1")},
"2" = {ck <- 1.1916},
"3" = {ck <- 1.1219},
"4" = {ck <- 1.0893},
"5" = {ck <- 1.0705},
"6" = {ck <- 1.0582},
"7" = {ck <- 1.0495},
"8" = {ck <- 1.0431},
"9" = {ck <- 1.0382},
"10" = {ck <-1.0343})
```
#value of ck was provided by Brasauskas and Serfling
```
}
```

```
else
{
ck = k/(k-1/3)
}
for ( i in 1:len)
{
for ( j in a:b)
{
m[j] <- log(x[j])-log(min)
suma = suma + m[j]
}
h[i] = (1/ck)*(k/suma)
a = a + k
b = b + k
suma = 0
}
est1 = median(h)
return(c(min, est1))
#Function returns minimum of vector and estimated Pareto shape parameter
}
```

Chapter **25**

Ontology Based Approach to Sentiment Analysis

Katarzyna Wójcik, Janusz Tuchowski

1. Introduction

Sentiment analysis or opinion mining is field of research that can have significant impact on today's business. Increasing number of consumers' reviews created the need of its automatic analysis. This issue is gaining popularity for both – researchers and entrepreneurs, for whom consumers' reviews are important source of business information.

There are few different text mining approaches to sentiment analysis. This paper is focused on ontology based approach in which the object of opinion is characterized by a hierarchy of its features. On this basis different analyses can be performed. In this paper opinions classification and feature-based opinion mining as special kinds of sentiment analysis will be mentioned.

The results achieved in empirical research conducted for ontology based approach will be compared with results previously achieved using other approaches to sentiment analysis. They will be also matched with efforts necessary to carry out the analysis using given method.

In the article firstly sentiment analysis and different text mining approaches to it will be defined. Then different types of opinions that can be found in the Internet will be presented. Definition of ontology and description of its possible usages in sentiment analysis will be presented in the next part of the paper. It will all lead to description empirical research. This part will touch such topics as opinions about mobile phones used in research, the ontology used in experiments and description of the analysis process. The presentation of research results will be the core of next part of the paper. In the summary some conclusions and authors' further research plans will be mentioned.

2. Sentiment analysis

Sentiment analysis or opinion mining refers to the application of natural language processing, computational linguistics, and text analytics to identify and extract subjective information in source materials.

Generally speaking, sentiment analysis aims to determine the attitude of a speaker or a writer with respect to some topic or the overall contextual polarity of a document. The attitude may

be his or her judgment or evaluation, affective state, or the intended emotional communication (http://en.wikipedia.org).

2.1. Opinions

Reviews are a specific type of textual data. They have a subjective character – they express the attitude of opinions' authors to the objects of the opinions. In some services verbal opinions are supported by points or stars representing the value of opinion.

Opinions that can be found in the Internet can be divided into three groups according to their form (Liu, 2007):

Form1: advantages (pros), disadvantages (cons) and summary

Form2: advantages (pros) and disadvantages (cons)

Form3: no rules or restrictions, free form

The form of opinion determines in some approaches methods of its analysis.

2.2. Text mining approaches to sentiment analysis

In the field of sentiment analysis there are three main tasks (Liu, 2007):

1. Sentiment classification: assignment of sentiment to whole opinion; division of opinions into groups on the basis of its polarity.
2. Featured-based opinion mining and summarization: discovering what aspects of product users like or dislike.
3. Comparative sentence and relation mining: analysis of sentences comparing directly one object to another

There are few text mining approaches to sentiment analysis (Lula, Wójcik, 2011):

1. Word-based approach – it is assumed that the meaning of the opinion (also its sentiment) is carried by separate words; so that the sentiment is assigned to every word in opinion.
2. Pattern-based approach – it is assumed that the sentiments are carried by phrases/expressions instead of separate words so the sentiment is assigned to identified phrases.
3. Ontology-based approach – in this approach ontology is used to present domain knowledge about the subject of opinion; it allows to show the structure of product or service which is rated in opinion.
4. Statistical learning approach – in this approach training set (containing opinions with sentiments given) is required; on this basis the model learns how to assign polarity to new opinions.

There are some significant differences between those approaches. They can be used in different tasks of sentiment analysis. For each task the best approach can be identified (Wójcik, Tuchowski, 2012). Figure 1 below presents which types of sentiment analysis involves particular text mining approaches (Wójcik, Tuchowski, 2013).

Figure 1. Different approaches used in particular opinion mining analysis
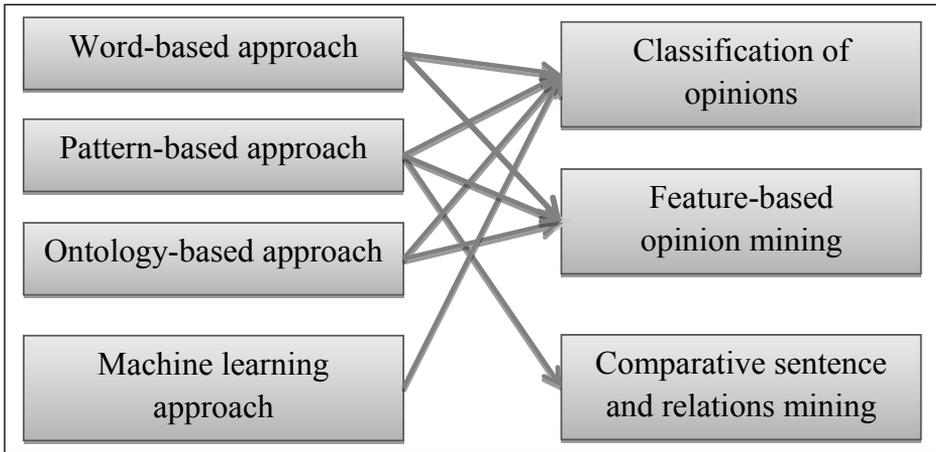
Source: own elaboration.

Often it may be useful to combine different text-mining approaches to sentiment analysis to improve the results.

2.3. Ontology-based approach to sentiment analysis

Ontology is a formal and shared specification of a domain of interest. It formally represents knowledge as a set of concepts within a domain together with the relationships between those concepts. Classes (concepts) in ontology can have hierarchical construction.

Ontology also contains a set of objects (individuals, instances of concepts) which represent real items or beings from a given domain. The concepts may have attributes expressing their properties. Ontology can be used to describe the domain and to reason about the entities within that domain.

Single ontology concerns only one domain. To construct ontology the knowledge about particular field of interest is needed. Ontology designed for one domain cannot be applied to another one. Created ontology can be a starting point for many different analyses of texts representing particular domain including sentiment analysis.

As it can be seen on Figure 1 ontology-based approach can be used in classification of opinions and in feature-based opinion mining. In both cases ontology can be used in a different ways. In most popular approach single opinion can be presented as an instance of ontology (Kontopoulos, Berberidis, Dergiades, Bassiliades, 2013). The comparison analysis of those instances should be conducted in classification of collected opinions. The polarities of opinions with the same subject can be aggregated to the overall sentiment to the product or service.

The ontology as graph-like construction makes feature based opinion mining easier to conduct. The main characteristics of the subject of opinion can be presented as its attributes in the ontology. Then the polarity of each feature must be determined either for single opinion or for the whole set of opinions. In a special case of this approach for every node two additional leafs representing positive and negative sentiment are added (Wei, Gulla, 2010).

In another ontology-based approach to sentiment analysis the ontology of sentiment can be created (Sam, Chatwin, 2013). However also in this case for different domains separate sentiment ontologies would have to be created because some polarized words can have positive or negative meaning depending on the context. Moreover for some domains there are special words expressing sentiment used only in this particular field of interest.

3. Empirical analysis

During research the simulation analysis was conducted. Its aim was to compare the ontology based approach to sentiment analysis with other approaches. To reach this aim not only the accuracy of results was compared but also the amount of work involved in each analysis.

3.1. Experiment description

In the research process the following stages of analysis can be distinguished:
1. Ontology preparation
2. Extraction of opinions from the Internet
3. Tagging
4. Assignment of sentiment
5. Sentiment calculation
6. Results comparison

3.1.1. Ontology preparation

The whole analysis begins with the design of ontology. As it was mentioned before separate ontology must be created for every domain. There are no strict rules of ontology design. The researcher must decide about its structure. The common problem appears when the decision if particular feature will be concept (class) or just the attribute of another class must be taken.

For the purpose of this research the ontology of smartphone was created. It was based on the one described in (Haider, 2012) using also results of research published in (Jainarain, 2012). The root class is Thing and its direct descendant is Phone class. This class is the ancestor for classes representing major features of smartphones. The next generations represents less important or more detailed characteristics of phones. In this case authors decided to represent all important features of smartphones as separate classes in ontology.

Figure 2. Ontology tree of smartphone ontology
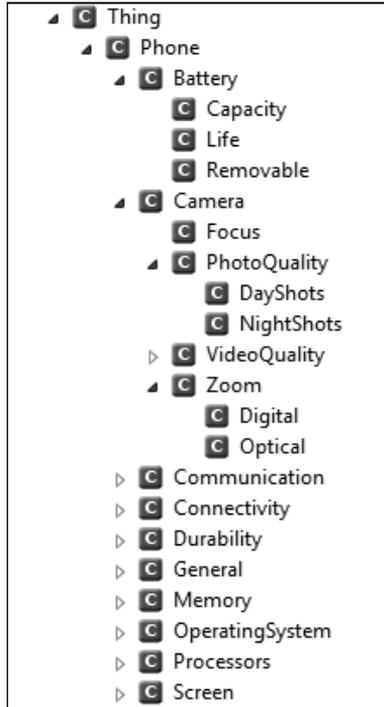
Source: own elaboration.

Prepared ontology can be also called taxonomy as it contains hierarchy and classification of concepts representing features of smartphones. Figure 2 presents a part of the ontology hierarchy. Battery and Camera subclasses are partially expanded. Figure 3 presents the same ontology as graph. Phone can be identified as the central node. Also Thing node as the root one can be pointed on that figure. Nodes are connected to each other with directed edges. The arrows in the middle of each edge represent the direction of relation. The relations "has a" or "is a" are used.

Figure 3. Smartphone ontology presented as graph
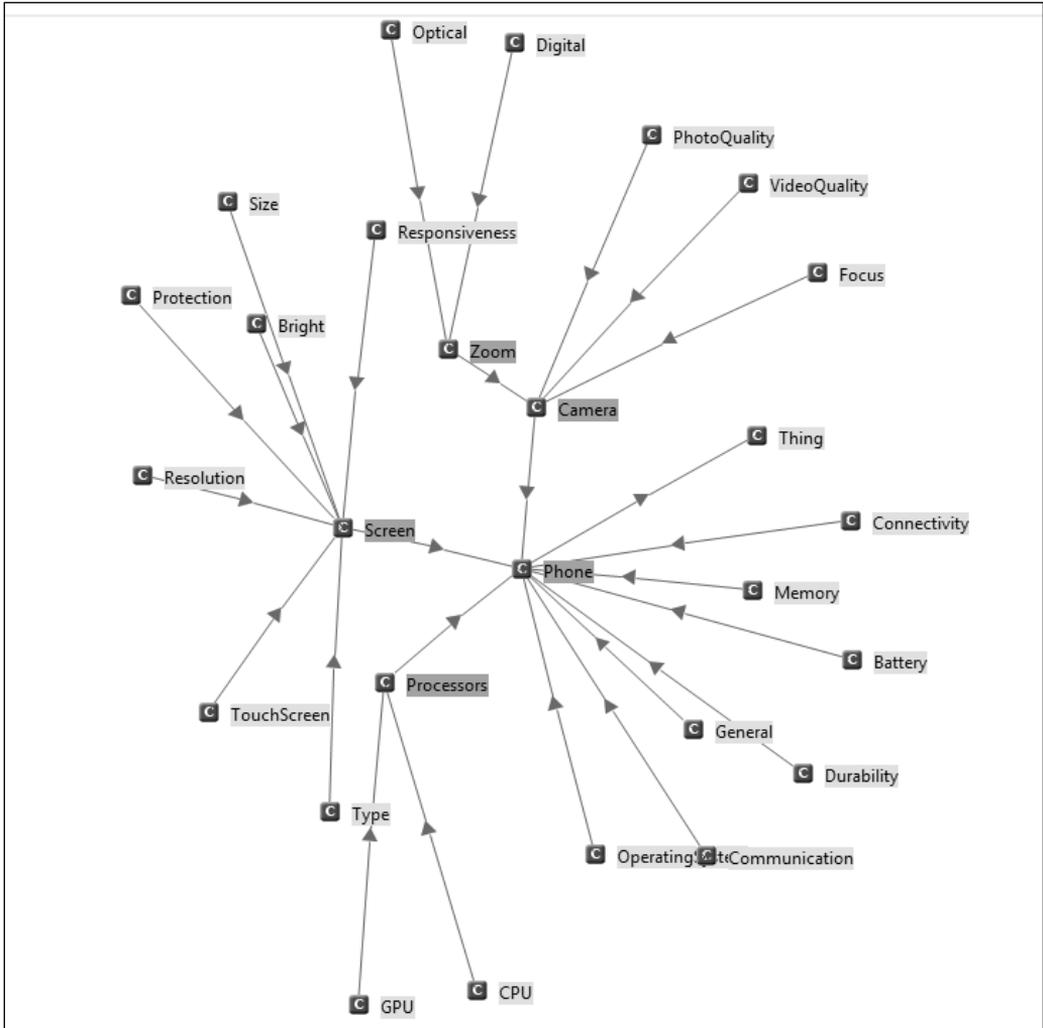
Source: own elaboration.

3.1.2. Extraction of opinions from the Internet

The next step of research concerns extraction of opinions about smartphones. In this case reviews about one particular model were chosen. All opinions were extracted from cokupic.pl via ceneo.pl. The analyzed opinions were all written in Polish language. Figure 4 presents exemplary opinion. It can be seen that the opinion is in the first form: it contains pros (1), cons (2) and summary (3). However in this case rather pros and cons summarize the opinion included in the plain text. Each review is also supported by overall mark expressed by stars (4).

Figure 4. Exemplary opinion extracted for the purpose of research

3.1.3. Tagging

The extracted opinions must be in next step tagged with concepts from ontology. Only phrases that have polarity were chosen from each opinion. Then those phrases were combined with instances of classes representing the feature which sentiment was enclosed in particular phrase. The instances were created in the tagging process and phrases became the labels of those instances. Figure 5 presents tagging process in GATE application.

To conduct tagging process in GATE all opinions must be loaded and combined into corpus. Then ontology is also loaded. In next phase phrases with polarity are marked (1) and class from ontology tree is chosen. This process includes creation of new instance of particular class (2) and assignment of phrase as the label of instance.

Figure 5. Process of tagging opinion with instances from ontology
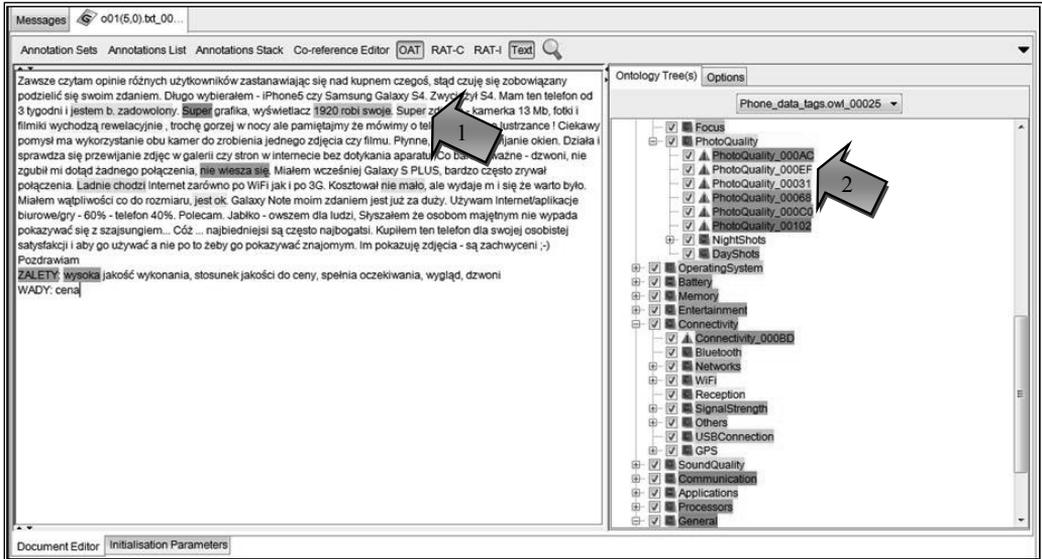
Source: own elaboration in GATE application.

3.1.4. Assignment of sentiment

Next step of analysis requires special dictionary containing words that can carry sentiment and numerical values representing polarity of each word (or phrase) including its direction and strength. For English language such dictionaries can be found in the Internet. SentiWordNet is one of them (Ohana, Tierney, 2009) (Esuli, Sebastiani, 2006). For Polish language there is no sentiment dictionary available.

Figure 6. Part of .owl file describing single phrase in ontology

```
<rdf:Description rdf:about="http://uek.krakow.pl/phone#Heat_0008E">
    <rdf:type rdf:resource="http://uek.krakow.pl/phone#Heat"/>
    <rdfs:label rdf:datatype="&xsd;string" xml:lang="pl">nagrzewa się</rdfs:label>
    <sentiment rdf:datatype="&xsd;int">-4</sentiment>
</rdf:Description>


Heat_0008E – Individual
Heat – Class
nagrzewa się – label (string from opinion)
-4 – Datatype Property (sentiment)
```

Source: own elaboration.

For the purpose of current experiment all tagged phrases were collected and to each of them sentiment as value from range [-10;10] was assigned. Then those values were put into ontology as instance attribute called sentiment. Figure 6 presents definition of one instance in ontology after tagging and sentiment assignment. Class of particular instance is pointed, its name (serialized by the program) and values of label and sentiment attributes.

3.1.5. Sentiment calculation

When ontology is filled with data concerning examined opinions the total sentiment can be calculated. In ontology based approach the hierarchical structure of ontology is used. Figure 7 shows the schema of exemplary classes from ontology. Each class has only one level assigned depending on the hierarchy. Class Phone was set as the first level class. Its direct descendants are second level classes, and its descendants represent subsequent levels.

Figure 7. Part of Smartphone ontology with assigned levels
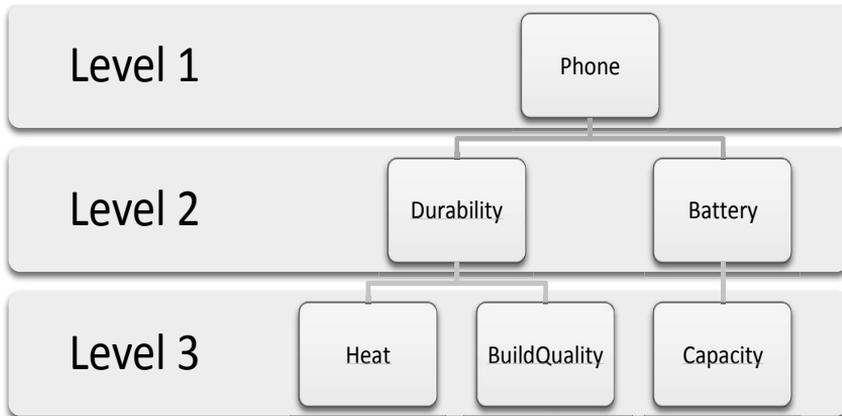
Source: own elaboration.

The total sentiment is calculated using formula 1. For each opinion the sum of weighted partial sentiments (assigned to words or phrases) is divided by the number of polarized phrases identified in it. In this particular experiment only the sentiment for the product was calculated without determining the sentiment of each single opinion about it.

$$sentiment = \frac{\sum_{i=1}^{n} \left[\frac{sentiment(i)}{level(i)} \right]}{n} \qquad (1)$$

3.2. Research results

There are two main approaches to measure the quality of model. One of them requires usage of predefined expected outputs of the model and second of them lies in analysis of model's char-

acteristics. In this research first approach was used. As expected outputs stars ratings were taken into consideration.

To determine the quality of presented solution its outcomes were compared with outcomes achieved using word based approach. Table 1 contains results of this comparison. Values of sentiment were normalized to the range [0;5] to make them comparable with sentiment determined by opinions' authors in the form of stars.

According to established criterion ontology based approach gave worse results than word based approach. Average outcome for model with ontology usage gave 2.8 while average outcome for model based only on words gave 3.11. This result is closer to the average sentiment extracted from the stars which was 3.6.

Table 1. Comparison of research results

Description	Range	Result
Sentiment with ontology	[-10;10]	1.17
Normalized sentiment with ontology	[0;5]	2.8
Sentiment without ontology	[-10;10]	2.43
Normalized sentiment without ontology	[0;5]	3.11
"Stars" sentiment	[0;5]	3.6

Source: own elaboration.

However ontology based approach allows to conduct feature based sentiment analysis. Polarized phrases are assigned to features they are describing. Two most frequently tagged of them were chosen and their sentiment was calculated. Table 2 presents sentiment values determined for phrases tagged in different opinions and total sentiment for Battery and BuildQuality features. The results were rescaled to the range of [0;5] so they can be compared to total sentiment of the whole device.

Table 2. Feature based analysis of examined opinions

	Battery (9 instances)	BuildQuality (8 instances)
	9	8
	-5	8
	6	8
	9	-5
	5	8
	-3	8
	5	-3
	-4	8
	-5	
Sentiment [-10;10]	1.888888889	5
Sentiment [0;5]	2.972222222	3.75

Source: own elaboration.

4. Conclusion

Summarizing research process and its results it can be inferred that ontology based approach requires a lot of preparation. The ontology must be designed and sentiment dictionary is needed. Ontology is always individual for particular domain (in this case product or group of similar products). The best solution is when sentiment dictionary is also dedicated. Process of tagging phrases and sentiment assignment are also laborious or requires preparation of tool which will automatize it.

In conducted experiment ontology based approach gave worse results than word based approach which requires less preparations (only sentiment dictionary must be delivered). However opinions set on which analysis was conducted was too small to definitely confirm superiority of one method over another. Certainly advantages of ontology based approach is that it can take attributes importance into consideration and gives good foundations for feature based opinion mining. Also mixed approach (involving pattern based approach) could be a good solution.

Further research plans of author contain such actions as:

- Development and modification of ontology – the construction of ontology has influence on the value of calculated sentiment (features levels are used as weights); modification of ontology may influence positively for the accuracy of results;
- Preparation of ontology for other products – for different products separate ontologies must be used; to make solid conclusions opinions about other products should also be analyzed;
- Modification of weights assigned to levels – other possibility of improving results is using different weights than features levels; that kind of analysis can also bring important conclusions;
- Feature based opinion mining – presented in this paper feature based opinion mining is only beginning; it must be developed and described;
- Examination of correlation between product features' values and feature sentiment in opinion;
- Automation of tagging process – in this research all opinions were tagged manually; also sentiment assignment process was conducted in that way; automation of those processes is very laborious but may give positive results;
- Preparation of sentiment dictionary – lack of Polish sentiment dictionary was one of major problems in this experiment; for future analyses prepared dictionary could facilitate the analysis process.

Bibliography

1. Esuli A., Sebastiani F. (2006), SENTIWORDNET: A Publicly Available Lexical Resource [in:] *Proceedings of the 5th Conference on Language Resources and Evaluation (LREC'06)*, pp. 417-422.
2. Haider S.Z. (2012), *An Ontology-based Sentiment Analysis. A Case Study*, University of Skövde.
3. Jainarain R. (2012), *Attributes That Influence Generation-Y Consumers in Their Choice of Smartphone*, University of Pretoria.
4. Kontopoulos E., Berberidis C., Dergiades T., Bassiliades N. (2013), Ontology-based Sentiment Analysis of Twitter Posts, *Expert Systems with Applicatins*, No. 40, pp. 4065-4074.

5. Liu B. (2007), *Web DataMining. Exploring Hyperlinks, Contents, and Usage Data*, Heidelberg, Springer-Verlag Berlin.

6. Lula P. (2011), Automatyczna analiza opinii konsumenckich [in:] *Taksonomia 18. Klasyfikacja i analiza danych – teoria i zastosowania*, (eds.) M. Walesiak, K. Jajuga.

7. Lula P., Wójcik K. (2011), Sentiment Analysis of Consumer Opinions Writen in Polish, *Economics and Management*, No. 16, pp. 1286-1291.

8. Ohana B., Tierney B. (2009), Sentiment Classification of Reviews Using SentiWordNet, *IT&T Conference*, Dublin, Dublin Institute of Technology.

9. Sam K.M., Chatwin C. (2013), Ontology-Based Sentiment Analysis Model of Customer, *International Journal of e-Education, e-Business, e-Management and e-Learning*, 3(6), pp. 477-482.

10. *Sentiment analysis*, [26.06.2014], http://en.wikipedia.org/wiki/Sentiment_analysis.

11. Wei W., Gulla J.A. (2010), Sentiment Learning on Product Reviews via Sentiment Ontology Tree [in:] *Proceedings of the 48th Annual Meeting of the Association for Computational Linguistics*, Uppsala, Sweden, Association for Computational Linguistics, pp. 404-413.

12. Wójcik K., Tuchowski J. (2012), Comparison Analysis of Chosen Approaches to Sentiment Analysis [in:] *IT for practice*, Frýdek Místek, VŠB – Technická univerzita Ostrava, pp. 187-192.

13. Wójcik K., Tuchowski J. (2013), Sentiment Analysis of Opinions about Hotels Extracted from the Internet [in:] *Knowledge – Economy – Society. Global and Regional Challenges of the 21st Century Economy*, (eds.) P. Lula, B. Mikuła, A. Jaki, Cracow, Foundation of the Cracow University of Economics, pp. 755-771.

Chapter **26**

The Integration of User Documentation into Agile Development of Software

Jan Ministr, Tomáš Pitner

1. Introduction

The agile methodologies of development software are adapted to the current demand of software development, which is prompt response to changes (Highsmith, 2009). Developed functionality of required information system is often consulted with the contractors or target users and adjusted according to their needs. Agile builds on incremental work, where the changes are welcome and easily incorporated into the software product. This approach also assumes that creating increments of the software product that are potentially immediately releasable can benefit the companies and bring them an advantage on the market (Cohn, 2010). In traditional development, the unchanging factor for the project is the required functionality for which the time and costs are estimated and planned. The aim is to deliver the required functionality within the planned time scope while not exceeding the assumed expenses. On the other hand, the agile approach works with the provided resources and assigned time and tries to deliver as much functionality as possible. This way, the expected time and resources will not be exceeded, but the customer may not receive a product with all the required functionality. Whole parts of the functionality are implemented incrementally according to the customer's priorities and current conditions, but it is ensured that the customer is presented with a working product. The iron triangle principle illustrates the differences between the factors that influence the traditional and agile methods. It shows, which conditions are set and which are variable, as can be seen on Figure 1.

One of the five main principles of the Agile Manifesto (Agile Alliance, 2013) is "Working software over comprehensive documentation" (Beck, 2013). It means that the emphasis is on working software, which is delivered in small increments in defined intervals. It also promotes testing of the software for ensuring its quality and operability. This principle is often misperceived, as it is believed that the software does not need any documentation at all. Such assumption may not be favourable in projects where certain types of documentation, for example the user manuals, are needed.

Figure 1. The triple constraints in traditional and agile processes
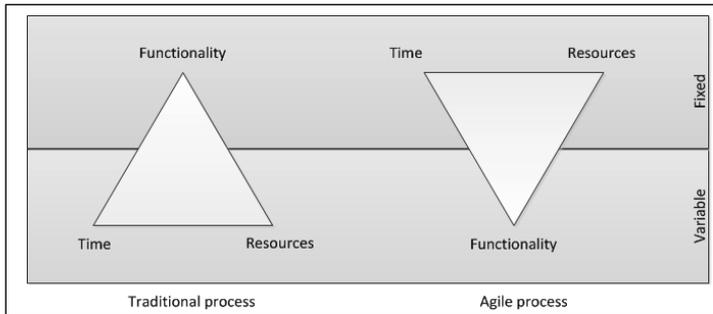
Source: Oslejšek, 2013.

Software documentation represents all written documents and materials that accompany computer software. According to (Sommerwille, 2013), software documentation can be divided into two categories:

1. *Process documentation* which records the progress of the development cycle. Into this category fall materials that are created for the purpose of keeping track of the project, passing and storing information about the project as well as plans, estimates and other information that helps make the whole process visible. Visible processes enable more effective management of projects. Types of documents from this category include project plans, test schedules, reports, standards, meeting notes or business correspondence.

2. *Product documentation* which focuses on the developed software product. These materials offer descriptions and information on the product and provide instructions on how to perform various tasks with the product. Product documentation includes:
   – *User documentation* which represents materials which are mainly prepared for end-users of the product and system administrators. They advise the users on working with the product and provide instructions on how to perform various tasks. These materials also help the system administrators install and maintain the system. User documentation includes tutorials, user guides, troubleshooting manuals, installation and reference manuals.
   – *System documentation* which represents documents that describe the system itself and its parts. System documentation includes requirements specifications, design specifications, architecture description, descriptions of functionality and interfaces, program source code listings and validation documents.

The structure of documents produced for software projects depends on various aspects. The required documents may be determined by the type of the project and its environment, contract with the customer, company politics and the methodology used for managing the software development. Each software project may need different documents. The contractor may explicitly specify that certain documents, for example the release notes, must be created for the product. The company politics also influence the required types of documents by, for example, adhering to ISO standards, which formulate additional demands on documentation materials. Traditional development methodologies rely heavily on process documentation and descriptions and specifications of the product. Agile methodologies, on the contrary, try to minimize the process documentation and emphasize the significance of oral direct face-to-face communication.

2. The ways of documentation creation and its quality

Usually people look for the documentation only when they need to, and they often have limited time and patience for finding the required information. Unfortunately, when people have bad experience with the software documentation, they generally begin to regard the documentation as unhelpful and unusable. The quality of software documentation mainly depends on its creators. The Bureau of Labor statistic United States Department of Labor (2013) defines the Technical Writer occupation as follows: "Technical writers, also called technical communicators, produce instruction manuals and other supporting documents to communicate complex and technical information more easily. They also develop, gather, and disseminate technical information among customers, designers, and manufacturers". Technical Writers are responsible to software documentation quality which according (Hargis, 2004) can be characterized by three groups of values with the following characteristic:

1. Easy to use (task orientation, accuracy, completeness).
2. Easy to understand (clarify, concreteness, style).
3. Easy to find (organization, retrievability, visual effectiveness).

In traditional approach to software development based on Waterfall, documentation is created mainly at the beginning and end of the project, as illustrated on Figure 2. At the beginning, requirement specifications are created in the form of documents describing the project to be developed, its features, attributes and behavior. The disadvantage of creating heavy project documentation at the beginning is that it is difficult to capture all properties of the product before its implementation begins. Consequently, these documents often become outdated as soon as they are created (Lacey, 2012). On other hand when Technical Writers in traditional methodologies create user documentation on the end of the project, they can explore information system with all its provided features, finished user interface and unchanging environment. The time needed to create the user documentation further extends the overall time of the project and thus postpones the product release.

Figure 2. The creating of the software documentation by traditional approaches
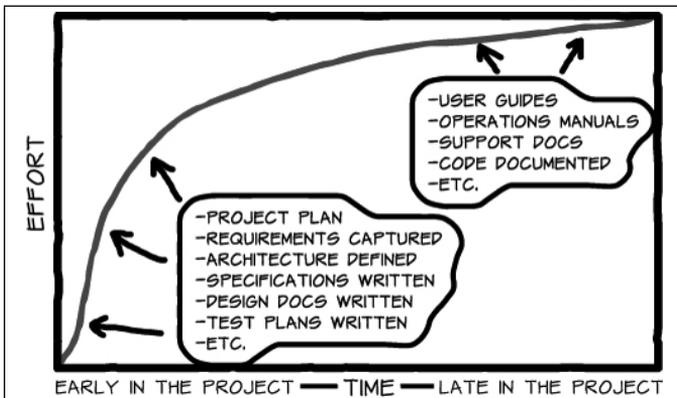
Source: Lacey, 2012.

Agile methodologies change the schedule when such documents are created. Besides, agile principles promote face-to-face communication and, consequently, minimize the amount of process documentation produced. The documentation is created throughout the whole project, as illustrated on Figure 3.

Figure 3. The creating of the software documentation by agile approaches
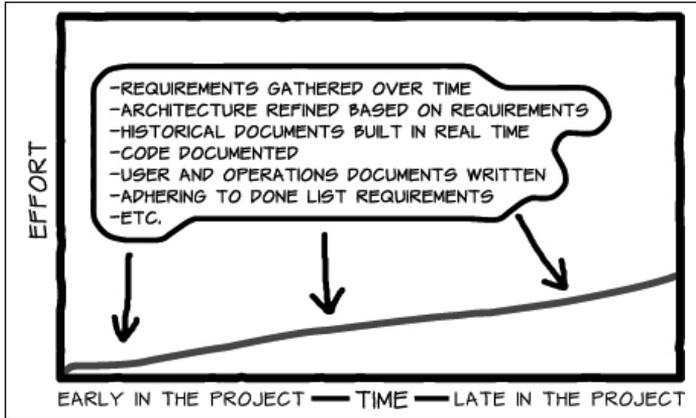
Source: Lacey, 2012.

User documentation is not created all at once at the end of the project, after the product has been implemented. It is created continuously within individual stages (Sprints) and updated as the functionality of the product develops, as illustrated on Figure 4.

Figure 4. The SCRUM framework
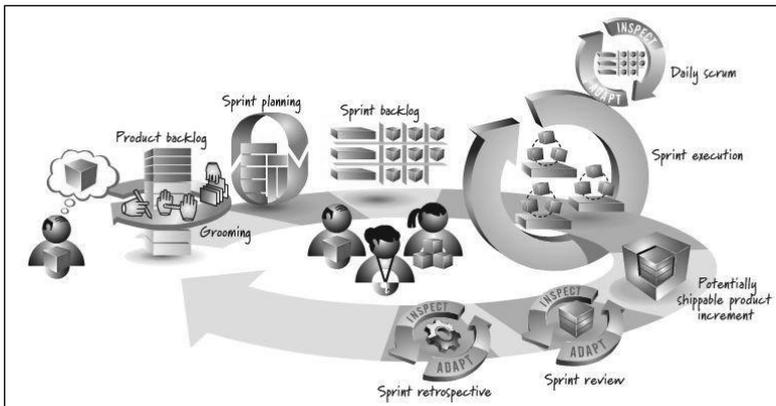
Source: Rubin, 2012.

The position of Technical Writers shifts from an independent service to a part of the process. In agile development, documentation is included in the work done during Sprints. Therefore, it is best that the Technical Writers become members of the Team in Scrum terminology

and physically move to the same office or place with the Team. Such practice encourages communication between the developers, QA engineers and the Technical Writers. It also enables the Technical Writers to participate on Scrum meetings and thus be more involved in the creation of the product, which can be beneficial for both sides. The Technical Writers closely represent the users of the system and can provide valuable feedback on the developed functionality while gaining technically accurate knowledge about the functionality directly from the members of the Team. Due to the fact that the documentation is created in Sprints, its creation cannot wait until the functionality planned for the Sprint is developed. There is usually not enough time for this left at the end of the Sprint. Therefore, it is important that Technical Writers learn to write user documentation about features that are not developed yet. They can write drafts of documentation in the form of tasks based on acceptance criteria in user stories, prototypes and wireframes and sk*etch*es of the user interface (Austin, Berry, 2013). It is certain that parts of the written fiction will have to be rewritten once the features are finished, but this way the Technical Writers can ensure that the documentation is created in time. Reviewing and rewriting parts of the documentation also make it more refined, accurate and helpful.

3. Process of document creation in the SCRUM framework

Most of agile software development methodology used for the project management methodology framework SCRUM. Process processing software documentation, as illustrated Figure 5, can then be divided into two basic parts:

1. *Planning of the Sprint*, when:
   - The Technical Writer together with the Product Owner identify user stories that will require creation or update of the documentation;
   - The Technical Writer or Product Owner creates documentation subtasks for identified user stories and specifies details and demands on the documentation;
   - The Technical Writer roughly estimates the time needed to complete the documentation for user stories chosen for the Sprint, based on previous experience during the Sprint planning meeting;
   - The Technical Writer determines whether it is possible to finish the documentation within the Sprint. If it is not possible, the Team has to find a way to help the Technical Writer with the documentation or refuse some user stories.

Figure 5. Agile documentation process
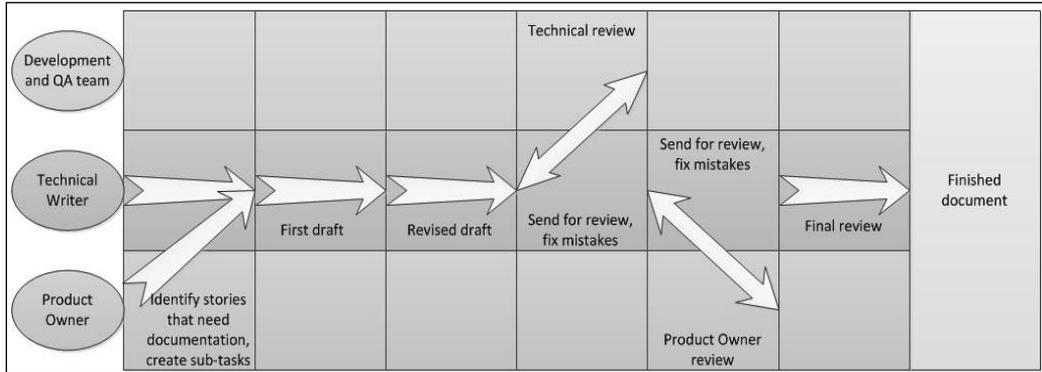
Source: Lacey, 2012 (modified).

2. *Executing of the Sprint*, when:
   - The Technical Writer writes documentation drafts for the user stories based on the information and acceptance tests provided in the description of the user stories;
   - The Technical Writer reviews the draft and tests it against the developed functionality. When an adequate draft has been created, the Technical Writer submits the draft for review by the other members of the team, who check the technical accuracy of the documents;
   - When technical mistakes have been corrected, the Technical Writer submits the documentation for review by the Product Owner, who inspects the business value of the documentation;
   - The documentation is finished when it does not contain any technical, grammatical or typographical mistakes and it adds appropriate business value approved by the Product Owner.

4. Implementation Experience

The implementation process of creating software documentation within the Scrum methodology was evaluated at Masaryk University in 2013. They were selected two development projects. Both projects and teams were fundamentally different. Each project had its specific issues and difficulties the teams had to face.

Through a discussion were identified four main difficulties that hindered the documentation process which resulted in a failure to finish the documentation in time:
- late reviews,
- lack of communication,
- new information does not reach the Technical Writer,
- unsuitable code examples.

It showed that communication and close collaboration is essential in highly productive teams. The Technical Writer is in a difficult position when trying to gain enough knowledge about the subject, and the other team members have to be available and willing to provide answers to questions. Also, the Product Owner has to understand the needs of target users of the functionality

to determine the demands of the documentation. This experience also showed that it is necessary to include the documentation into the "Definition of Done" and consider the documentation a part of the whole delivered functionality and the responsibility of the whole team. Completing the documentation within the Sprint also enables the Technical Writer to regard the work on the project as finished.

Experience gained in these two projects helped Technical Writers and other roles in the company adjust their processes and it also improved the overall functioning of the Scrum methodology in the company. The lessons learned in these projects and actions taken after them are captured in the following list:

1. Product Owners need to have only one role in the company.
2. Product Owner helps define whether the documentation is included in the Team's Definition of Done.
3. Review by the Product Owner comes before the technical review.
4. The team regards the documentation reviews with high priority.
5. Documentation is presented on Sprint review meetings along with the developed functionality.
6. Technical Writers have to carefully choose between the benefits of attending Scrum meetings and the time spent on creating the documentation.
7. A team member visits Technical Writer who is not sitting in the same office with the team.
8. A documentation backlog was created.

The two case studies presented the experience gained in two different development projects from a Technical Writer's point of view. The suggestions from the previous chapter were tried out on real projects and their impact on the resulting user documentation was assessed at the end of each of the two studies. They proved that creating quality technical documentation in agile environment is possible and that it provides benefits to the Technical Writers as well as the company.

5. Conclusion

The level of quality documentation processing software development significantly affects the overall characteristics of the software from the user's perspective. Creating software documentation is also significant at less large-scale projects, which are being developed using agile approaches. The most process of software documentation highly depends on the activity Technical Writer's. Appropriate incorporation of the software development process documentation into the Scrum methodology may be opportunities for companies gain competitive advantage through improving the required user's properties of the developed software.

Bibliography

1. Agile Alliance (2013), *Agile alliance: The Agile Manifesto*,
   http: //www.agilealliance.org/the-alliance/the-agile-manifesto [12.12.2013]
2. Austin G., Berry M. (2013), *A Writer's Guide to Surviving Agile Software Development*, http:// media.developerforce.com.s3.amazonaws.com/techpubs/agile_writers_guide.pdf [09.09.2013].

3. Beck K. et al. (2013), *Manifesto for Agile Software Development*, http://agilemanifesto.org/iso/en/ [12.12.2013].

4. Bureau of Labor Statistics, U.S. Department of Labor (2012), *Bureau of Labor Statistics, U.S. Department of Labor: Occupational Outlook Handbook – Technical Writers*, http://www.bls.gov/ooh/media-and-communication/technical-writers.htm [12.12.2013].

5. Cohn M. (2010), *Succeeding with Agile*, Addison Wesley.

6. Hargis G. et al. (2004), *Developing Quality Technical Information: A Handbook for Writers and Editors*, IBM press.

7. Highsmith J. (2009), *Agile Project Management: Creating Innovative Products*, Addison Wesley.

8. Lacey M. (2012), *The Scrum Field Guide*, Addison Wesley Professional.

9. Ošlejšek R. (2012), *Objektové metody návrhu informacních systemu*, Brno, Faculty of Informatics MU, https://is.muni.cz/auth/el/1433/jaro2012/PA103/um /prez/01_Strategie-vyvoje-sw.pdf [11.11.2013].

10. Rubin K.S. (2012), *Essential Scrum: Practical Guide to the Most Popular Agile Process,*. Addison Wesley.

11. Sommerwille I. (2013), *Chapter 30: Documentation. A Revised Chapter from the Book Software Engineering*, http://ifs.host.cs.st-andrews.ac.uk/Books/SE9 /WebChapters/PDF/Ch_30%20Documentation.pdf>[12.12.2013].

Mining the Social Media for Obtaining Credit Scoring Rate

Jakub Kanclerz

1. Introduction

The Exponential growth of the World-Wide-Web, we have witnessed during the past few years, brings great impact on the people everyday life. Globally, the total number of people using Social Media continues to increase. The first message known as electronic one, was delivered in 1965 (www.multicians.org) at Massachusetts Institute of Technology's using the Compatible Time-Sharing System (CTSS). In 1971 Ray Tamlinson who was a part of small group of programmers extended the file-transfer CPYNET protocol they were working on (http://openmap.bbn.com). That adaptation allows to deliver a message between two physically separated machines. The only 50 years are between those digital messages and moderns tweets or statuses. And in the words of Gordon E. Moore, every two years the technology are two times more perfect that it was. The physical side of Moore's law is restricted by the speed of light or the size of atom. But the only limit of abstract layer is human mind.

The communities created in the Internet let users exchange interests and opinions regardless of the political, economic, or geographic condition. The first communities was chats, messengers, forums. Nowadays, the popularity of social network portals beats new records. The raport from www.statista.com drawn in January 2014 reveals that the biggest social media portal have over 1 billion registered users (http://www.statista.com). What is more, the analysis of the behavior of Internet users points that 58% of them visit social network sites (http://www.statisticbrain.com). Furthermore, among people aged 18-24 years old it is even 98%.

These statistics are also known by entrepreneurs in a more (or less) accurate way. In no time, companies had been aware that the 1 billion registered users at Facebook are new marketing opportunities. The opinion, private information and every kind of activity on Web sites like Facebook or Twitter is part of vast quantities of data. Those data are the source of information about potential customers – who they are and what they expects. Besides, data available at social media sites are up-to-date and allow to keep the track on response to marketing moves. Exchanging the opinions, consumers reveal the product preferences. Then entrepreneurs meet their expecta-

tions and provide stock tailored to demand. Thanks to social media, and information flow within, the customer requests the product and pull it from delivery channel.

2. Scoring Model

The literature provides varying definitions of the scoring. According to an law act of the USA The Equal Credit Opportunity Act (http://www.ecfr.gov/): *Scoring is a system that evaluates an applicant's creditworthiness mechanically, based on key attributes of the applicant and aspects of the transaction, and that determines, alone or in conjunction with an evaluation of additional information about the applicant.*

The document also gives some additional characteristic of scoring model such as:
- should be based on data that are derived from an empirical comparison of sample groups,
- should be developed and validated using accepted statistical principles and methodology,
- should be periodically revalidated by the use of appropriate statistical principles and methodology.

Another definition explains the scoring as a way to apply statistical modeling to a representative of the database and create a numerical score (Stanton, 1999, p. 8).

Scoring is widely used in the evaluation of the reliability of the given individual. In addition, it can be used during the process of credit ratings or to calculate the risk associated with other financial products. Increasingly the use of scoring models in insurance companies can observed.

Scoring is the process of evaluating the phenomenon using scoring models. It assigns points to individual characteristics of the studied phenomenon, and then, basing of the results obtained, converts the result of the test to the likelihood of an event.

3. What can we find out?

Social media has gained their popularity not only by moving relationships to the Internet. They provide opportunities to integrate with already existing application, web-sites and portals. This communication is done via the API (Application Programing Interface). By releasing that sets of technologies portals like Facebook, built an apparatus that allows developers to create external applications. Those applications empower Facebook users to interact with one another in new and exciting ways–ways that are to be invented by developers.

First of all, the paper is focused on data stored in the portal and their accessibility offered by the REST API and query language FQL. FQL is a SQL-style language designed to facilitate the collection of data provided by users of the portal. In addition, Facebook makes it easy for developers to create software able to exchange information with the portal. Especially that experts prepared the official library written in PHP and Java (Graham, 2008, p. 6).

The data that can be obtained, thanks to prepared application, are detailed in the technical documentation of the Facebook API. It includes information about users such as:
- list of rated books,
- list of posts,
- user's friends list,
- user's likes list,
- links shared by user,
- photos,

- locations in which they were,
- groups to which the user belongs,

And many others. The full list can be found in the official documentation portal (https://developers.facebook.com).

4. Building of Scoring Model based on data gathered from Facebook

Scoring Model is an automatic process for client review. The output rate is based on probability of event occurrence. Based on the data from the survey, designed model assigns point value to each characteristic that in later analysis are base for decision making (Matuszczyk, 2008, p. 84). In the model developed during the research, the step of gathering data from survey will be substituted by data obtained from Facebook. The process of building the model will be based on user behavior. Their interests, posted topics and shared locations. The construction of model follows steps listed below:

- Concept
  ◦ Defining goals
- Design
  ◦ Defining good and bad customers
  ◦ Choosing base population
  ◦ Preparing data
  ◦ Selecting model estimation method
  ◦ Elaborating of characteristic and model quality

Construction of the model was based on the proposal formulated by E.M. Lewis in 1992 (Matuszczyk, 2008, p. 84). Due to the small sample used in the study, construction procedure has been simplified. The omitted stages of model's preparation has been defined as implementation and monitoring phase.

4.1. Model's construction steps

4.1.1. Goals definition

The construction of model begins with definition of goals. Developed scoring model will be used to assess the ability of the audited entity to repayment of regular obligations. The experiment requires the boarder value of the credit that customer can affords to be established. The total amount was set to 3000 PLN. That value divided the responders into two groups. The output of model is the decision to grant the credit or not to do it.

4.1.2. Definition of good and bad customer

The next assumption that must be done is the decision to place the entity as good or bad customer. The results were based on total amount of granted credit. Entities which the credit's value was greater than 3000 PLN were marked as good customers. The others, whose creditworthiness not allows to get a bank loan were distinct as bad potential customer.

4.1.3. Determination of base population

In order to create a reliable model, it is required to have a trial of bank clients or access to the data of the customer's history. The study uses the data analysis in a very limited way. Ultimately, the trial used during the construction of the system should include people interested in particular product. They may be customers who have already used the given solution or are interested in using it in the future. The target group should be large enough to cover a variety of customer behavior. Another assumption is to maintain a balance between good and bad customers. Literature recommends maintaining the 50:50 proportion. In case of difficulty in obtaining an adequate number of bad or good customers period of analysis for the group can be extended by including objects from the period preceding the survey. However it is important to adjust additional units to formed origin profile.

4.1.4. Preparation of data

The experiment was followed by internet survey. The questionnaire was prepared using dedicated internet application written in PHP. The web service brought ability to combine the answers given by users and the pieces of information gathered from their Facebook's profiles. To avoid unnecessary confusions about the studies' subject, collected information were made anonymous. Any data that could be used for identification, like name, social ids, exact locations have not been stored in any way.

Data obtained during the survey:
- Basic Features
  - age
  - sex
  - last unit of education
- Category of most recent likes
  - 1st recent
  - 2nd recent
  - 3th recent
- Interests
  - Total amount of shared movies
  - Total amount of shared music
- Locations
  - The places where user was tagged

Likes analysis

Important part of data analysis is investigation concerning users likes. Gathered data, were grouped by category according to subject. On that basis, three most popular areas of interests were picked. It was obtained by frequency analysis of like categories. The clustering, has been achieved thanks to script, designed in Ruby and PHP programming languages. That is why the response received from the Facebook became a readable and interpretable by humans.

Table 1. Exemplary user's likes frequencies

| 'Community' => 6, |
| 'Internet/software' => 4, |
| 'Restaurant/cafe' => 3, |

Source: own work.

Location analysis

The next part of data preparation, is connected to analysis of user tagged places. To estimate the variation between locations in which the user was located, distance between the most repetitive location and the others shared by user must be specified. Locations obtained using API, uses format expressed in "Signed degrees format (DDD.dddd)" (http://www.geomidpoint.com/). This notation is characterized by:

- Precede South latitudes and West longitudes with a minus sign.
- Latitudes range from -90 to 90.
- Longitudes range from -180 to 180.

To transform longitude and latitude expressed in that way into direct distance expressed in km the Harversine's formula must be used. The Haversine formula is an equation important in navigation giving great-circle distances between two points on a sphere from their longitudes and latitudes (http://en.wikipedia.org).

Table 2. Location's differentiation example of single user representing distance between live city and shared tagged places

0=> 74.255714710030801,	9 => 452.08901819769255,	18 => 1075.1145413252284,
1 => 0,	10 => 1112.341515043172,	19 => 1075.1145413252284,
2 => 1.5392609172501892,	11 => 1105.4147474208708,	20 => 1075.1145413252284,
3 => 659.82055947766958,	12 => 1123.9793430641048,	21 => 259.37361132669855,
4 => 659.82055947766958,	13 => 767.18119483039686,	22 => 1075.1145413252284,
5 => 767.18119483039686,	14 => 671.479538935454,	23 => 259.37361132669855,
6 => 671.479538935454,	15 => 1077.1168887499039,	24 => 296.0956584856425,
7 => 661.70957524131484,	16 => 1075.1145413252284,	
8 => 81.481326986229561,	17 => 1075.1145413252284,	

Source: own work.

The results were obtained using the equation implementation in a PHP programming language[1]. Such crafted data let easily determine the variability of the user's location using standard deviation.

Prepared data

The results from the experiment are listed below. Above and beyond information obtained from Facebook, responders answered the question about their incomes and expenditures. That data allows to get an approximate total amount of credit, that the interviewed person can afford.

---

[1] https://github.com/jkanclerz/Jkan/blob/master/src/Jkan/Component/Geolocation/Calculator/HaversineDistanceCalculator.php.

The tool that was used to calculate safe amount of credit is online calculator provided by bankier. pl. Other available online tools gave the same results.

Table 3. Portion of gathered data used in experiment

Ip	Age	Sex	Education	Like 1	Like 2	Like 3	Movie	Music	Localization difference	Income	Expenditure	Amount	Decision
1	24	1	U	Community	Internet software	University	0	2	401.87	2700	1800	3200	1
2	32	1	U	Professional services	Food beverages	Politician	5	1	621.31	6800	5000	6500	1
3	24	1	U	Community	Sports venue	Sports league	2	2	280.65	2000	1700	1100	0
4	30	0	U	Education	University	Local business	2	7	41.65	3950	3660	1600	0
5	24	0	U	Community	Entertainment website	Musician band	0	0	346.12	3550	1200	8450	1
6	21	0	C	Community	Musician band	Movie	13	20	215.36	1200	1100	400	0
7	26	0	U	Community	Website	Actor director	138	2	3.31	2000	1200	2800	0
8	23	0	U	Community	Health wellness website	Professional sports team	0	1	249.33	2450	2000	1600	0

Source: own work.

Legend:

Education	Sex	Amount	Decision
U – University C – College	1 – Male 0 – Female	Total amount of granted credit	Is the total amount of granted credit is greater than 3000

4.1.5. Selection of model estimation method

The neural network was selected as the model estimation method. Neural network is technical device or algorithm. It bases on process existing between biological cell. Each neuron has many inputs and single output. The network is built by direct connections between cell's output and inputs. The dependencies between cells are defined and adopted during network's tutoring process. The important feature of neuron is differentiated reaction to stimulation, that activates it. The neu-

ron inputs has own weight value calculated during tutoring process. The practice shows that neuron uses activate function to aggregate input data and send the result to the output. The credit scoring systems use multilayer perceptron network (MLP). The quantity of input layer neurons dependent on number of variables. The output layer has as many neurons as output variables is needed. Figure 1 presents the example of a feedforward neural network.

Figure 1. Example of a feedforward neural network
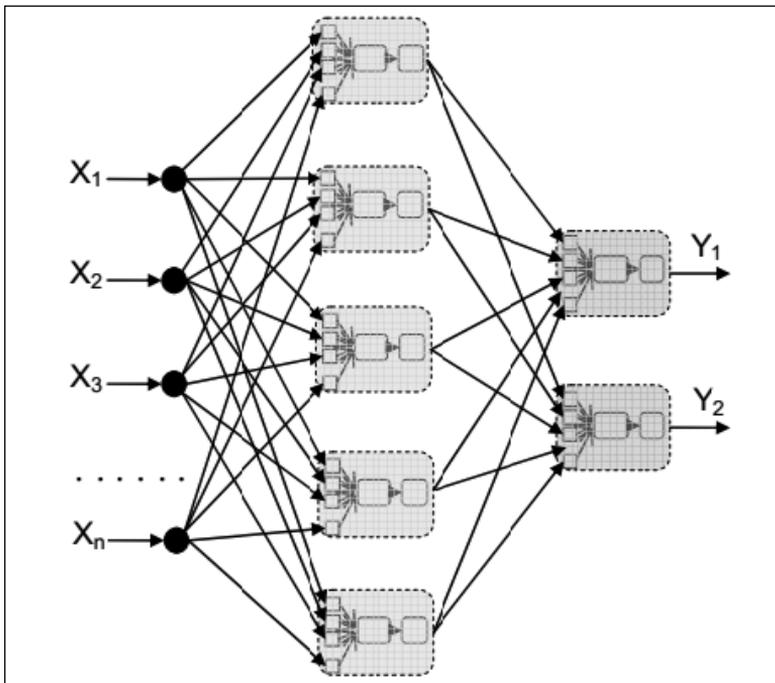
Source: Lula, Morajda et al., 2014, p. 131.

The network used in experiment has single hidden layer with sufficient number of neurons to process data. Using many hidden layers, make result's interpretation very difficult. In literature the recommendation to use single hidden layer can be found (Matuszczyk, 2008, p. 140).

Experimental nature of the model suggest to use neural network. A large variety of data and the diversity in terms of accessibility of information among respondents makes it difficult to use of statistical methods for the estimation of the model. While using neural networks is not necessary to redefined initial concepts when new conditions appears. Additionally, there is the opportunity to work with dynamic variables that remain imprecisely defined in time. The neural network allows to adapt to newly encountered cases. Moreover, estimation method using neural networks can be combined with precisely defined statistical methods (Matuszczyk, 2008, p. 143). Studies says that the solution based on neural network is free of restrictions on the distribution of variables and model errors. It is easy to find the opinions of scientists that the neural networks are the most promising method of estimation of the risk assessment (http://www.phil.frb.org/).

4.1.6. General characteristic and model quality

When the neural network has been built, the random object were used as training set. The model answers the question to grant or not to grant the credit. That is why model has been qualified as dual class. During the tutoring process each class's representation was balanced. This proportion must be kept, otherwise the neural network may not consider dependency, rather trend to recommend more numerous group.

Figure 2. Configuration of Multi-Layer Perceptron Network

Source: own work, Neural Connection.

Dual class characteristic signalizes the neuron's activation function. In the developed model, the linear function was chosen (Fig. 2). Despite it, the choice activation function is up to developer. Problems where the answer must be given as exact value, like probability, may use one of continuous functions. The neuron is able to use:
- hyperbolic tangent,
- sinusoid or cosinusoid.

The network that make use of continuous function is able to answer not only the yes or no questions (Matuszczyk, 2008, p. 139).

Figure 3. Network structure

```
Module Type: Multi-Layer Perceptron.
=====================================

Number of Inputs to the Module: 29

Number of Outputs from the Module: 4

Number of records in the training data set:    4

Number of records in the validation data set:    3

Problem Type: Decision

The Input Vectors are not Normalized before use.
The Target Vectors are not Normalized before use.

M.L.P. Network Configuration.
=============================

Automatic Hidden Layer Size Determination is active.
Number of Units in the Input Layer: 29
Number of units in Hidden Layer 1: 6
█Nodal Output Activation Function for the Layer: linear.
```

Source: own work, Neural Connection.

The building of network that will use only eight objects, gathered during the experiment has small empirical value. The aim of this research is to present a proposition of model, not to analyze the comprehensive collection of objects. The assembled data, were divided into three sets: training, testing and validation set (Fig. 3). The model estimated with few or several object is too sensitive. The result is encumbered by isolated cases.

Table 4. Neural network decision

Ip	Age	Sex	Education	Like 1	Like 2	Like 3	Movie	Music	Localization difference	income	Expenditures	Amount	Decision	Network Decision
1	26	0	U	Community	Website	Actor director	38	2	3.3130	2000	1200	2800	0	0

Source: own work.

The object from testing set was rated by network equally with bank's calculation method. However the developed model, considering sample size, is unreliable. It was not able to accurately predict decision. Tiny quantity of objects does not let to test model's properties. The model's ability of generalization can't be tested as well. Nevertheless the experiment shows, that chosen methodology could be used during credit's decision taking.

5. Conclusion

Currently, banks are no longer wondering whether to provide electronic services to customers. At that time the question is how to offer such services and how to offer that services as fast

as possible. The development of electronic banking, growing tendency of customers to use mobile banking as well as changes in the structure of demand for banking services are forcing banks to adapt to market needs. Now, widely available social media are not only virtual place to make new friends. They have been changed into the fast growing market of products and services. The data collected from social media can be used not only to improve the products, but they also can greatly simplify the procedures for access services and financial products. So far they have been lagged behind dozens of solutions shifted from the traditional model of services to provide solutions via other Internet channels. The use of an electronic system based on an analysis of data obtained from social network sites will shorten the time of their application.

It should be remembered that the introduction of scoring methods based on data gathered from the internet should comprehensively analyze the situation of the client, work with various media available and be adaptable to newly arising. Another important factor is the safety of sending information. To bring the desired effect these steps must be implemented automatically. The system established in that way will allow institutions to increase the effectiveness of using scoring of customer service and also to develop new competitive advantage. system will allow institutions to increase the effectiveness of using scoring of customer service and also to develop new competitive advantage.

The return of obtained model allows to calculate credit scoring for Social Media's active users. Bringing possibility to access finance products including credit or insurance by Social Web. Allows young, and professionally active people, living affluent but without permanent employment easily obtain finance support.

Bibliography

1. Graham W. (2008), *Facebook API Developer Guide*, Springer-Verlang.
2. Lula P., Morajda J., Paliwoda-Pękosz G., Stal J., Tadeusiewicz R., Wilusz W. (2014), *Computer Methods of Data Analysis and Processing*, Cracow, Cracow University of Economics.
3. Master L. (1997), *What's is the Point of Credit Scoring*, http://www.phil.frb.org/research-and-data/publications/business-review/1997/september-october/brso97lm.pdf.
4. Matuszyk A. (2008), *Credit Scoring*, Warszawa, CeDeWu Sp. z o.o.
5. Stanton T.H. (1999), *Credit Scoring and Loan Scoring: Tool for Improved Management of Federal Credit Programs*, Grant Report.
6. http://www.multicians.org/thvv/anhc-34-1-anec.html.
7. http://openmap.bbn.com/~tomlinso/ray/firstemailframe.html.
8. http://www.statista.com/statistics/272014/global-social-networks-ranked-by-number-of-users/.
9. http://www.statisticbrain.com/social-networking-statistics/.
10. https://developers.facebook.com/docs/graph-api/reference/v2.0.
11. http://www.ecfr.gov/cgi-bin/text-idx?rgn=div8&node=12:2.0.1.1.3.0.2.2, EQUAL CREDIT OPPORTUNITY ACT (REGULATION B) 202.2 Definitions (p) (i, ii, iii).
12. http://www.geomidpoint.com/latlon.html.
13. http://en.wikipedia.org/wiki/Haversine_formula.
14. http://www.bankier.pl/narzedzia/kalkulator-zdolnosci-kredytowej.

Chapter **28**

Empirical Measurements of Small-World Properties in University Timetable

Paweł Wołoszyn, Jacek Wołoszyn, Mateusz Dudek
Maciej Komorowski, Marcin Zgoda

1. Introduction

Small-world networks are graphs possessing specific topology of edges resulting in small shortest path lengths which on average are proportional to the logarithm of graph order. When the network is growing the average distance between any two nodes increases in a much slower rate than the number of nodes. In effect a "small world" is created where in spite of large number of vertices a chain of only a few edges is needed to travel between any two of them. Small worlds are useful as a model of both naturally existing systems like social networks or ecosystems and artificially created networks such as the Internet or power grids. The properties of such graphs can be utilized for efficient design of robust algorithms and processes operating on a large number of nodes susceptible to perturbations. This paper investigates small-world properties of university timetable which can be treated as a graph of meetings between student groups gathering at the same place and the same time. We present the results of empirical measurements of distances, degree distribution and clustering coefficients in such networks. We also discuss the interpretation of distance and connectivity in these graphs and consider the potential for practical applications of observed properties.

2. Small-world networks and their measures

Small-world networks (Watts, Strogatz, 1998) can be regarded as scientific formalization of common sense observation that the world seems to be small when measured in terms of social or similar relations. The famous and sometimes abused ,six degrees of separation' concept expresses the popular notion that in spite of large number of people involved in social structures the distance between any two persons, measured as the number of intermediate acquaintances needed to establish a link between them, is surprisingly low even if the entire world population is considered. Although this concept raises some doubts when related to real human society, still the same "small world" property has been observed and confirmed in numerous natural and man-

made systems, for example neural networks, ecosystem food chains, metabolic pathways, road networks, power grids, computer networks or Internet social media.

In theoretical models of small-world networks there are two important graph theory measures taken into consideration: clustering coefficient and average shortest path length. Clustering coefficient describes how tightly neighborhoods of vertices are interconnected and this measure can be considered more local property. On the other hand the average distance between all pairs of vertices is a global property of the network. Average distance is perhaps more directly related to the idea of 'small' or short-path world, nevertheless both measures are important for classifying a graph as a small-world network.

The phenomenon of short node-to-node distance is associated with randomness present in the graph structure, which brings irregularity into vertex degrees. Highly regular lattice graphs have long distances between nodes and the only way of shortening them is to add more edges thus raising degrees of vertices – the extreme case being the complete graph where all vertices are directly connected. Irregular graphs however can provide short node distances by diversifying node degrees and differentiating their roles. Some nodes form small but tightly knit clusters interconnected with edges forming nearly-complete subgraphs. Other nodes become high-degree hubs serving as an intermediate connection between many different clusters.

Purely random graphs, for example generated by Erdős–Rényi model (Erdős, Rényi, 1959), do not exhibit such clustering properties, although they have short distances between nodes. This is the reason for introducing clustering coefficient as another measure of graph small-world qualities. Regular ring lattice graphs have high clustering coefficient, as neighbors of any vertex are also their own mutual neighbors. Random graphs, on the other hand, have low clustering coefficient because edges in local neighborhoods have no higher probability of creation than any other edges.

In real world networks often a mixture of random and regular graph properties can be observed, when they exhibit short average path length and high clustering simultaneously. To be classified as a "small world" the network has to be disordered but not too much randomized, placed somewhere in the middle of continuous scale introduced in Watts–Strogatz model. Small worlds can be then qualitatively characterized as being both locally and globally developed, however short path length and high clustering alone are rather imprecise criterions not allowing for objective classification. This raises the problem of quantitative measuring of small-world properties in arbitrary graph. In this paper we use one of such measures proposed in (Telesford, Joyce, Hayasaka, Burdelle, Laurienti, 2011) which is based on comparing a network to both regular and random equivalent graphs. The measure ω is defined as:

$$\omega = \frac{L_{rand}}{L} - \frac{C}{C_{latt}} \qquad (1)$$

where L and L_{rand} are the average shortest path lengths of the measured network and an equivalent purely random graph respectively, while C and C_{latt} are clustering coefficients of the measured network and an equivalent reg ular ring lattice. Values of ω are independent of network size and limited $(-1,1]$ to interval. Negative values are characteristic for regular lattices, positive values are typical for random graphs and values close to zero indicate that the network has small-world properties.

Another method of probing small-world characteristics of networks is to compare their path length to the number of nodes. Typically for small-world networks the average distance between vertices grows proportionally to the logarithm of graph order. This method however is applicable

only if an entire graph collection of different orders is available, or a single graph is dynamically growing and can be observed on many different stages of growth, otherwise the proportionality is impossible to establish. In our case the timetable being analyzed exists as a single instance only and therefore we cannot take this approach.

Collecting networks of various numbers of nodes is possible if the generating mechanism is known and can be recreated in experimental setup. Unfortunately it was impossible for us to reconstruct the network building process because the timetable we analyzed was arranged semi-automatically with significant manual aid of several persons responsible for harmonizing teaching activity of the entire university. Furthermore, as the schedule coordinates four types of resources – students, teachers, rooms and time slots – it is difficult to unambiguously define the scale of timetable and decide what type of resources should be resized to create smaller timetable instance: should it contain fewer student groups, fewer teachers, fewer rooms, smaller number of weeks and hours or perhaps all of these reductions should be applied together. Time-tables semi-manually arranged according to reduced requirements could also become unrealistic and not suitable for comparison.

Instead of constructively creating variously sized networks and comparing their average path lengths, one can also take single network and perform destructive tests by removing random nodes and observing accompanying changes in network measures. Such procedure can test network robustness providing some insight into its small-world properties. Networks with high local clustering and presence of high-degree hubs are more robust than random graphs and deleting randomly picked vertex causes generally less pronounced increase in mean distance between vertices.

There is also different approach applicable which is focused on analyzing the distribution of various parameters among graph vertices, the degree distribution being the most characteristic. It is of special importance how a vertex degree distribution decays for large degrees representing network hubs. The decay regime indicates how much the network properties are related to its scale and in case of small-world networks it allows for classifying them further into three groups (Amaral, Scala, Barthelemy, Stanley, 2000). If a degree distribution follows the power law, the corresponding network is considered scale-free. If a degree distribution does not have long tail and decays fast, for instance following Poisson distribution, the network can be described as single-scale. The third and intermediate case is a broad-scale network with degree distribution consistent with power law only in a limited interval followed by a sharp cutoff.

Scale-free networks compared to other small-world networks have an abundance of hubs responsible for further reduction of vertex distances, which are even less dependent on the network scale. If a model scale-free network is growing, the average distance between nodes increases proportionally to the logarithm of the logarithm of the number of nodes and the network can be considered ultra-small world (Cohen, Havlin, 2003). To create a scale-free network a different model than that of Watts–Strogatz is needed, for example the preferential attachment Barabási–Albert model (Barabási, Albert, 1999). Watts–Strogatz mechanism generates graphs with degree distribution interpolated between degenerate distribution for regular graphs and Poisson distribution for random graphs. Thus small-world networks created according to Watts–Strogatz model can be classified as single-scale networks.

All of the above measures and classifications were applied to the timetable graph in order to determine its characteristics and decide whether it possesses small-world properties and what kind of scale dependence can be expected.

3. Timetable as a graph of meetings

University timetabling, similarly to other types of educational timetabling, is a managing tool developed to coordinate learning meetings in which students and lecturers participate according to course curricula. Each meeting involves one or more student groups, a teacher, a room and a time slot. These four resources must be allocated satisfying several constraints, the most obvious being a requirement that participants and rooms are assigned to at most one meeting simultaneously.

Arranging valid and efficient timetable is non-trivial and often difficult task in university practice, taking into consideration the number of student groups and teachers, diversity of teaching programs, individualization of curricula and presence of elective subjects. In fact the timetable construction problem is NP-complete (Cooper, Kingston, 1996) and thus in its generalized formulation it is algorithmically intractable. Therefore in automated timetabling often approximate optimization methods are used including several heuristics and artificial intelligence techniques, for example simulated annealing (Abramson, 1991), tabu search (Costa, 1994), neural networks (Kovačič, 1993) or automated reasoning (Deris, Omatu, Ohta, 2000). One specific group of methods frequently utilized in computing timetables are genetic algorithms (Burke, Newall, 1999), (Abdullah, Turabieh, 2008) and their various adaptations, for example techniques using Lamarckian inheritance (Paechter, Cumming, Luchian, Petriuc, 1994) or fuzzy genetic heuristics (Chaudhuri, De, 2010).

The NP-completeness of timetable construction is related to the fact that the task is reducible to graph coloring problem, the well-known NP-complete problem of assigning a number of colors to graph vertices without causing collisions of the same color assigned to adjacent vertices. The correspondence between timetable construction and graph coloring was pointed out very early in the research on the subject (Neufeld, Tartar, 1974) and it is still providing methods for effective timetabling, for example (Burke, Elliman, Weare, 1994). Some of these methods are in fact crossovers between graph coloring and other approaches like genetic metaheuristic (Erben, 2001) or even hyper-heuristics (Burke, McCollum, Meisels, Petrovic, Qu, 2007).

In this paper also a graph-based approach to timetable analysis is presented, however in contrast to other works it does not focus on generating timetables. Instead we take already constructed university timetable and make it an object of interest by converting it to specific graph of meetings between student groups. The purpose of creating graph representation is not connected with evaluating the quality of constraints satisfaction but with measuring small-world properties of the timetable. The main reason behind presented approach is the observation that student groups assigned to the same room meet themselves if their time slots are adjacent. According to that, besides being a collection of meetings between students and teachers, the timetable can also be interpreted as a set of meetings between students belonging to different groups.

To obtain the graph of meetings we start with the set of vertices which represent unique student groups appearing in the timetable. According to the practice common in Polish universities students are assigned to groups corresponding to their study programs, which are only little individualized as elective lectures account only for a minority of subjects. It is the rule therefore that each student belongs to only one group during each academic year. Such system simplifies timetabling because time and place constraints are applied on the level of entire groups and not individual students. The drawback is the lack of timetable accommodation for non-typical cases, like for example students following two different curricula at the same time. For our analysis

this rather rigid grouping results in smaller number of vertices in constructed graph than it could contain if groupings were more individualized and students belonged to multiple groups.

In the next step the graph is built by adding edges between groups which meet each other in the course of a single week. Two groups are connected if two conditions are met simultaneously: first, both groups have to be assigned to the same room in the timetable and second, the time slots for both groups have to be either identical or scheduled immediately one after another with only a short break allowed. The former case takes place whenever two or more groups are attending a lecture in a larger auditorium. The latter case occurs when one group is leaving a room while another is about to enter the same room.

Edges and the graph itself are undirected as the meetings are mutual. Some meetings can have many-to-many characteristics, for example when two lectures for several groups are scheduled in adjacent time slots in the same room. All of these groups leaving or entering a lecture hall form a clique in the graph. No loops are permitted in the graph because it would make no sense to explicitly indicate that a group meets itself on every occasion. The graph is also simple and does not contain multiple edges despite the fact that meetings of any two groups can repeat many times during one week. Because multiple meetings are reduced to only one edge and events in the same location separated temporally by one or more time slots are not counted as meetings, the graph contains less information than the original timetable and cannot be treated as its equivalent.

Semesters in Polish universities typically last for 15 weeks and weekly schedule repeats in more or less exact copies for the entire semester. Some differences between weeks are inevitable due to variations in courses length and periodicity, and sometimes religious or national holidays force the timetable planners to move meetings to different time slots in atypical weeks. For this reasons we have decided that each week will be represented as separate graph. The timetable thus produces a collection of at most 15 graphs which are analyzed independently and their measures are averaged when necessary for drawing conclusions.

4. Empirical measurements and results

The source for our analysis is the timetable of Cracow University of Economics, available online at (CUE Timetable, 2014) published for the summer semester of 2013/14 academic year. This particular timetable has several advantages simplifying its analysis and enriching its complexity:

- schedule planning is centralized for the entire university, so it can be expected that the method used for assigning rooms and time slots is consistent across all student groups,
- all faculties use the same resources available on the university campus and the same time slots, so student groups following various curricula are unlikely to be isolated from each other,
- the timetable is publicly available in both human-readable HTML form and in XML form ready for automated processing, which makes it easy to compile several documents into one meeting database.

The timetable in fact consists of two distinct sections ranging from Mondays to Fridays and from Fridays to Sundays, containing activities for intramural and extramural (non-resident) students respectively. Weekend activities for extramural students are not overlapping with the other section and there is much more irregularity and non-uniform distribution of meetings in weekend schedule, which would result not only in introducing disconnected subgraphs but also in signifi-

cant diversification of successive graphs characteristics. Therefore we decided to reject weekends and analyze only intramural part of the timetable which is much more regular and repetitive. Furthermore we rejected also the last week from the semester which turned out to be incomplete.

As a result we obtained a collection of 14 graphs, 12 of them already connected and the other two requiring removal of no more than 4 disconnected vertices to become connected. Graphs contain on average about 360 student groups (corresponding to about 10 thousand students) and 3600 meetings. Figure 1 shows sample visualization of a single graph from the collection. One can notice the abundance of high-degree vertices and the presence of tightly knit local neighborhoods. It visually suggests that the network should be noticeably clustered and traveling between any two nodes should require passing through only a few edges. In fact all graphs have relatively small diameter of 6 or 7 edges. The detailed measurements performed on the graph collection are summarized in Table 1.

Figure 1. Visualization of example meeting graph extracted from CUE timetable
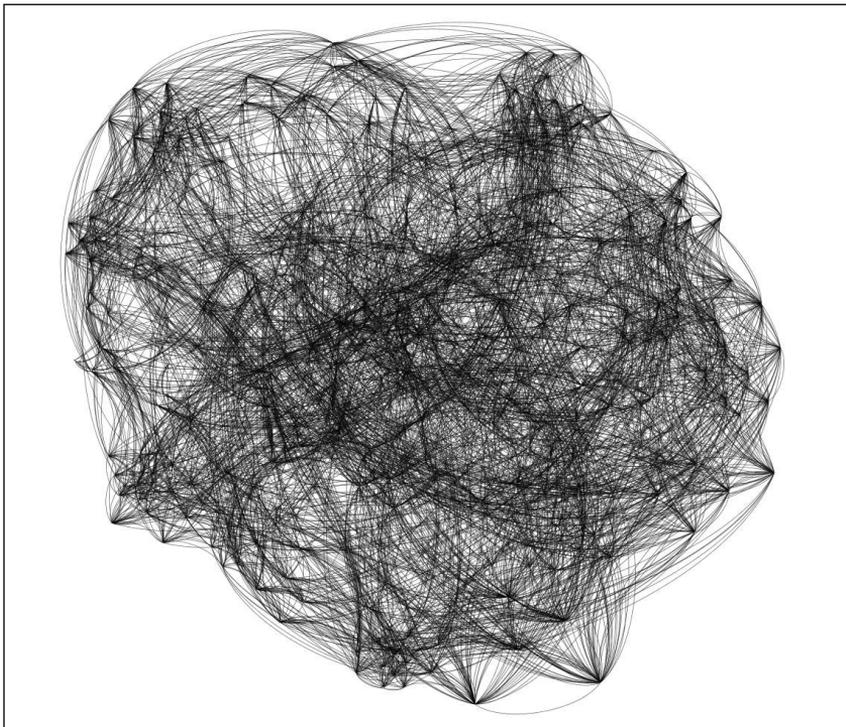
Source: own work.

Table 1. Parameters measured in 14 weekly meeting graphs of CUE timetable

Measure	Mean value	Standard deviation	Min – max range
Graph order	358	7.8	337-368
Graph size	3602	777	2,262-4,817
Clustering coefficient	0.39	0.04	0.35-0.49
Average distance per graph	2.68	0.22	2.44-3.20
Diameter	6.14	n/a	6-7

Source: own work.

The most interesting measure is the mean shortest path length which turned out to be quite low in comparison to the network order: to establish a link between any two students drawn from 360 existing groups only 2.7 meetings are needed on average. Also, with negligible exceptions, graph connectedness ensures that there are no isolated groups or clusters unreachable from any other group. It suggests that the network of meetings is likely to possess some small-world properties.

Before investigating it further we checked the distribution of vertex distances (Fig. 2). The most often encountered values are 2 and 3 edges and hardly ever (1% of all pairs) distances reach 5 or more edges. The more realistic diameter could be then assessed at 4, disregarding few extreme cases. It provides even stronger suggestion of small-world features in meeting graphs.

Figure 2. The distribution of distances between vertices in meeting graphs. Error bars represent standard deviation in graph collection
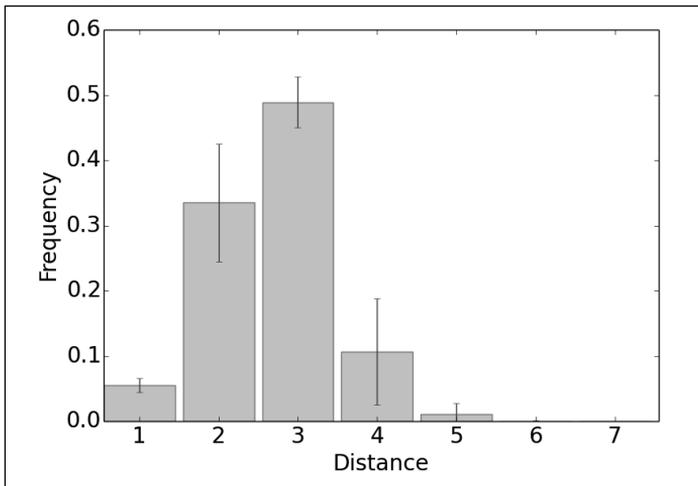
Source: own work.

Next we checked vertex degree distribution in timetable graphs, averaged across the entire collection, and compared it to theoretical network models generated with the same number of vertices and edges (Fig. 3). Timetable graphs have unimodal degree distribution with maximum at 15 and mean value of 20. It does not fit Poisson distribution characteristic for purely random graphs and neither does it match Watts–Strogatz graphs which have even narrower distributions.

The meeting graphs degree distribution cannot also be fitted with normal or log-normal distribution. Although on the figure the distribution does not seem to decay fast, it does not have a heavy tail, typical for scale-free networks, either. Fitting a power law to this distribution results in poor fit and gives rather unrealistic exponent value around 8.2, even if only a limited range of degrees is fitted. Therefore we conclude that the meeting graph is a single scale network.

Figure 3. The degree distribution of timetable meeting graph compared to scale-free Barabási-Albert network and Erdős-Rényi random graph of the same order and size
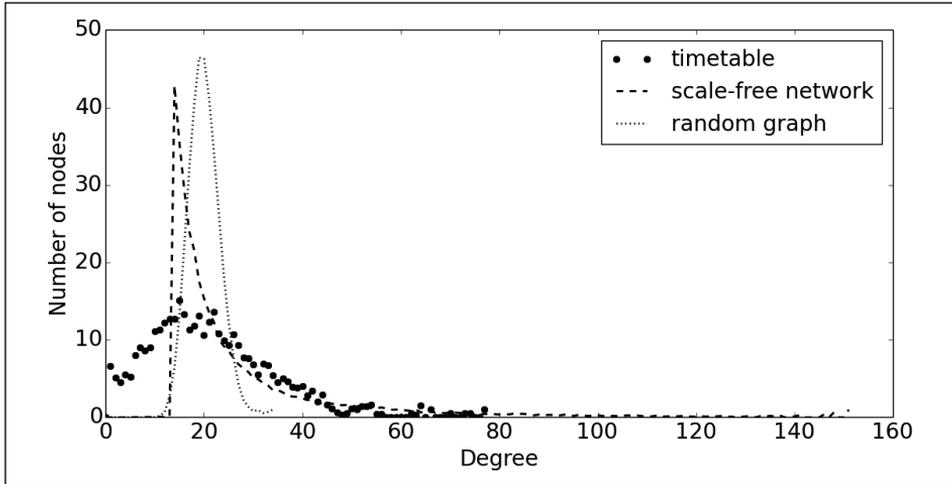
Source: own work.

To estimate how much of small-world characteristics the timetable graph exhibits, we computed the ω measure cited above, although using different graphs as a reference for comparing clustering coefficient and path lengths. Instead of performing randomization and "latticization" procedures used originally in (Telesford, Joyce, Hayasaka, Burdette, Laurienti, 2011) we simply generated random and lattice graphs with the same order and size using Watts–Strogatz model with rewiring probability set to 1 and 0 respectively. This approach is simpler and does not require access to mentioned algorithms, nevertheless it gives similar results when compared to original formulation (Tab. 2).

Table 2. Comparison of ω measures of the same American football games network (Girvan, Newman, 2002) computed using original method (Telesford, Joyce, Hayasaka, Burdette, Laurienti, 2011) and our modified method

Measure	Latticized	Original network	Randomized
ω – original method	−0.60	0.29	0.89
ω – modified method	−0.64	0.32	0.89

Source: own work.

For the timetable graph collection we obtained on average $\omega = 0.29$ (Tab. 3). The result confirms that these networks exhibit small-world properties.

Table 3. Clustering coefficient *C*, average distance *L* and *ω* measure of meeting graphs (averaged for the entire collection) and equivalent Watts-Strogatz lattice and random graphs. Grayed cells highlight reference values for calculating *ω* of timetable graph

Measure	Lattice	Timetable	Random graph
C	0.71	0.39	0.05
L	9.47	2.68	2.25
ω	−0.76	0.29	0.93

Source: own work.

5. Conclusion

University timetable can be perceived not only as a time management tool or a result of optimization task, but also as a foundation of an intricate network of meetings between students belonging to numerous groups. These meetings occur as a side effect of gathering students at the same physical location and the same or adjacent time slots. Timetabling algorithms and strategies are not targeted at optimizing the network of inter-group meetings, nevertheless they are capable of indirectly creating such network which in our case occurred to be a single scale small world.

The connectedness of meeting graph means that during every week of semester all groups directly or indirectly meet each other, disregarding only a few single exceptions. There are no isolated clusters regardless of faculty or curriculum the groups are belonging to. It can be interpreted as highly cohesive, or monolithic timetable providing foundation for tightly connected pan-university students community, as opposed to alternative variant with disconnected populations of groups studying in different faculties. This property is determined both by university campus architecture and timetabling strategy. The architecture allows for high students mobility and creation of high degree hubs by providing large lecture halls able to accommodate several groups at once. The timetabling strategy noticeably utilizes the opportunity for dispersing teaching tracks among all possible locations. It is difficult to determine what rules decide which groups will meet at the same location, if there are any such rules at all. Judging from the degree distribution there is no preferential attachment or similar scheme involved and it should be most likely assumed that manual or automatic timetabling systems do not explicitly analyze inter-group meetings when allocating university resources.

Small values of distances between groups and their narrow distribution make the community even more integrated. It is somewhat surprising that among 10 thousand students nearly all of them can be reached with the help of up to three intermediaries who meet themselves during the breaks between lectures. It should be noted however that we have not yet considered the temporal ordering of meetings (it will be analyzed in our further research) and it is possible that causality-preserving unidirectional link between some groups requires more than one week to complete because some meetings must occur before others.

The network of meetings with its small-world characteristics can be a significant and undervalued addition to other relations binding the community of students within the university, like for example dormitory acquaintances, online communities or sport societies. It can enrich community ties and facilitate propagation of news, opinions, trends or gossips, although it could be difficult to isolate this effect from the influence of other social networks. On the other hand

the meeting network can be directly utilized in some practical application, for example a distributed courier network capable of physically delivering books, notes or similar packages between students. Another possible application is a distributed lending facility. Such applications have to be driven by computer system designed for searching and optimizing meeting chains although with current mobile technology the use of such system should be straightforward, the main inconvenience being the necessity for users to wait for meetings between lectures. More specific simulations testing the robustness of meeting network are needed to estimate effectiveness and reliability of this kind of distributed applications which will become the topic of our further research.

Bibliography

1. Abdullah S., Turabieh H. (2008), *Generating University Course Timetable Using Genetic Algorithms and Local Search. Third International Conference on Convergence and Hybrid Information Technology*, Busan, IEEE, pp. 254-260.
2. Abramson D. (1991), Constructing School Timetables Using Simulated Annealing: Sequential and Parallel Algorithms, *Management Science*, 37(1), pp. 98-113.
3. Amaral L.A., Scala A., Barthelemy M., Stanley H.E. (2000), Classes of Small-World Networks, *Proceedings of the National Academy of Sciences*, 97(21), pp. 11149-11152.
4. Barabási A.-L., Albert R. (1999), Emergence of Scaling in Random Networks, *Science*, 286(5439), pp. 509-512.
5. Burke E.K., Newall J.P. (1999), A Multistage Evolutionary Algorithm for the Timetable Problem, *IEEE Transactions on Evolutionary Computation*, 3(1), pp. 63-74.
6. Burke E.K., Elliman, D.G., Weare R. (1994), A University Timetabling System Based on Graph Colouring and Constraint Manipulation, *Journal of Research on Computing in Education*, 27, pp. 1-16.
7. Burke E.K., McCollum B., Meisels A., Petrovic S., Qu R. (2007), A Graph-Based Hyper-Heuristic for Educational Timetabling Problems, *European Journal of Operational Research*, 176(1), pp. 177-92.
8. Chaudhuri A., De K. (2010), Fuzzy Genetic Heuristic for University Course Timetable Problem, *International Journal of Advance Soft Computing Application*, 2(1), pp. 100-123.
9. Cohen R., Havlin S. (2003), Scale-Free Networks Are Ultrasmall, *Physical Review Letters*, 90(5), 058701-1-4.
10. Cooper T.B., Kingston J.H. (1996), The Complexity of Timetable Construction Problems, *Lecture Notes in Computer Science* (1153), pp. 281-295.
11. Costa D. (1994), A Tabu Search Algorithm for Computing an Operational Timetable, *European Journal of Operational Research*, 76(1), pp. 98-110.
12. Cracow University of Economics (2014), *CUE Timetable*, from CUE website: http://planzajec.uek.krakow.pl/ [25.05.2014].
13. Deris S., Omatu S., Ohta H. (2000), Timetable Planning Using the Constraint-Based Reasoning, *Computers & Operations Research*, 27(9), pp. 819-840.
14. Erben W. (2001), A Grouping Genetic Algorithm for Graph Colouring and Exam Timetabling [in:] *Practice and Theory of Automated Timetabling III*, (eds.) E. Burke, W. Erben, Berlin Heidelberg, Springer, pp. 132-156.

15. Erdős P., Rényi A. (1959), On Random Graphs I. *Publicationes Mathematicae*, *6*, pp. 290-297.
16. Girvan M., Newman M.E. (2002), Community Structure in Social and Biological Networks, *Proceedings of the National Academy of Sciences*, 99(12), pp. 7821-7826.
17. Kovačič M. (1993), Timetable Construction with Markovian Neural Network, *European Journal of Operational Research*, 69(1), pp. 92-96.
18. Neufeld G.A., Tartar J. (1974), Graph Coloring Conditions for the Existence of Solutions to the Timetable Problem, *Communications of the ACM*, 17(8), pp. 450-453.
19. Paechter B., Cumming A., Luchian H., Petriuc M. (1994), Two Solutions to the General Timetable Problem Using Evolutionary Methods, *Proceedings of the First IEEE Conference on Evolutionary Computation*, Orlando, IEEE, pp. 300-305.
20. Telesford Q.K., Joyce K.E., Hayasaka S., Burdette J.H., Laurienti P.J. (2011), The Ubiquity of Small-World Networks, *Brain Connectivity*, 1(5), pp. 367-375.
21. Watts D.J., Strogatz S.H. (1998), Collective Dynamics of "Small-World" Networks, *Nature*, 393, pp. 440-442.

Chapter **29**

Applications of the Functional Data Analysis for Extracting Meaningful Information from Families of Yield Curves and Income Distribution Densities

Daniel Kosiorowski, Dominik Mielczarek
Jerzy Rydlewski, Małgorzata Snarska[1]

1. Introduction

Multivariate data analysis allows the study of observations, which are finite sets of numbers. On the other hand economic data usually are usually represented in the form of functions, *i.e.* specific models under economic theory considerations.

Functional data analysis (c.f. Ramsay et al., 2009; Ramsay, Silvermann, 2005) is a part of modern multivariate statistics that analyses data providing information about curves, surfaces or anything else varying over a continuum. The continuum is often time, but may also be spatial location, interest rate, obtained income, probability, *etc*.

In this paper we show how to use selected tools of the FDA in a process of exploring useful information from yield curves and probability densities of income distributions.

Our considerations involve in particular functional principal components and functional factor modelling framework. We use them for finding the main ways in which the curves vary between clusters of economic objects.

2. Methodological framework

As stated previously, data concerned by functional data analysis (FDA) provide information about different patterns such as curves, surfaces or any other functions. The domain is often time. The data may be very accurate and hence error can be ignored, or may be subject to substantial measurement error.

Functional data analysis often make use of the information in the slopes, curvatures of curves, *etc.*, as reflected in functions' derivatives. That is why we need to assume that functions, we are estimating, are smooth. Plots of first and second derivatives of functions may reveal important aspects of the processes generating the data we analyze. Hence, curve estimation methods may play a critical role in functional data analysis. It greatly improves the power of FDA methods, and leads to purely functional models. It is important to remark that the notion of functional variable covers a larger area than curves analysis. A functional variable can be a random surface or a vector of curves or any other more sophisticated infinite dimensional mathematical object.

The goals of functional data analysis are the same as those of any other branch of statistics. They include representing and displaying the data so as to highlight various hidden characteristics, studying important sources of pattern and variation among the obtained data, explaining variation in a dependent variable, comparing sets of data with respect to different types of variation.

To sum up, the basic philosophy of FDA is that we should think of observed data functions as single entities, rather than merely a sequence of individual observations. The term functional refers to the intrinsic structure of the data rather than to their explicit form. We are concerned with a collection of functional data, rather than just a single function x. But in practice, functional data are usually observed and recorded discretely – in other words, they are points. A record of a functional observation x_i at moment j consists of pairs (t_j, y_{ij}) at moments $j = 1, ..., n_i$, where y_{ij} is a recording or observation of $x_i(t_j)$, a value of the function at the argument value t_j. Note, that in this situation, the functional feature does not come directly from the observations. It is possible that the argument values t_{ij} are the same value for each record, but often they may vary from record to record. Intervals between points might not be equal.

Assume for further considerations that a functional datum for replication i arrives as a set of discrete measured values, $y_{i1}, ..., y_{ini}$, and the first aim is to convert these values to a function x_i with values $x_i(t)$ computable for any argument value t.

The simplest way to convert data to functions is the interpolation schemes, *i.e.* joining each pair of adjacent observations by a straight line segment. Unfortunately, this approach is not adequate if we require any derivative information. Consequently, we should consider some techniques for converting raw functional data into functional form. Because some noise is part of most data, the functional representation of raw data involves some smoothing. For this reason special attention should be given to estimating derivatives, since these are important in many functional data analyses.

We assume that we can evaluate any of its derivatives $D_m x$ that exist at t. Only discrete values are actually available, so evaluating $x(t)$ and $D_m(t)$ at any arbitrary value involves some form of interpolation or smoothing of these discrete values.

The problem is functional rather than multivariate because it is assumed that functions x_i lie behind the data. We assume that the range of values for the argument t is a bounded interval T, and that x satisfies reasonable continuity and smoothness conditions on T. Without some regularity conditions, it is impossible to draw any conclusions at all about values $x(t)$ for any points t apart from actual observation points.

In order to use FDA techniques we need to transform function x_i into a function with values $x_i(t)$ with interpolation or smoothing. Now we need to discuss various smoothing methods designed for direct observational error.

We build function in two steps. We define a set of functions ϕ_k called *basis functions*. We set up a vector, matrix, or array of coefficients to define the function as a linear combination

of these chosen basis functions. The functions that we wish to model are periodic or aperiodic. The Fourier basis system is the usual choice for periodic functions, and the spline basis system tends to serve well for aperiodic functions. Due to our applications/examples we are interested in the latter.

We need a useful strategy for constructing functions that works well with parameters that are easy to estimate and that can accommodate nearly any curve. On the other hand, obviously, we do not want to use more parameters than we need. We use a set of functions ϕ_k, where k = 1,…,K, called *basis functions*, which are combined linearly. That is, a function $x(t)$ defined in this way is expressed as

$$x(t) = \sum_{k-1}^{K} c_k \phi_k(t) = c'\phi(t).$$ (1)

The parameters $c_1, c_2, …, c_K$ are the *coefficients* of the expansion. The matrix expression in the last term uses c to stand for the vector of K coefficients and ϕ to denote a vector of length K containing the basis functions.

The number K of basis functions determines the degree to which the data y_j are smoothed. Assume that the n × K matrix of basis function values at the observation points $\Phi = \{\phi_k(t_j)\}$ is of full rank. In such case an exact representation is possible when K = n, *i.e.* we can choose the coefficients c_k such that $x(t_j) = y_j$ for each j. The simplest linear smoother is determined if we calculate the coefficients c_k by minimizing the least squares criterion:

$$SMSSE(y|c) = \sum_{j=1}^{n} \left[y_j - \sum_{k=1}^{K} c_k \phi_k(t_j) \right]^2$$ (2)

which in matrix notation is $SMSSR(y|c) = (y - \Phi c)^T W (y - \Phi c)$.

This criterion is easily minimized by the solution $c = (\Phi^T \Phi)^{-1} \Phi^T y$ and smoothing matrix is given by $S = \Phi(\Phi^T \Phi)^{-1} \Phi^T$

However, if the evaluation points are not the same as the observation points, then the smoothing matrix is given by $S = \tilde{\Phi}(\Phi^T \Phi)^{-1} \Phi^T$, where matrix $\tilde{\Phi}$ have elements $\Phi_j(s_j)$ and the evaluation points s_j are not the same as the observation points. The least squares criterion is now:

$$SMSSR(y|c) = (y - \Phi c)^T W (y - \Phi c)$$ (3)

where W is a known symmetric positive-definite weighting matrix. This estimates of the coefficients c is then $c = (\Phi^T W \Phi)^{-1} \Phi^T W y$ and in a case, where the evaluation arguments and the data arguments are the same, the smoothing matrix is:

$$S = \Phi(\Phi^T W \Phi)^{-1} \Phi^T W$$ (4)

Here an interesting question appears: how should be chosen the order of the expansion K? As K can take only integer values, it implies that control over smoothing may be rather difficult. The localized least squares methods and smoothing splines methods indicate how to improve

the control. When n is large, efficient computation is crucial and we need efficient and stable least squares algorithms.

Choosing a good basis is another issue as there is no such thing as a good universal basis. Good basis should possess features matching those known to belong to the functions being estimated. It means that such a basis would enable excellent approximation using a comparatively small value of K and would need less computation. The proper choice enables functions' derivatives estimation. However, bases that work well for function itself may give poor derivative estimates. It is due to the fact that a precise representation of the observations may cause functions' estimates to have small and high-frequency oscillations. One criterion for choosing a basis may be number of the well estimated derivatives approximants.

The number of basis elements is often chosen using the Akaike Information Criterion (AIC) or Bayes Information Criterion (BIC). We use the criterion for various functions and then we count the average of the indicated number of elements for each function.

Let discuss a popular base widely used in the practice. Spline bases are more flexible and thus more complicated than finite Fourier series. We divide the interval of observation into subintervals, with boundaries at points called break points or simply breaks. Polynomial splines are the functions constructed by joining polynomials together smoothly at values called knots. A polynomial spline is a polynomial of fixed degree K_2. Knots are related to the break points *i.e.* every knot has the same value as a break point, but there may be many knots at certain break points. Let the number of these knots be indicated by K_1+1, so K_1-1 is the number of interior knots. At each break point, neighboring polynomials are required to have a certain number of matching derivatives. The number of matching derivatives is determined by the number of knots located at that break point, *i.e.* if only one knot is positioned at a break point, the number of matching is two less than its order. The most common choice of degree is 3. The continuity of the first two derivatives of a spline of degree 3 means that the curve is visually smooth. Polynomial splines aggregate the computability of polynomials with the capacity for changing local behaviour and excellent flexibility.

The simple way to represent polynomial spline is as a linear combination of the basis functions:

$$\phi_k(t) = (t - \tau_k)_+ K_2 \qquad (5)$$

where values τ_k are knots and $(f)_+$ equals f, when $f \geq 0$ and 0 otherwise. Notice, that only the $K_1 - 1$ interior knot values are used. This representation is called the *truncated power basis*.

This basis must be then enlarged by the monomial basis $t_k, k = 0,\ldots,K_2$ so that a complete polynomial spline of order K is obtained. The total number of basis functions is therefore $K = K_1 + K_2$, which is the degree of the piecewise polynomial plus the number of interior knots. This basis often produces nearly singular cross-product matrices. There is also a problem if there is a small number of knots. Therefore, *B-splines* which have *compact support* are used.

The choice of knots may often be rather arbitrary. However, some approaches suggest that we should choose a quite dense set of knots and then eliminate unnecessary knots by some algorithm.

Note, that there is typically only a single knot at every break point except for the boundary values at each end of the whole range. The end points are attributed as many knots as the order of the spline.

3. Functional Principal Components for income distribution exploration

A concern about income and wealth distribution has long history in the economic debate. The first economists who specified and fitted an income distribution model was V. Pareto. The Pareto function however fits the data fairly well toward the higher levels but the fit is poor toward the lower income levels. Nowadays there is a variety of income models which are used for tax purposes, or exist in a public debate concerning social justice and social solidarity. Economists are still looking however for some regularities, general rules governing a shape of the income distribution in a relation to a degree of social or economic of a country. The derivation of a function that describes the size distribution of incomes is of crucial importance. It is still not clear, why certain economic systems income distributions are ruled by the Pareto law whereas for the others are ruled by the lognormal or gamma rule. In order to solve this problem functional Principal Component Analysis was involved (c.f. Kosiorowski, Mielczarek, Rydlewski, Snarska, 2014).

Principal components analysis (PCA) is often the first method that we use to analyze functional data. Functional principal component analysis (FPCA) is a statistical method that enable investigating the dominant modes of variation of functional data. We use a representation of the random function in the eigenbasis. This is an orthonormal basis of the Hilbert space L^2 and it consists of the eigenfunctions of the autocovariance operator. Then the set of eigenfunctions, associated with each eigenvalue, explains more variation than any other basis expansion. Consequently, we can apply a rotation to them, so that without changing the total amount of common variation, we obtain interpretable results of the dominant modes of variation in the functional data.

Statistical variation is usually summarized by both the covariance matrix and the correlation matrix. Multivariate analyses are usually based on the correlation matrix. When we have a functional observation the estimated covariance function

$$v(s,t) = \frac{1}{N-1}\sum_i \left[x_i(s) - \overline{x}(s)\right]\left[x_i(t) - \overline{x}(t)\right] \qquad (6)$$

and the cross-product function $c(s,t) = \frac{1}{N}\sum_i x_i(s)x_i(t)$.

We are looking for a probe ξ which in a best way underlines a variability of the data. In other words we are searching for a weight function $\xi(t)$, for which a function $\rho_\xi(x_i) = \int \xi(t)x_i(t)dt$ takes maximal value. It is common to use a size restriction on weight function ξ *i.e.* $\int \xi^2(t)dt = 1$.

This problem may be turn into a problem:

$$\mu = \max_\xi \left\{\sum_i \rho_\xi^2(x_i(t))\right\} \qquad (7)$$

subject to the condition $\int \xi^2(t)dt = 1$

μ and ξ are often called the largest eigenvalue and eigenfunction, respectively, of the estimated variance-covariance function v.

We can construct recursively a nonincreasing sequence of eigenvalues $\mu_1 \geq \mu_2 \geq \dots \geq \mu_K$ in such a way that each new eigenfunction, is orthogonal to those already computed on previous steps, *i.e.* $\int \xi_j(t)\xi_l(t)dt = 0, \ j = 1,\dots,l-1$ and $\int \xi_l^2(t) = 1$. For details see Ramsay et al. (2009) and Krzyśko et al. (2012).

In multivariate analysis eigenvalues and eigenvectors are computed from equation

$$V\xi_j = \mu_j \xi_j. \tag{8}$$

The method is essentially the same for functional data. We calculate eigenfunctions ξ_j of the bivariate covariance function v(s, t) which are solutions of the functional eigenequation $\int v(s,t)\xi_j(t)dt = \mu_j\xi(s)$.

PCA techniques of multivariate analysis are analogous to the PCA of functional data analysis. We replace summation over integer indices by integration over continuous indices such as t. However, there is one great important difference between multivariate and functional PCA. The reason is the fact that, whereas in multivariate data the number of variables p is usually less than the number of observations N, in functional data the number of observed function values n is usually much greater than N. That's why the maximum number of nonzero eigenvalues in the functional context is often equal to N-1.

Usually we choose an orthonormal basis of *l* elements that can be used to approximate the sample functions x_i. The basis is good in the sense that the total error sum of squares is the minimum achievable with the fixed number of basis functions.

It turns out that there is a relationship between the optimal total squared error and the eigenvalues that are removed:

$$PCASSE = \sum_{j=l+1}^{N-1} \mu_j \tag{9}$$

Therefore we choose a number of harmonics *l* after **some** inspection of a plot of the eigenvalues μ_j against their indices j.

The coefficient vectors c_i, where $i =1,2,\dots,N$ contain the coefficients c_{ij} defining the optimal fit to each function x_i. They are referred to as *principal component scores*.

They are defined by the following equations

$$c_{ij} = \rho_{\xi_j}(x_i - \overline{x}) = \int \xi_j(t)[x_i(t) - \overline{x}(t)]dt. \tag{10}$$

They can be helpful in interpreting the nature of the variation identified by the PCA.

Note, that eigenfunction basis is not unique. For any nonsingular square matrix L of order equal to *l*, the system of equations Φ=Tξ is also optimal. It spans the same functional subspace as the subscace spanned by the eigenfunctions.

If $T^T = T^{-1}$ the matrix is often referred to as rotation matrix and the new system Φ is orthonormal as well.

If $l > 1$ then we are forced to searching among the infinite number of alternative systems of equations $\Phi = T\xi$ to find the one where all of the orthonormal basis functions ϕ_j are better for some substantial reason. It is often a matter of choosing a rotation matrix T.

See Jolliffe (2005) for further information on principal components analysis.

We performed FPCA empirical study using census data from MINESSOTA POPULATION CENTER (https://international.ipums.org/international/). We considered data on TOTAL IN-COME from the following countries:

1. PANAMA **1960, 1970, 1980, 1990, 2000, 2010,**
2. MEXICO **1960, 1970, 1990, 1995, 2000, 2005, 2010**
3. PUERTO RICO 1970, 1980, 1990, 2000, 2005
4. CANADA 1971, 1981, 1991, 2001
5. BRAZIL 1960, 1970, 1980, 1991, 2000, 2010
6. USA 1960, 1970, 1980, 1990, 2000, 2005, 2010

For each case we considered only nonzero observations smaller then third quartile of the income. For comparison purposes, we standardized the data by dividing them by their medians. For each case the density was estimated by means of the local linear polynomial estimator which is available within the {locfit} R package in equally spaced grid of 500 points. Next we performed FPCA for the estimated densities using B-spline basis consisted of 17 functions. Figures 1 and 2 present the example densities used within our FPCA analysis.

Figure 3 presents four harmonics (analogues of the eigenvectors in the classical PCA) for the considered densities. These modes of variation of our data explain jointly nearly all variation of the data. Figure 4 presents squared harmonics which possess all properties of a probability density function and are orthogonal. The first harmonic which explains 80% of the total variability and is responsible for the Pareto type asymmetry between incomes of the Poor and incomes of the majority of agents concentrated around the median of the income. The second harmonic is responsible for 15% of the total variability and relates to the people entering middle class incomes. The third harmonic is responsible for 4.4% of the variability and relates to the financial success of an agent. In case of the third harmonic the incomes exceeds three times median income. The first squared harmonic exhibits the highest degree of inequality (measured for example by means of Gini coefficient) whereas the second and the third harmonic represent smaller degrees of the income inequality.
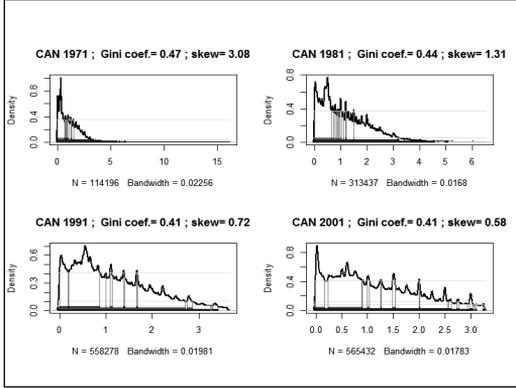
Figure 1. Estimated income densities in Canada

Figure 2. Estimated income densities in Mexico
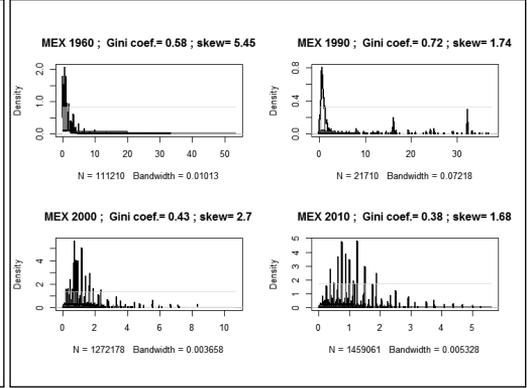
Figure 3. Obtained harmonics (eigenvector analogues) for the income densities
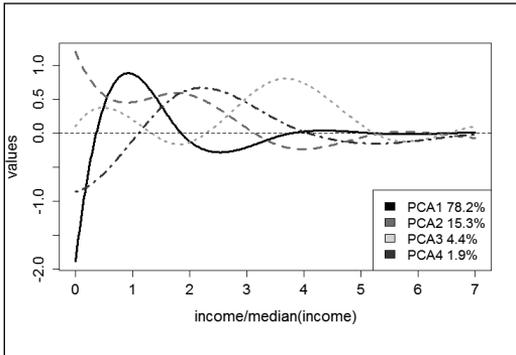
Figure 4. Obtained squared harmonics (they have the probability density properties) for income thee densities
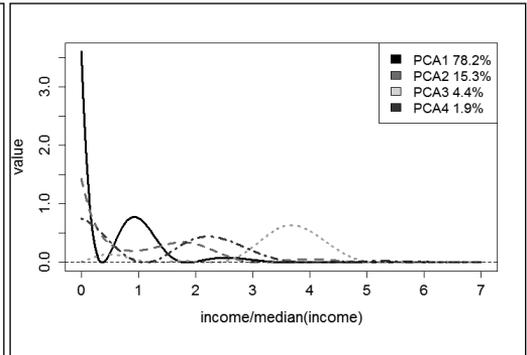
In the context of further studies it would be interesting to compare the obtained decomposition of the income with a decomposition for data from only one country, *i.e.*, *e.g.*, basing on the income densities in administrative districts of this country.

4. On the use of DFM in extracting meaningful information from yield curves

In many different fields of empirical economics the object of interest depends on continous parameter (*e.g.* continuous time). A natural example here are yield curves, which are believed to have a predictive power on future state of economy (Ang, Piazzesi, Wei, 2006; Chauvet, Potter, 2005).

One can think of a yield curve, as a theoretical construction which relates required yields with different maturities of bonds. One has to bear in mind, that yields are not directly observed. They are calculated on the basis of bonds and treasury bills traded on the market. The yields are therefore not accessible for every possible maturity. In practice these data are available only on

discrete grid ie. are sparsely distributed in time for different time horizons. Furthermore these data are often highly correlated[2] (Diebold, Li, 2006).

As proposed by Hays, Shen and Huang (2012), we apply functional dynamic factor models to extract meaningful information from two data sets containing daily yields for Poland and United States from the period between 2.01.2001 and 31.12.2013. In particular data for United States consist 3,6,12 month treasury bill and 1,2,3,5,7,10,20,30 year treasury bond yields, downloaded directly from Federal Reserve Board H15 daily reports.

Polish market treasury yield data were not directly observed during the whole period. That is why data were first merged from Stock Exchange, Bondspot, investing.com and stooq.pl daily price reports. To extract the 1, 2, 3, 6 months and 1, 2, 3, 4, 5, 10 year yields. we have used Fama – Bliss (1987) procedure (c.f. Diebold, Li, 2006, for details)

4.1. Functional factor model

During the rest of the paper, we will consider a time series of curves $t\{y_t(\tau) \in T, t = 1,2,...,t\}$, where T is a continuous interval of maturities and t indexes discrete (daily) times.

The functional model has the form

$$y_t(\tau) = \beta_{0,t} + \beta_{1,t} x_{1t}(\tau) + \beta_{2,t} x_{2t}(\tau) + \varepsilon_t = f_t(x_i(\tau)) + \varepsilon_t \qquad (11)$$

In our simplified framework we assume, that functional factor loadings are represented by (Fig. 5)

$$x_1(\tau) = \frac{1 - e^{-\lambda_t \tau}}{\lambda_t \tau} \qquad x_2(\tau) = (\frac{1 - e^{-\lambda_t \tau}}{\lambda_t \tau} - e^{-\lambda_t \tau}) \qquad (12)$$

Figure 5. Functional forms of factor loadings
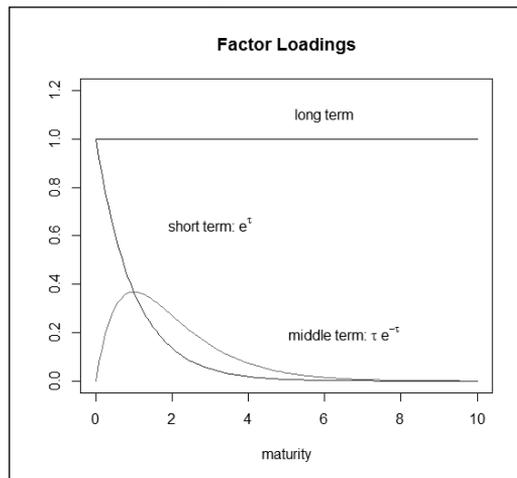
Figure 6. Estimated dynamic factors for US (left) and Poland (right)
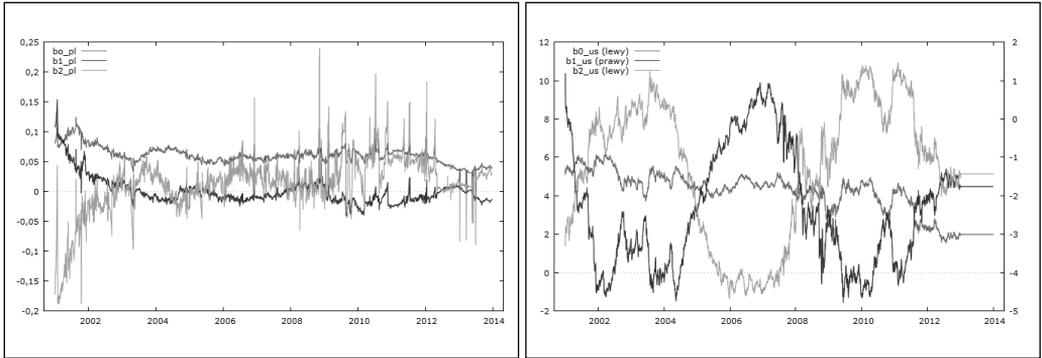
In Figure 6 we have presented estimated dynamic factors, for which we have assumed to follow a simple AR(1) process (Diebold, Li, 2006).

In Figure 7 we have presented means of functional curves compared to real data. One can observe, that static factor loadings are quite good approximation for US yield curve, but behave rather poorly, compared to yield curve for Poland. A natural extension might lead to allow factor loadings to have different functional form over time.

Figure 7. Estimated functional means of yield curves for Poland and US
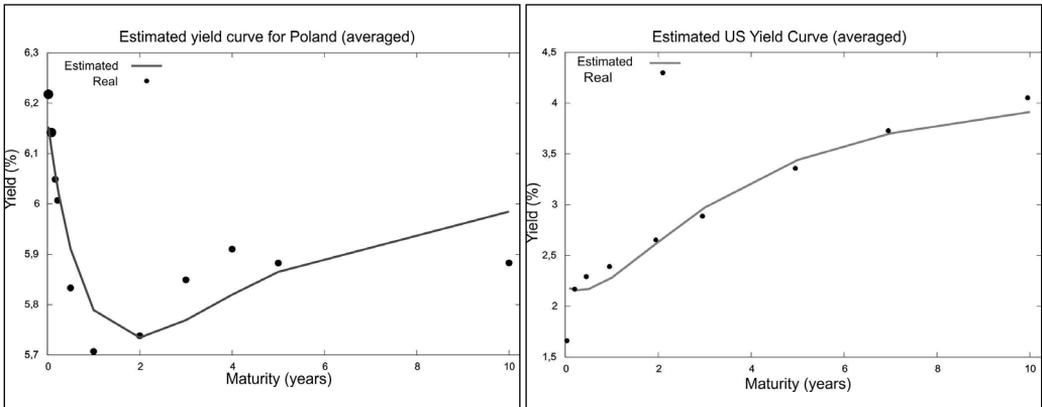
5. Conclusion

The main purpose of this paper was to introduce the ideas of functional data analysis as an alternative to classical multivariate point estimation and analysis techniques in analyzing economic and financial data. We have presented how an extension of standard principal component and factor models can be adopted in a framework, where data are thought to originate from functions (income distribution or yield curves).

Bibliography

1. Ang A., Piazzesi M., Wei M. (2006), What Does the Yield Curve Tell us about GDP Growth?, *Journal of Econometrics*, 131(1-2), pp. 359-403.
2. Chauvet M., Potter S. (2005), Forecasting Recessions Using the Yield Curve, *Journal of Forecasting*, 24(2), pp. 77-103.
3. Cox J.C., Ingersoll J.E. Jr., Ross S.A. (1985), *A Theory of the Term Structure of Interest Rates*.
4. Diebold F.X., Li C.F. (2006), Forecasting the Term Structure of Government Bond Yields, *Journal of Econometrics*, 130(2), pp. 337-364.
5. Hays S., Shen H., Huang J.Z. (2012), Functional Dynamic Factor Models with Application to Yield Curve Forecasting, *The Annals of Applied Statistics*, 6(3), pp. 870-894.
6. Joliffe I. (2005), *Principal Component Analysis*, Wiley.
7. Kosiorowski D., Mielczarek D., Rydlewski J., Snarska M. (2014), Sparse Methods for Analysis of Sparse Multivariate Data from Big Economic Databases, *Statistics in Transition New Series*, Vol. 15, No. 1.
8. Krzyśko M. (2012), *Kernel and Functional Principal Component Analysis*, Multivariate Statistical Methods Lecture Series, Polish Statistical Society.
9. Ramsay J.O., Silverman B.W. (2005), *Functional Data Analysis*, Springer.
10. Ramsay J.O., Hooker G., Graves S. (2009), *Functional Data Analysis with R and Matlab,* Springer.

Chapter **30**

IT/IS Good Practices for Polish Judiciary

Mariusz Grabowski, Jan Madej, Jan Trąbka

1. Introduction

The project presented in this article is one of the initiatives towards the improvement of Polish judiciary through increasing operational effectiveness of Polish courts, obtaining cost efficiencies and upgrading professional qualifications of employees.

The financial resources for the project implementation were granted to the Ministry of Justice and its subordinate units, including The National School of Judiciary and Public Prosecution (NSJPP), being the project sponsors. The financing program is regulated by the European Social Fund within the framework of Human Capital Program (2007-2013) under Priority V "Good governance", specifically Measure 5.3 Support towards the implementation of Lisbon Strategy. The main goal of Priority V "Good governance" of the above mentioned Human Capital Programme is to improve the potential of public administration and judicial system to issue legal acts and regulations as well as strengthen their capabilities to provide high standard of services. Specifically, Measure 5.3 of the funding programme is to support the mechanisms responsible for the creation and enforcement of public policies, creation of legal acts and improvement of the services rendered by the courts.

Consequently, NSJPP being the program beneficiary has been implementing a series of projects in line with the above measures, among others the project named "Education in the area of time management and cost management of judicial proceedings – case management" which is to be continued.

The agreement for subsidizing the above project (reference number POKL.05.03.00-00-012/11) was concluded on 13 July 2012. The project end-date has been planned on 31 July 2014 where total grant amounts to PLN 3,726,600.

The project consortium members are made up of the Cracow University of Economics (workplace of the researchers), Allerhand's Institute in Krakow and consulting firms PSDB Sp z o.o. and WYG Consulting Sp z o.o. In the course of public procurement the consortium took the ownership of the assigned tasks under the pilot implementation of state-of-the-art methods of common courts management. The list of deliverables included:
1. Training in the area of modern human capital and finance in courts.
2. Training in the field of court case workflow management and workload management at the department level.

3. Training in the field of people management and deployment of modern technologies in courts.
4. Elaborating on the report aiming at diagnosing the factual state in 30 pilot courts and indicating the key directions for improvement (a shortlist of good practices).

The objective of the project described in this paper consists in the pilot deployment of good governance across court units by way of elaborating and implementation of a number of good practices of management in each of 30 courts selected for the pilot phase. The description of the organizational structure of Polish courts is presented below for reference.

The Polish judicial system is composed of the Supreme Court, common courts, administrative courts and military courts. Common courts are established at three levels: regional, district and appeal courts. Common courts handle law-cases in the area of criminal, civil, labor, commercial and family laws. In 2012 there were 321 regional courts, 45 district courts, 11 appeal courts in Poland. The courts are managed by the Presidents of the Courts appointed by the Minister of Justice and by the Directors of the Appeal and District Courts as well as by the Finance Managers of Regional Courts who hold supervision over finance and administrative matters being the project stakeholders.

The pool of 30 pilot courts selected for the project was represented by all the three levels of Polish judiciary. Thus the group of courts included 1 appeal court, 6 district courts and 21 regional courts.

The responsibility for the conceptual work was assigned to researchers (experts) from the Cracow University of Economics whereas implementation phase was vested in the consultants – the consortium members. The expert group included specialists from three domains: organization and management, human resource (HR) management and information systems (IT/IS).

The article presents the research conducted by the IT/IS experts who were responsible for identification, improvement and final formulation of good practices related to the use of IT in the courts participating in the project.

2. The course of developing IT/IS good practices

The self-diagnosis documents elaborated by the participating courts (before the start of the project in 2011) constituted the starting point for analysis done by IT/IS expert team. The self-diagnosis documents contained the identification of the most important organizational problems related to court functioning as well as information concerning existing solutions (good practices)[1] which, according to the courts, deserve dissemination and popularization.

After analyzing the self-diagnosis documents the expert team visited several courts. The visits (lasting usually from 2 to 4 hours) where aimed at verifying and discussing the situation described in self-diagnosis with the factual state as well as identifying the good practices used in the courts. Onsite visits involved meetings and discussions with specialists representing various court organizational units including court presidents, directors, managers and employees of HR, finance and accounting and IT departments. During the meetings experts provided the theoretical insight on the subject and highlighted the list of potential improvements. In consequence expert group defined research directions, planed subsequent steps and shortlisted tentative list of good practices.

In the next step the IT/IS expert team conducted a number of full-day workshops in courts. In the result of direct interactions with IT specialists in the courts and the IT/IS experts got ac-

---

[1]   There is no commonly accepted definition of good practice within the IT/IS literature (Kautz et al., 2007). In this paper good practice is defined in its common-sense meaning, as the solution or methodology that proved to be acceptable in obtaining predefined objectives and thus is worthy to be disseminated.

quainted with IT solutions functioning in the respective courts and presented IT-related good practices implemented in the other courts. After a number of full-day workshops, the IT/IS expert team worked out a preliminary list of IT/IS good practices and assigned five maturity levels[2] for each of them. The maturity levels were purposed to enable the adjusting the respective good practice to the needs of a particular court. After finishing the full-day workshop visits, IT/IS experts elaborated on the part of the report in which preliminary IT/IS good practice concepts were captured. The experts also prepared a short presentation of each preliminary practice to be discussed during a meeting with the stakeholders (presidents of the courts, directors) who were responsible for selecting the practices to be implemented in their courts. During the stakeholder meeting, various aspects of the existing good practices and their impact on work organization in the courts were discussed. The meeting was concluded with the preliminary selection of presented solutions. The court executives requested also for a more comprehensive description of good practices.

The questionnaires containing the preliminary description of good practices and the description of maturity levels were disseminated to all courts participating in the project. The courts were asked to answer which practices are suitable for the implementation in their organizations and position their organizations against the appropriate maturity level. Having collected and analyzed the courts' feedback to the questionnaires, the IS/IT expert group made certain adjustments to the good practices (according to the degree of the courts' maturity in using the practice, their needs and comments) in order to better suit the courts' organizational needs. It occurred that some additional visits in the courts were necessary. It was taken into account within the proposed schedule of actions and project plan.

The court executives made the final selection of good practices, basing their decision on the good practice usefulness and applicability to their organizations. They also had an occasion to discuss all related aspects of good practices' description and their implementation during the workshop meeting attended by the presidents of the courts, directors, experts and the representatives of the company responsible for the project implementation. After the meeting, the final set of practices was selected by all courts. Table 1 presents the final list of IT/IS good practices together with the statistics of their selection by the courts of respective instances (the number of courts for each court category participating in the research is given in parentheses).

Table 1. IT/IS Good Practices in the Courts of Particular Level

	Regional courts (21)	District courts (8)	Court of appeal (1)	Total
Digital writ of habeas corpus	8	4	0	12
Tools for internal communication	19	6	1	26
Digital case files management system	5	6	0	11
Resource reservation system	8	6	1	15
Workstation/device security checklist-based control	12	3	1	16
IT service management	16	6	1	23

Source: own work.

---

[2] The concept of maturity levels was taken from (Paulk et al., 1993) and COBIT (ITGI, 2007). The maturity levels used in this paper were adjusted according to the specifics of given good practices.

Currently (second quarter of 2014) the good practices are being implemented across the courts participating in the project. The expert group serves now as an advisory body to help and address any potential problems as well as assist in fine-tuning of a particular good practice to the needs of specific courts. The completion of the implementation phase is scheduled for the second half of 2014.

3. Concise description of IT/IS good practices

3.1. Digital writ of habeas corpus

The good practice is aimed at implementing digital flaw of writ of habeas corpus documents exchanged between courts and other entities. In particular this solution automates the information flaw related to bringing prisoners and/or witnesses to the court by specialized police escort services. The essence of good practice is to replace paper communication with EDI (Electronic Data Interchange) communication channel embedded in the information systems of interested parties. The good practice aims at speeding up the information flaw as well as obtain cost savings.

The proposed solution streamlines the implementation of the first stage of bringing bodies to the court. Currently, the flaw of information is carried out mostly in paper by post or fax while every entity involved (the court and the police and/or department of corrections) are documenting the process independently thus duplicating paper work.

The lowest maturity level of this practice (Tab. 2) is based on using templated data obtained from court office management system. Higher levels utilize software (created internally by the IT staff) integrated with the existing and commonly used court office document management (SAWA), *i.e.* XML-based encrypted data transmission between systems. The highest maturity level is to extend the good practice by other actors of the proceeding (*e.g.* by the department of corrections).

Table 2. Maturity levels of IT/IS good practice: "Digital writ of habeas corpus"

Level	Description
1	Using templates filled with data obtained from court office management system
2	Level 1 + manual sending data using XML via e-mail to the police
3	Import of data from court office management system + manual sending via e-mail + periodic exchange of cryptographic keys
4	Software implementing requirements from level 3 + encrypted channel of communication between court and police
5	Level 4 + extension of the system to other institutions (*e.g.* department of correction)

Source: own work.

Digital writ of habeas corpus brings significant time and cost-savings. In the traditional approach the writ of habeas corpus life-cycle took from a few to several days. In a digital model it can be completed in a few minutes. In terms of cost and time savings, the calculation carried out based on the model implemented in one of the pilot courts indicated savings up to PLN 130,000 (over USD 30,000) in shipping costs and 2,500 hours in labor cost annually on an average number of instances at 30,000 in a year.

3.2. Tools for internal communication

The court is an institution with an extensive organizational and physical structure. Communication between organizational units, as well as individual employees, requires efficient IT-based information tool. Traditional communication is costly, time consuming, labor intense and generates a large quantity of errors. IT tools can significantly reduce the above mentioned deficiencies, thus the main objective of this good practice is to improve the effectiveness and efficiency of internal communication at all organizational levels.

The tools for internal communication include the IT/IS tools accessible by all court employees through internal computer network (intranet). These tools perform the following functions: (1) access to information, *i.e.*, enabling publishing organizational information to the whole organization, usually through the use of the intranet; (2) communication, *i.e.*, facilitating information and digital document flaw through internal e-mail system and on-line communicators; (3) managing group work, *i.e.* allowing common work of employees' groups which can use shared documents and calendars when performing, delegating and controlling specific tasks.

The specific maturity levels of good practice are presented in the Table 3.

Table 3. Maturity levels of IT/IS good practice: "Tools for internal communication"

Level	Description
1	Intranet web portal
2	Level 1 + intranet e-mail system
3	Level 2 + intranet digital communicator and intranet forum
4	Level 3 + formal model of communication (rules for information exchange, digital signatures, information archiving and classification procedures)
5	Level 4 + communication tracking process (bottleneck identification) + trend analysis in internal communication methodology as to its potential application in the court

Source: own work.

The key benefits of good practice are an increased speed and quality of information flow within the entire court organizational structure as well as easy access to the document collections linked to their digital form. To show the potential cost savings of good practice the following simulation was performed. A single case life cycle cost (related only to the printing and labor) amounts on an average to PLN 56 and 2.11 labor/hour. To indicate the annual savings it was assumed that the average size court works 22 days in the month and processes 1,000 small, 200 medium and 50 large cases. Such calculation will result in the savings of PLN 22,000 (USD 7,250) and 1,972 labor hours.

3.3. Digital case files management system

The main objective of a good practice is to develop and implement in the courts participating in the project a DMS (Document Management System) for managing the digital case files. The primary users of the system are judges, however, as the system develops the digital case files will be provided for other parties of the court case. Achieving the main objective demands

the accomplishment of a number of secondary goals, *i.e.*, implementing the system for scanning the case files together with content recognizing by means of OCR (Optical Character Recognition) technology, development of the solutions allowing obtaining the documents in the digital form, developing the rules for digital case files storage and retrieval as well as mechanisms that guarantee security of documents.

Complex nature of good practice demands 5 maturity levels (Tab. 4). The lowest level includes digitalization (scanning, OCR) of selected case files – primarily these that constitute "difficult" judicial cases due to their size. Higher maturity levels assume real-time digitalization of all paper case files and elaborating the mechanisms for acquiring digital case files from various sources, *i.e.* police, persecutor's office, court case parties, law firms, expert witnesses. The natural consequence of getting the court files in a digital form will be development of a formal model for their sharing by various authorized entities, *i.e.*, judges and court case parties. The highest maturity level assumes system optimization and the implementation of new solutions within the area of direct digital documents transfer from/to various entities.

Table 4. Maturity levels of IT/IS good practice: "Digital case files management system"

Level	Description
1	Digitalization of selected case files
2	Real-time digitalization of case files
3	Obtaining selected documents in digital form for case files
4	Obtaining all documents in digital form for case files
5	Optimization of case files management system

Source: own work.

The main advantages of digital case files management system are: shortening the court case life-cycle through getting quick and easy access to case files (videos, audio recordings, digital images, *etc.*) and providing mechanisms for their easy search and annotation using keywords, tags, notes, and comments. Providing the digital form will minimize the risk of loss, damage or modification and facilitate the transfer of files to a higher court and archive. It should also be noted that these benefits translate directly to the financial benefits primarily from the reduction in the cost of the use and handling paper records (such as time-consuming access to the file, preventing simultaneous access to the file to different people, transporting files between court departments, the necessity of supplementing the lost documents, bearing the costs of office supplies and printing materials, dealing with the space required to store the files and archive).

3.4. Resource reservation system

The objective is to implement IT supported tools and techniques related to the management of organizational resources so they could be optimally controlled.

The court's resources can be divided into three categories: premises, physical and personal. Premises include courtrooms, conference rooms or rooms with a special character (*e.g.* room with the ability to conduct a teleconference). Physical resources include the specialized equipment, *e.g.*, multimedia presentation devices or vehicles. Personal resources are the employees. In many cases the effective and efficient work organization demands controlling the resource availability

and their utilization in case of the premises and physical resources as well as an access to the calendars of individual employees in order to coordinate their actions. Such critical personal resources include calendars of the president of the court, vice presidents, heads of departments and/or calendars of the members of IT staff. Table 5 presents the maturity levels for this good practice.

Table 5. Maturity levels of IT/IS good practice: "Resource reservation system"

Level	Description
1	Local applications (*e.g.* spreadsheets) used by organizational units for booking the court resources (court halls, conference rooms, special rooms, cars, beamers, multimedia presentation tools)
2	Networked application for resource reservation (court halls, conference rooms, special rooms, cars, beamers, multimedia presentation tools)
3	Level 2 + calendars for court president, directors of the court departments and other court executives
4	Level 3 + formalized method for resources reservation + metrics for resource utilization
5	Level 4 + analysis of trends in resource utilization + users requirements analysis + optimization of resource reservation system.

Source: own work.

They range from managing premises and physical resources locally (*i.e.* within the given organizational unit) (level 1) on *ad hoc* basis, through introducing global resource management practices and personal calendaring functions (levels 2-3) to creating formalized method for resource reservation and advanced techniques used for analyzing resource utilization.

The benefits of the good practice include: improvement of the efficiency of resource reservation and resource planning, possibility of identification of underestimated resources and elimination of those duplicated, better coordination of employees work time and schedule , improvement of user-friendliness of resource reservation procedure and reducing the costs of resource reservation and resource acquiring and maintenance.

3.5. Workstation/device security checklist-based control

Providing security of courts' information systems is one of the basic duties of court management and IT/IS personnel due to the fact that these systems process highly sensitive data. For this reason, the primary objective of this good practice is increasing the courts' IT/IS security level. The secondary objective – also very important form IS functioning – is to increase IT/IS users' awareness in this area.

The good practice assumes conducting the checklist-based control of IT workstations and devices. The data obtained during the control will be analyzed, which allows to indentify system weakness and developing appropriate safeguards. The practice is based on 5 maturity levels (Tab. 6).

Table 6. Maturity levels of IT/IS good practice: "Workstation/device security checklist-based control"

Level	Description
1	IT/IS (checklist based) control at workstation/devices level of selected workstations/devices
2	Level 1 for all workstations/devices
3	Level 2 + elaborating a formalized method for conducting cyclical IT/IS security control and developing a method for audit checklists modification
4	Level 3+ developing a formalized methodology for IT/IS workstations and devices security assessment
5	Level 4 + establishing a team – "IT/IS security forum" which actively discusses IT/IS security issues + tracking and analyzing trends of potential security threats and vulnerabilities

Source: own work.

At the lowest level only selected workstations and/or devices are controlled. Higher levels assume bordering the scope to all workstations and devices as well as developing a formalized methodology for assessing the IT security level for respective workstations and devices. This will allow comparing IT/IS security level of given units and its monitoring in the changing conditions. The most advanced maturity level recommends establishing a team *i.e.* security forum, which treats IT/IS issues in a proactive manner and track and analyze potential trends in IT/IS threats, vulnerabilities and corresponding safeguards.

The main gains related to the implementation of good practice include: enhancement of court IS security, increasing IS stability, increasing the degree of control over the IT infrastructure and providing system compliance with external legal regulations (*e.g.*, Rozporządzenie MSWiA, 2004; Rozporządzenie PRM, 2011) and standards (*e.g.*, PN-ISO/IEC 27001:2007; PN-ISO/IEC 17799:2007). Another important advantage is also increasing user's awareness of IS security issues and reducing the costs associated with the threats' consequences and IT/IS security breaches (including reducing the cost of system unavailability, repairs and data recovery).

3.6. IT service management

The main objective of good practice is to introduce the principles and mechanisms related to the effective and efficient management of IT resources and introduction of IT service-oriented model constituting a core concept of ITSM (IT Service Management) body of knowledge. ITSM is based on two general assumptions: (1) introducing the idea of IT service defined as an organizational need being met by the application of IT and (2) giving priority of business processes of the organization over its IT infrastructure, which means that IT infrastructure in the first place takes into account the legitimate organizational needs and in the second IT-related constraints. Information technology service model has proven itself in practice as allowing for the increasing of organizational capacity while reducing costs. The maturity levels related to this good practice are submitted in the Table 7.

Table 7. Maturity levels of IT/IS good practice: "IT service management"

Level	Description
1	Unification of hardware (workstations, notebooks, printers, scanners *etc.*) through setting the parameters for respective user groups and setting the minimal order quantities
2	Level 1 + unification of hardware types in IT/IS service models (*i.e.* hardware for office, judges, court halls *etc.*) + using checklists for hardware and software installation
3	Level 2 + automation of installation procedures and software configuration (*i.e.* Windows Deployment Services (WDS) and/or Group Policy Objects (GPO)
4	Level 3 + using software tools for IT infrastructure description and monitoring (*i.e.* WikiMedia, nVision, ADOit)
5	Level 4 + implementation of selected elements of IT Infrastructure Library (ITIL) (*e.g.* Service Desk)

Source: own work.

They range from tasks related to the IT resource unification (level 1), through automation of hardware/software installation, configuration and monitoring (levels 2-4) to implementation of selected elements of IT Infrastructure library (level 5) (Cartlige et al., 2007).

Main benefits of good practice include: IT services adjusted to the court needs, planning and budget optimization, increased effectiveness and efficiency of staff performance resulting from alignment of IT services to the specific users' needs, efficient change management, increased users satisfaction and improved court image among its internal and external stakeholders. The other important advantage is ensuring compliance with legal regulations (*e.g.*, Rozporządzenie PRM, 2011; Rozporządzenie RM, 2012) and standards (*e.g.*, PN-ISO/IEC 2000-1:2007; PN-ISO/IEC 2000-2:2007).

4. Conclusion

The project described in this paper, in its assumptions and the obtained outcomes, indicated the need for exchanging best practices proven in the business as they can be successfully transferred to support administrative and judicial functions of Polish common courts. The authors of this study, both experts in the project and researchers from the IT/IS domain indicated methods and practices that can be effectively adapted from commercial enterprises and customized for successful implementation to support IT/IS supported functions in the Polish courts. The other positive aspect of the project is the fact that some best practices were obtained from the courts participating in the project. This expresses the additional function of the project as a platform for the exchange of knowledge between the courts operating at different levels and scales. Using IT good practices expands and enhances work efficiency. Similar projects that address similar problems should be continued in the future to leverage the business and academic expertise in the judicial system in Poland.

Bibliography

1. Cartlidge A., Hanna A., Rudd C., Macfarlane I., Windebank J., Rance S. (2007), *An Introductory Overview of ITIL® V3*, The UK Chapter of the itSMF, http://www.best-management-practice.com/gempdf/itSMF_An_Introductory_Overview_of_ITIL_V3.pdf [4.11.2013].
2. ITGI (2007), *Control Objectives for Information and related Technology (COBIT) 4.1*, Rolling Meadows, IL, IT Governance Institute.
3. Kautz K., Madsen S., Nørbjerg J. (2007), Persistent Problems and Practices in Information Systems Development, *Information Systems Journal*, Vol. 17, No. 3, pp. 217-239.
4. Paulk M.C., Weber C.V., Curtis B., Chrissis M.B. (1993), *Capability Maturity Model for Software (Version 1.1)*, Technical Report CMU/SEI-93-TR-024 ESC-TR-93-177, February, Pittsburgh, PA, Software Engineering Institute, Carnegie Mellon University, http://www.sei.cmu.edu/reports/93tr024.pdf [26.02.2014].
5. PN-ISO/IEC 17799:2007 (2007), *Technika informatyczna – Techniki bezpieczeństwa – Praktyczne zasady zarządzania bezpieczeństwem informacji*, Warszawa, Polski Komitet Normalizacyjny (equivalent to ISO/IEC 27002).
6. PN-ISO/IEC 20000-1:2007 (2007), *Technika informatyczna – Zarządzanie usługami – Część 1: Specyfikacja*, Warszawa, Polski Komitet Normalizacyjny.
7. PN-ISO/IEC 20000-2:2007 (2007), *Technika informatyczna – Zarządzanie usługami – Część 2: Reguły postępowania*, Warszawa, Polski Komitet Normalizacyjny.
8. PN-ISO/IEC 27001:2007 (2007), *Technika informatyczna – Techniki bezpieczeństwa – Systemy zarządzania bezpieczeństwem informacji – Wymagania*, Warszawa, Polski Komitet Normalizacyjny.
9. Rozporządzenie MSWiA (2004), *Rozporządzenie Ministra Spraw Wewnętrznych i Administracji z dnia 29 kwietnia 2004 r. w sprawie dokumentacji przetwarzania danych osobowych oraz warunków technicznych i organizacyjnych, jakim powinny odpowiadać urządzenia i systemy informatyczne służące do przetwarzania danych osobowych*, Dz. U. Nr 100, poz. 1024.
10. Rozporządzenie PRM (2011), *Rozporządzenie Prezesa Rady Ministrów z dnia 20 lipca 2011 r. w sprawie określenia podstawowych wymagań bezpieczeństwa systemów i sieci teleinformatycznych*, Dz. U. Nr 159, poz. 948.
11. Rozporządzenie RM (2012), *Rozporządzenie Rady Ministrów z dnia 12 kwietnia 2012 r. w sprawie Krajowych Ram Interoperacyjności, minimalnych wymagań dla rejestrów publicznych i wymiany informacji w postaci elektronicznej oraz minimalnych wymagań dla systemów teleinformatycznych*, Dz.U. 2012 nr 0 poz. 526.

Chapter **31**

E-commerce in EU and Serbia: Current Trends and Perspectives[1]

Zoran Kalinić

1. Introduction

The application of information-communication technologies (ICT) and especially the Internet are leading to a structural change of modern business and commercial transactions by making them more efficient. E-commerce may be defined as the use of Internet and the Web to perform digitally enabled transactions between and among organizations and individuals (Laudon, Traver, 2012), and, according to the OECD definition, it includes "any transaction for the sale or purchase of goods and services conducted over computer networks by methods specifically designed for the purpose of receiving or placing of orders" (OECD, 2013). Payment and final delivery of the goods or services do not have to be conducted online, while orders made by telephone calls, facsimile or manually typed e-mail are excluded, and more generally, the definition should include not only the Web, but also extranet and electronic data interchange (EDI) systems. E-commerce is the fastest growing part of commerce today, and very often is considered as a potential engine of economic growth. In 2011, e-commerce represented about 14% of the total turnover of EU27 non-financial enterprises, up from about 9% in 2004 (OECD, 2013).

The creation of a Digital Single EU Market is one of the seven pillars of the Digital Agenda for Europe which has set out e-commerce targets for 2015: 50% of consumers buying online and 20% buying online cross-border within the EU (EC, 2012). The finalization of the Digital Single Market and improvement of consumers' confidence in e-commerce have been identified as two of the twelve priority areas of action under the Single Market Act.

Initially, e-commerce was limited to communications between large companies in specific industries that had opened dedicated communication channels, usually using EDI technology. But with the development of the Internet, the benefits of e-commerce are extended to any company or individual with an internet connection, allowing them to complete transactions. E-commerce eliminates the barriers of time, space and distance, all products and services are usually just one

click away. Also, transactions are faster, and generally for companies' costs are lower (Diacon, Donici, 2011).

For businesses, e-commerce improves efficiency by enlarging the scope of the market and lowering operating barriers and costs. E-commerce offers numerous benefits for consumers, by providing detailed information on goods and services, helping consumers to locate shops and sellers, facilitating price comparisons, offering fast and convenient delivery, and allowing them to purchase easily via a PC or mobile device whenever and wherever they are (OECD, 2013). There is a variety of reasons why consumers shop online, ranging from cheaper products to finding better quality products. For frequent online shoppers, the dominant factor for shopping online seems to be price, followed by time savings, the possibility of ease price comparisons, the flexibility of anytime, anywhere ordering and finding a wider selection online. But, despite the strong growth in e-commerce in the last few years, it is evident that its full potential has not been reached yet. There are still considerable obstacles holding back both consumers and businesses.

Although the composition of e-commerce has remained nearly constant over the previous 10 years, with business-to-business (B2B) sales dominating the scene with roughly 90% of the value of e-commerce transactions, because of already well-established relations and the lack of precise and comparable data in B2B e-commerce, the focus of research in this paper will be on business-to-consumer (B2C) activities, which have been growing very fast in recent period. Also, special emphasis will be on new forms of e-commerce: mobile commerce or the usage of mobile devices in commercial activities and social commerce *i.e.* the phenomenon that social networks are increasingly used to market and sell products online in a way that is more tailored to individual users (OECD, 2013).

The paper is structured as follows. In the next section the current state of e-commerce in the world and Europe is presented. The trends and perspectives of e-commerce are presented in Section 3. Mobile and social commerce, as fastest growing forms of e-commerce, are analyzed in the following sections, while conclusions are given in the final section.

2. Current state of e-commerce in Europe

E-commerce has a tremendous growth for more than a decade. According to eMarketer's latest forecasts, worldwide B2C e-ecommerce sales will increase by 20.1% in 2014, to reach $1,500 trillion (eMarketer, 2014a). The total worldwide sales and % of change are presented in Figure 1. Growth will remain in the double digits through 2017, primarily coming from the rapidly increased number of online and mobile users in emerging markets, increases in m-commerce sales, and advancing shipping and payment options.

Figure 1. B2C e-commerce sales worldwide, 2012-2017 (billions $ and % change)
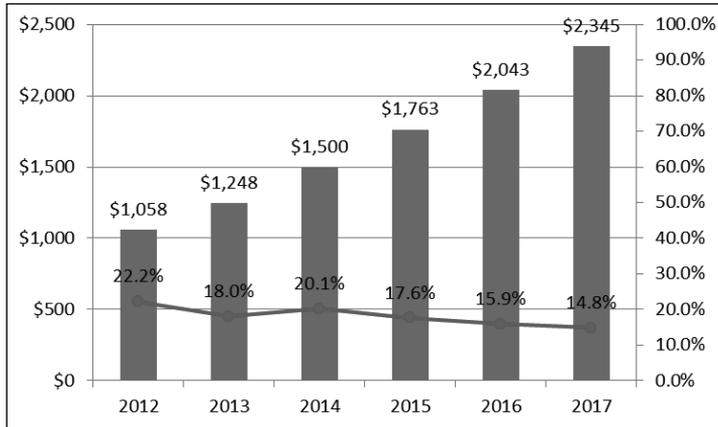
Of course, the growth varies across the regions. During 2014, for the first time, consumers in Asia-Pacific region will spend more on e-commerce purchases than those in North America, making it the largest regional e-commerce market in the world (Tab. 1).

Table 1. B2C e-commerce sales worldwide, by region, 2012-2017 (in billions $)

	2012	**2013**	**2014**	**2015**	**2016**	**2017**
Asia-Pacific	$301.2	$383.9	$525.2	$681.2	$855.7	$1,052.9
North America	$379.8	$431.0	$482.6	$538.3	$597.9	$660.4
Europe	$318.3	$358.4	$400.0	$438.9	$472.9	$505.7
Latin America	$37.6	$48.1	$57.7	$64.9	$70.6	$74.6
Middle East and Africa	$20.6	$27.0	$33.8	$39.6	$45.5	$51.4
Worldwide	**$1,057.5**	**$1,248.4**	**$1,499.3**	**$1,762.9**	**$2,042.6**	**$2,345.0**

As the most perspective market, China will take in more than 60% of all e-commerce sales in Asia-Pacific this year, with estimated annual growth in 2014 by 63.8%, and nearly three-quarters of regional spending by 2017 (eMarketer, 2014a). Its e-commerce market will overtake the US, current leader in spending, by 2016. Massive gains in China, as well as in India and Indonesia, will push Asia-Pacific's growth ahead.

E-commerce has a steady, double-digit growth over the nearly 15 years. In only 6 years, from 2004 to 2010, total e-sales grew from 9 to 14% of turnover of non-financial enterprises in the European Union, and from 10 to 16% in the United States (OECD, 2013). Naturally, the growth has been uneven across OECD countries. For example, almost 80% of enterprises in Switzerland with at least 10 persons employed undertake e-purchases, while the percentage is lower than 10% in 10 other OECD countries. Also, companies are much less likely to do e-sales than e-purchases (in 2010, 35% of all businesses with 10 or more employees made electronic purchases, while only 18% had e-sales of goods and services (OECD, 2013)). New Zealand and Israel lead the OECD

in the number of companies reporting e-sales (approx. 50%), while the percentage is lower than 20% in most countries (for example, in Italy only 5%).

The share of the European Internet economy is estimated at 3.5%, a percentage that is set to double by 2016 and to triple by 2020 (ECE, 2013). Also, at the end of 2012 number of B2C websites in Europe was approx. 550,000, growing at a pace of 15 to 20% per year and set to grow even more given the growth foreseen in the emerging markets in the southern and the eastern Europe.

Europe's B2C e-commerce growth in 2012 was 19% (ECE, 2013). Growth rates in mature markets such as the United Kingdom, the Netherlands, Sweden and Norway are slowing down to around 10-15% per year, while Germany, France, Italy and Spain are still increasing by about 20-25% and more. The emerging e-commerce markets are those of Eastern and South-Eastern Europe: Turkey (75% growth in 2012), Greece (61%) and Ukraine (41%) and the others, including Serbia, where annual growth is expected to reach 30 to 40% and more in the next few years (Poland – 25%) (ECE, 2013). While the growth rate is higher in the Eastern region, sales are much higher in the more mature Western Europe online market (RM, 2013a).

It is important to stress that at a time of financial crisis and uncertainty, the UK internet economy was growing at a high rate, creating thousands of new businesses and jobs (Kuchler, 2012). Small and medium-sized enterprises in the UK who used the Internet for marketing, sales and contacts with customers and suppliers, grew at a rate of 12%, which is much faster than only 4% growth of those who barely used the Internet.

The total Europe's B2C e-commerce turnover in 2012 was 311.6 billion Euros. The European e-commerce industry is dominated by the three leading countries: United Kingdom (96 billion Euros), Germany (50 billion Euros) and France (45 billion Euros), and they represent 61% of the total European B2C e-commerce sector, or 70% of EU-only (ECE, 2013). Estimated share of online retail in total retail is 5% worldwide, with UK as a leader with 16% (ECE, 2013).

As one of the main measures of e-commerce development, the percentage of individuals who ordered goods or services over the Internet in the last 3 months is presented in Figure 2. Again, huge differences across countries can be seen and also that the leaders in e-commerce in Europe are UK, Denmark and Germany, while one the other side are Bulgaria and Romania.

Figure 2. Online shoppers in the last 3 months (in %), in 2013, per country
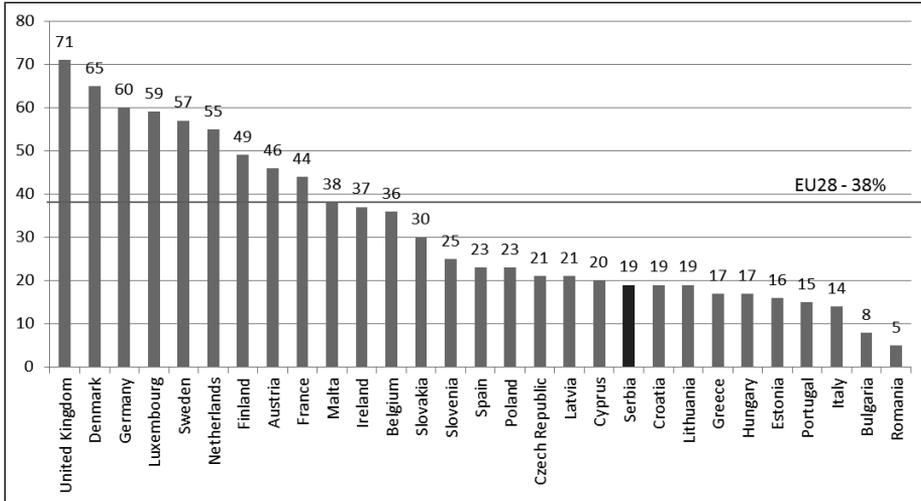
Source: Eurostat, 2014; RZS, 2014.

Internet penetration and connection speed are important elements in higher e-commerce penetration. It's not a coincidence that the countries where most consumers buy online have high internet penetration, fast and relatively affordable internet connections *i.e.* there is a clear correlation between online shopping and the Internet penetration rate – higher the level of Internet access, higher the levels of online shopping acceptance, as can be seen in Figure 3. Also, comparison of e-commerce penetration growth over last few years in EU, Poland and Serbia is shown in Figure 4.

Figure 3. Internet penetration rate in households (in %), in 2013, per country
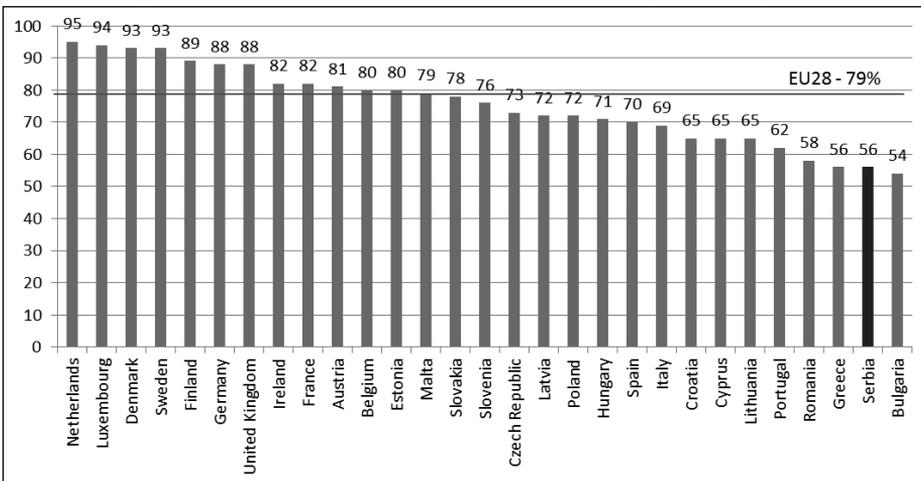
Source: Eurostat, 2014; RZS, 2014.

Figure 4. Individuals who ordered goods or services over the Internet in the last 3 months (in %), in 2013, over period
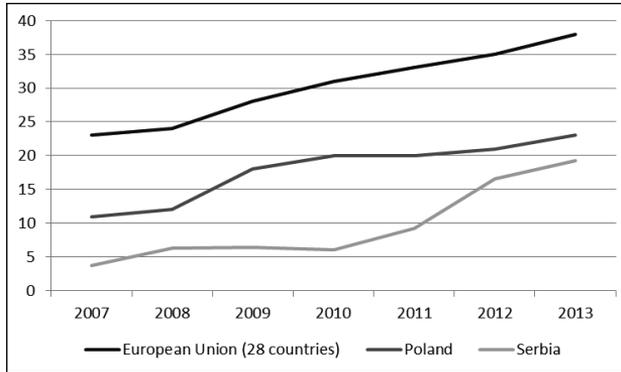
Source: Eurostat, 2014; RZS, 2014.

Simple statistical analysis shows a strong correlation between internet penetration rate and the percentage of online shoppers (Pearson's correlation coefficient is r = 0.911), as may be seen in Figure 5.

Figure 5. Correlation between internet penetration rate in households (in %) and individuals who bought something online in last 3 months (in %) (Pearson's r = 0.911)
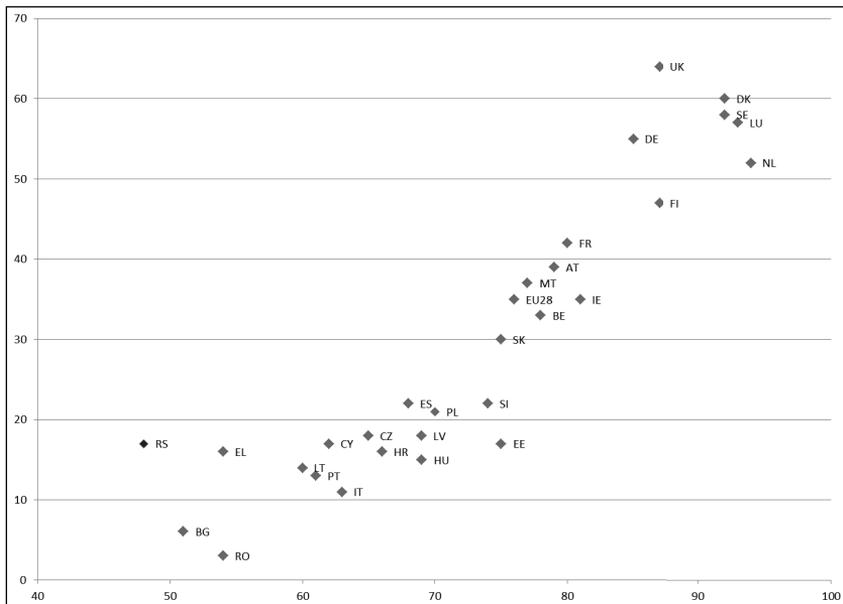
Source: Eurostat, 2014; RZS, 2014.

The percentage of individuals who used Internet in last 3 months, in 2013, is presented in Figure 6.

Figure 6. Individuals who used Internet in last 3 months (in %), per country

Source: Eurostat, 2014; RZS, 2014.

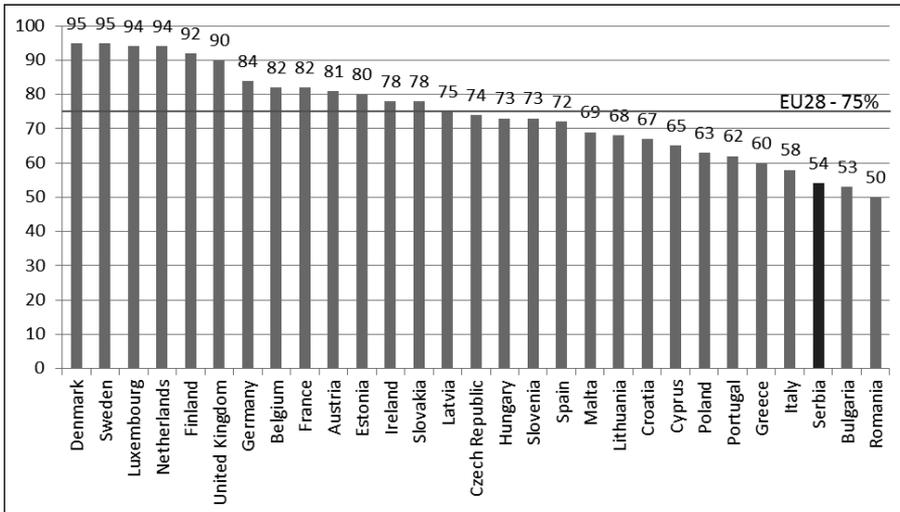The global number of Internet-users in 2012 was estimated at around 2.4 billion, but the forecasts say that it will reach 3.5 billion or around 50% of world population in just a couple of years. As Internet penetration rate and the number of Internet-users grows and users are getting more and more confident in online shopping, the number of e-shoppers is set to grow rapidly. According to Ecommerce Europe's estimates, the global number of e-shoppers in 2012 was already over 1 billion, or over 40% of Internet-users (ECE, 2013; yStats, 2013a, eMarketer, 2013a).

Internet access in the EU28 is widespread and today people use the Internet for a wide range of activities, among others to order goods and services online. In the EU28 in 2012, 75% of individuals aged 16 to 74 had used the Internet in the previous 12 months, and nearly 60% of them said that they had shopped online. Among the Member States, the highest shares of online shoppers were registered in the United Kingdom (82% of internet users), Denmark and Sweden (both 79%) and Germany (77%), in Serbia it's 50%, in Poland – 45%, and the lowest shares are in Romania (11%) and Bulgaria (17%) (Eurostat, 2013).

Another important factor on e-commerce adoption is economical wealth of the nation, and there may be found strong correlation between GDP per capita and the percentage of online shoppers (Pearson's correlation coefficient is r = 0.835, without Luxembourg, as outlier), as presented in Figure 5.

Figure 5. Correlation between GDP per capita (in Euros) and individuals who bought something online in last 3 months (in %) (Pearson's r = 0.835)
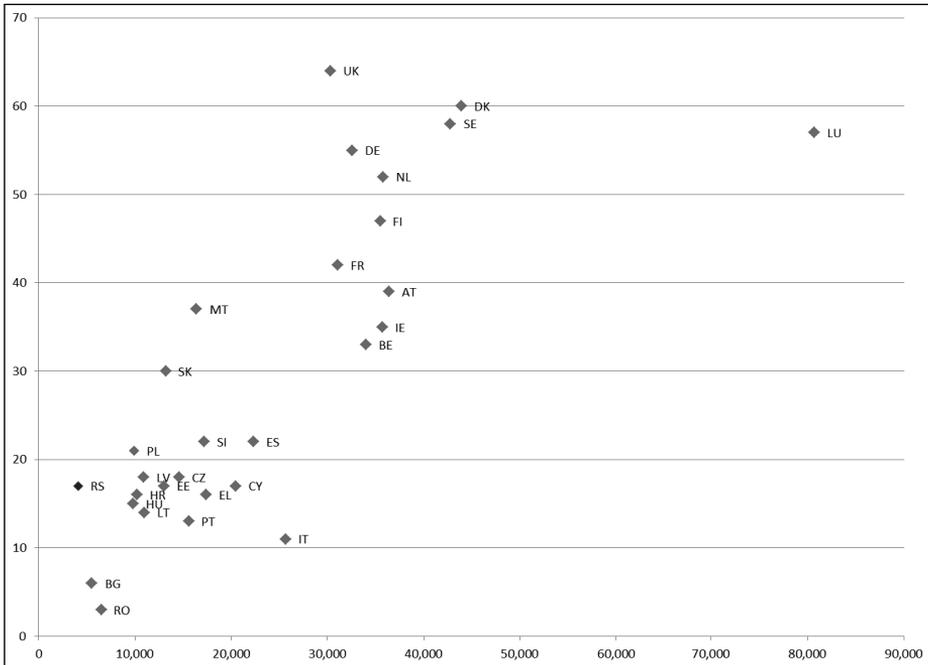
Source: Eurostat, 2014; RZS, 2014.

In mature markets (the UK, Germany, Denmark), on average, consumers shop online for physical goods at least once a month, compared to three or four times a year on average, in growing markets (France, the Netherlands, Belgium). Frequent cross-border shoppers tend to be younger, highly educated men (IPC, 2010). In 2012, the average amount spent per capita in Europe was €380, per Internet-user €589 and per e-shopper €1,243. The leading countries in e-spend per capita are UK, Norway and Austria, all with over 2,000 Euros per e-shopper (ECE, 2013).

In the EU28, ordering clothes and sports goods and booking travel and holiday accommodation are the most common online purchases amongst Internet users (approx. one third of Internet users purchased online during the previous 12 months, for both). Almost one quarter of Internet users in the EU28 reported that they bought books, magazines or e-learning material from the Internet while less than 10% of them ordered food and groceries online (Eurostat, 2013).

Among EU Member States in 2012, the United Kingdom (51%) and Germany (49%) had the highest shares of Internet users having purchased clothes and sports goods online in the previous 12 months. Poland also had the highest shares of Internet users who online purchased clothes and sports goods (25%), followed by books and magazines (14%). Sweden (60%) had the highest proportion reporting that they booked travel and holiday accommodation online, followed by Denmark (56%). Buying books, magazines or e-learning material online was most common in Luxembourg (47%) and Germany (41%). The United Kingdom (21%) was the leading Member State for online food and grocery shopping, while in the majority of Member States this share

was 10% or less (Eurostat, 2013). In Serbia, the most popular products for online shopping are clothes and sports goods (30%), followed by household appliances (20%) and electronic equipment (19%) (RZS, 2013).

Despite the very good results and steady growth of e-commerce, significant challenges and problems to higher e-commerce adoption and use remain. Barriers to e-commerce adoption appear to affect small enterprises disproportionately, which presents a significant challenge for policy makers as small and medium enterprises (SME) account for over 99% of all businesses in the OECD and 40-70% of value added in the economy (OECD, 2013).

3. Trends in e-commerce

Current trends show that online shopping will become more personalized, with retailers customizing their products and services and integrating online sales channels such as websites and social networks on any device that connects to the Internet (yStats, 2013b). Also, online shoppers are forecasted to increasingly prefer to pay online when buying over the Internet, causing the online and mobile payment markets to grow strongly, especially in Asia.

Online consumers are leaving behind a record of their behaviors, preferences and interests, which provides an ever-growing source of knowledge for companies ("big data"). In this way, companies may adapt their marketing strategies to specific market segments and even individual consumers (Gagliardi, 2013).

One of the trends in global e-commerce is expansion through the globalization of consumer preferences and the localization of the purchase experience – "glocalization". Most of the customers prefer to buy locally, so all important players should try to expand globally *i.e.* to internationalize their business, but on each national market they should act locally *i.e.* to adapt their operations with local payment methods, currency support, complex legal issues as well as marketing and merchandising campaigns (Gagliardi, 2013).

Price comparison websites are becoming a key source of information for consumers both in their online but also in their offline purchase decisions, and this trend seems likely to grow further (EC, 2012). Eight out of ten online consumers use price comparison websites to inform themselves before making an online or offline purchase, mostly because they are the quickest way to compare price and find the cheapest one, but also to find out more about the range of offers, to find information about specific products or customer comments, product reviews and ratings. Another worldwide trend influencing growth in online sales is the concept of group buying, particularly in the Middle East (yStats, 2013b).

Also, one of the major trends in online shopping is expected to be growth of m-commerce, reflected in the growing number of mobile devices and triple-digit growth rates of mobile payments in the years to 2016 (yStats, 2013b). Social and mobile commerce dominated emerging business investments in 2013 (Oracle, 2013), and both will be more discussed later in the paper.

4. Mobile commerce

Mobile Internet usage has become popular with the emergence of new mobile devices such as smartphones, phablets and tablets, especially among young people. About one-third of EU citizens is accessing the Internet via mobile devices (ECE, 2013). There are significant differ-

ences in mobile Internet usage between EU members, *i.e.* in six of them (Denmark, Ireland, Luxembourg, the Netherlands, Finland and Sweden), more than 50% of the population use portable computers or mobile devices through a mobile phone network or wireless connection while away from home or work, while less than 20% do the same in Bulgaria, Italy, Hungary, Lithuania and Romania (ECE, 2013).

The term m-commerce (mobile commerce) refers to a business model which "allows a consumer to complete a commercial transaction using a mobile device, either at a point of sale (*e.g.* payments made through NFC technology), or remotely (*e.g.* through SMS payments or payments charged on mobile operators' bills)" (OECD, 2013). According to Raconteur (2013), 83% of IT decision-makers think that mobility will impact their business as much as web.

Mobile commerce (m-commerce) is significantly extending the potential connectivity options between companies and their customers via mobile devices, which, together with recent expansion of mobile broadband, smartphones and inexpensive data offers, enable mobile subscribers to access data services wherever they are and at nearly all times (OECD, 2013). M-commerce is expected to play an ever larger role in the future, with over half a billion customers following the trend to shop via mobile devices by 2016 (yStats, 2013b). Retailers nowadays have a great opportunity to better understand their customers, get closer to them and provide a personalized shopping experience with unique catalog views and targeted promotions, by collecting and analyzing a mass of customer data, which they now can get. Customer information now goes way beyond traditional browse and order history, because it may include geo-location, mobile application usage and social sentiment via unstructured data like Facebook posts and Tweets (Deloitte, 2012).

At the moment, both mobile and social commerce in Europe are at an embryonic stage, as just 6% of consumers made an online purchase using mobile phone, and 2% bought something through a social network website (EC, 2012). But, mobile is the fastest-growing technology the world has ever seen and arguably the biggest technological driver of social and economic change. Mobile subscriptions are growing four times faster than the global population (Raconteur, 2013).

Mobile devices, especially smartphones and tablets, provide a powerful platform for e-commerce growth, particularly for B2C transactions. "Always-on, always-with-you" capabilities that mobile offers and new mobile applications enable users to scan product bar codes, check product specifications, compare prices and purchase products online, anytime, anywhere. Also, by the integration of near field communication (NFC) technology in mobile phones, users are enabled to pay for items just by holding their phone to an NFC reader and confirming the sale.

M-commerce had a tremendous growth in recent years. For example, in the UK market, the percentage of sales via mobile devices in first quarter of 2010 was only 0.4% of e-commerce sales, but in last quarter of 2011 it reached 5.3%, representing a growth rate of 1.320% over the 2-year period (EMOTA, 2012). Also, in the United States triple-digit growth rates of mobile payments in the years to 2016 are expected (yStats, 2013a). eBay's m-commerce revenue grew from USD 2 billion in 2010, to USD 5 billion in 2011. In the same year, m-commerce represented 7% of eBay's total revenue (OECD, 2013). Estimated share of m-commerce in Europe is 17 billion Euros or 5.5% of e-commerce (ECE, 2013). The share varies across the countries, but the leader is UK, where m-commerce reached 12% of total e-sales, and Scandinavia (8%), while in, for example, in Poland it was 1.7%.

One out of every three visits to leading e-commerce websites now comes from either a tablet or smartphone, up from one out of five just last year, while mobile e-commerce orders grew 102%

over one year (EQ, 2014). In the US, mobile devices were responsible for almost 40% of Black Friday online traffic. Furthermore, tablet's massive year over year spike of 53% of market share also shows how rapidly the tablet is becoming the device of choice for shoppers. Research from Google finds that smartphone usage for m-commerce is already high in Denmark, Switzerland and the United States (62% u Q1/2014) and to a lesser extent in Mexico, Spain, Belgium and Finland. Of the European nations, the UK is the most mobile commerce-friendly, with nearly a quarter (23.1%) of all smartphone owners in the UK having accessed some online retail site from their mobile in the last three months of 2012 (ECE, 2013).

Retailers are now experiencing the latest shopping phenomenon – show-rooming. The customers try out goods on the shop floor, and if it fits them, they, using their smartphones, tap in the product information, or even scan in its barcode, to search the whole internet for a better price. If they find it, buying is just a click way (Raconteur, 2013). Recent study showed that 88% of consumers do Web-rooming (research items online, then purchase products at physical stores), compared with 73% who do show-rooming (IW, 2013).

According to Oracle (2013), 37% of companies already have some form of m-commerce, 31% plan to implement it in the next 12 months and for remaining 32% it's a low priority or they have no plans to implement it. Also, in the recent study, great majority of respondents say mobile commerce is very (39%) or extremely (32%) important to the future of their organizations, while an additional 18% indicate moderate importance. As the leaders in the m-commerce development and implementation, professionals point out mobile device and OS vendors, such as Apple, Google and Samsung (45%), banks and credit card issuers (22%), new/emerging players, such as PayPal (21%) and mobile operators (11%) (IW, 2013).

Concerning the implemented technologies, in the recent study 52% of the companies said they have a smartphone application, 41% a tablet application, 34% a general site or application with integrated mobile payments, and 33% a mobile-specific e-commerce site (IW, 2013). Most online retailers understand that applications outperform web pages, but also require more development and different versions for each mobile platform. Also, the construction of the web application greatly affects how quickly web pages load, and page load time shouldn't be more than three to five seconds (one-second delay in page response translates to a 7% loss in sales (IW, 2013)). Some customers may be reluctant to install applications from companies from which they only occasionally make purchases, so they prefer to use web page approach.

When asked to identify the top business benefit proffered by m-commerce, 28% of IT professionals from companies with m-commerce strategies pointed to the ability to engage customers via fine-tuned targeted marketing, 14% to reaching new (and perhaps younger) demographics, and 14% to value-added location-based services (IW, 2013).

As a top inhibitors of m-commerce today, companies stress consumer perception that mobile commerce is still unsafe and unsecure, confusion over business models related to money flow, insufficient connectivity speeds, and the immaturity of technology to integrate with existing e-commerce and IT back-end systems (IW, 2013).

Some people consider m-commerce as fairly peripheral, because of still low levels of penetration, but it should be analyzed in a broader view. For example, it accounts for £5 billion of the UK retail market, but it influences £18 billion of sales, whether that is comparing prices, checking stock or paying (Raconteur, 2013).

Forrester's EU Mobile Commerce Forecast predicts that, by 2017, mobile commerce, through the smartphone (*i.e.* not including tablets), will represent almost 7% or 19 billion Euros of e-sales

in Europe, which illustrates how large the overall future market will be for online shopping in terms of sales (ECE, 2013). If shopping via tablets is taken into account as well, the statistics look even more impressive.

5. Social commerce

There are various definitions of social commerce. It may be defined as a word-of-mouth applied to e-commerce (Dennison et al., 2009), or in a more comprehensive manner, where social commerce refers to a more social, creative and collaborative approach used in online marketplaces (Parise, Guinan, 2008). Huang and Benyoucef (2013) define s-commerce as "an Internet-based commercial application, leveraging social media and Web 2.0 technologies which support social interaction and user generated content in order to assist consumers in their decision making and acquisition of products and services within online marketplaces and communities".

In 2013, there were more than 1.6 billion social network users worldwide with more than 64% of Internet users accessing social media services online (Statista, 2014). Social networks are one of the most popular places for online users to spend their time, contacting their friends and families or catching up with news and other content. Leading social networks in the world are Facebook (approx. 1.2 billion users), QZone (632 million), Google+ (300 million), LinkedIn (259 million), Twitter (232 million), *etc*. (Statista, 2014).

Social commerce usually refers to utilizing Web 2.0 in e-commerce (Kim, Srivastava, 2007), particularly core Web 2.0 features such as user-generated content and sharing of content (Huang, Benyoucef, 2013). The impact of Web 2.0 on e-commerce can be seen in both business operations and social interaction among consumers, as with Web 2.0, customers' perceptions, preferences and decisions are influenced, beside the information presented on e-commerce websites, by the content on social networks generated by other consumers. The rapid development of social media and Web 2.0 enabled the transformation or evolution of e-commerce from a product-oriented to a social and customer-centered environment, where customers have access to social knowledge and experiences, so they could be better informed before making purchase decisions (Huang, Benyoucef, 2013). Worldwide social commerce in 2014 is estimated at $20 billion, with the estimation of 50% growth for the 2015 (Statista, 2014).

S-commerce offers benefits to both, companies and consumers. The benefits of using social networking for companies include increased brand awareness and online communication, as well as improved customer relationship management (Huang, Benyoucef, 2013). On the other hand, social influence has a significant impact on customers' purchase decision making, using a diversity of applications such as product review or recommendation by a friend or other customers or a discussion board.

Although consumers will still make the majority of e-commerce purchases on company websites, social networks will increasingly be the initial point of contact and research. Consumers will look to their networks for information about products and services, discounts and offers, but also for the opinions of their friends and other consumers about the product or service. So, companies will actively encourage buyers to make purchases and talk about goods on their favorite social networks (Gagliardi, 2013).

The companies have started to use social media in various ways such as direct sales on social media sites, advertising of products or to drive traffic to their websites and receive feedback from

existing or potential customers. Despite current relatively small size of the s-commerce, the high penetration of social networks provides promises for social commerce for the future. As more and more companies are establishing Facebook and Twitter accounts, conversations on these platforms shift from interpersonal communications to shared opinions and experiences about brands.

Recent research found that Facebook is the top social commerce site worldwide (eMarketer, 2014b). Facebook penetration rates in 2013 were quite high: 54% in Western Europe, 45% in Eastern and Central Europe, up to 66% in Latin America, while the worldwide rate was 43% of the Internet users (eMarketer, 2013b). The majority of B2C companies (53%) already have social commerce in place (Oracle, 2013), and nearly 88% of the companies expect to expand their investment on social commerce in the future (Constantinides et al., 2008).

6. Conclusion

In the last decade, e-commerce has been one of the main growth engines of the retail sector, as a dominant distance sales channel. Although it accounts for around 5% of the total retail sector, e-commerce has a double-digit growth, which will continue in the years to come. Also, the impact of e-commerce on the whole retail sector is significantly greater since consumers often research on the Internet, usually using price comparison web-site, before they made an offline purchases. The same stands for m-commerce *i.e.* mobile devices are used for direct shopping, but also more often for market research (price comparison, product or service details, store finder, *etc.*).

The prospects for e-commerce are quite positive, because 21% of the companies predict that at least 25% of their annual sales will come from e-commerce in the next three years, while 24% believe more than 15% will come from mobile commerce (EC, 2012).

Due to increased importance of social media, companies should have strong, up-to-date presence on social networks. Also, because of expected expansion of mobile commerce, each company should put special attention of its web presence development *i.e.* its web site nowadays must be mobile friendly.

But, despite the promising results and perspectives, there is a general consensus that much remains to be done, especially in the improvement of online regulatory environment, such as European legal framework on consumer rights, contract law and redress, in order to reach the untapped potential of e-commerce.

Bibliography

1. Constantinides E., Romero L.R., Boria M.A.G. (2008), Social Media: a New Frontier for Retailers?, *European Retail Research*, 22, pp. 1-28.
2. Deloitte (2012), *European eCommerce Assessment 2012 Benchmarking the top 200 in online retail*, Online Business Innovation, Deloitte, April.
3. Diacon P-E., Donici A.N. (2011), *E-commerce across European Union*, CES working Papers, III, (3), pp. 390-397.
4. EC (2012), *Bringing e-commerce Benefits to Consumers: A Coherent Framework to Boost Confidence in the Digital Single Market of E-commerce and other Online Services*, Commission staff working document, Brussels, SEC (2011), 1641.

5. ECE (2013), *Europe B2C Ecommerce report 2013*, Ecommerce Europe, Brussels, June 2013, https://www.ecommerce-europe.eu/website/facts-figures/ light-version/download%20 [16. 05. 2014].

6. eMarketer (2013a), *Worldwide B2C Ecommerce: 2013 Forecast and Comparative Estimates*, eMarketer, https://www.emarketer.com/Coverage/ ConsumersEcommerce.asp [12.05.2014].

7. eMarketer (2013b), *Emerging Markets Drive Facebook User Growth*, eMarketer, http:// www.emarketer.com/Article/Emerging-Markets-Drive-Facebook-User-Growth/1009875 [20. 04.2014].

8. eMarketer (2014a), *Global B2C Ecommerce Sales to Hit $1.5 Trillion This Year Driven by Growth in Emerging Markets*, eMarketer, http://www.emarketer.com/Article/Global-B2C-Ecommerce-Sales-Hit-15-Trillion-This-Year-Driven-by-Growth-Emerging-Mar kets/1010575 [10.05.2014].

9. eMarketer (2014b), *Facebook Is No. 1 for Social Commerce*, eMarketer, March 2014, http:// www.emarketer.com/Article/Facebook-No-1-Social-Commerce/ 1010721 [20.04.2014].

10. EMOTA (2012), *Europe Confirmed as Leader in Global e-Commerce*, 1 June 2012, European Multi-Channel and Online Trade Association, http://www.bevh.org/presse/pressemit teilungen/details/datum/2012/juni/artikel/emota-europe-confirmed-as-leader-in-global-e-commerce/ [11.05.2014].

11. EQ (2014), *EQ4 2013: Holiday Roundup*, Ecommerce Quarterly, Monetate, http://resources. monetate.com/eq/EQ4_2013_FINAL.pdf [21.04.2014].

12. Eurostat (2013), *Nearly 60% of EU Internet Users Shop Online*, Eurostat news release, 147/2013.

13. Eurostat (2014), *Statistics Database, Information Society Statistics*, http://epp.eurostat. ec.europa.eu/portal/page/portal/statistics/search_database [18.05.2014].

14. Gagliardi J. (2013), *E-Commerce in 2014: Seven Key Trends*, http://insights.wired.com/pro files/blogs/e-commerce-in-2014-seven-key-trends#axzz2vY9puZ69 [20.04.2014].

15. Huang Z., Benyoucef M. (2013), From E-commerce to Social Commerce: A Close Look at Design Features, *Electronic Commerce Research and Applications*, 12 (2003), pp. 246-259.

16. IPC (2010), IPC *Cross-Border E-Commerce Report 2010*, International Post Corporation, http://www.ipc.be/~/media/documents/public/markets/ipc%20cross-border%20e-commerce %20report.ashx [14.05.2014].

17. IW (2013), *2013 Mobile Commerce Survey*, InformationWeek Reports, May 2013, http:// reports.informationweek.com/abstract/83/10616/IT-Business-Strategy/Research:-2013-Mo bile-Commerce-Survey.html [20.04.2014].

18. Kim Y.A., Srivastava J. (2007), Impact of Social Influence in E-commerce Decision Making, *Proceedings of the Ninth International Conference on Electronic Commerce*, Minneapolis, MN, August 2007, New York, NY, ACM Press, pp. 293-302.

19. Kuchler H. (2012), UK 'Leads the World' in E-commerce, *Financial Times*, http://www.ft.com/ cms/s/0/ef3e1a04-71b4-11e1-8497-00144feab49a. html#axzz2vY8az6uY, [21.04.2014].

20. Laudon K.C., Traver C.G. (2012), *E-commerce 2012: Business. Technology. Society. 2012*, 8th edition, Pearson Education.

21. OECD (2013), Electronic and Mobile Commerce, *OECD Digital Economy Papers*, No. 228, OECD Publishing, http://dx.doi.org/10.1787/5k437p2gxw6g-en [11.03.2014].

22. Oracle (2013), *B2C E-Commerce Trends for 2013*, Oracle, http://www.oracle-downloads. com/b2c_commercetrends.pdf [14.05.2014].

23. Parise S., Guinan P.J. (2008), Marketing Using Web 2.0 [in:] *Proceedings of the 41st Hawaii International Conference on System Sciences*, (ed.) R. Sprague, Hawaii, HI, January, Washington, DC, IEEE Computer Society Press.

24. Raconteur (2013), *Mobile Business 2014*, Raconteur, November 2013, http://raconteur.net/ mobile-business-2014 [08.05.2014].

25. RZS (2013), *Usage of Information and Communication Technologies in the Republic of Serbia, 2013*, Belgrade, Statistical Office of the Republic of Serbia, http://webrzs.stat.gov.rs/ WebSite/public/PublicationView.aspx?pKey=41&pLevel=1&pubType=2&pubKey=1941 [16.04.2014].

26. RZS (2014), *Statistical Database, Usage of IC Technologies*, Statistical Office of the Republic of Serbia, http://webrzs.stat.gov.rs/WebSite/public/ ReportView.aspx [16.05.2014].

27. Statista (2014), *Statistics and Market Data on Social Media & User-Generated Content*, Statista, http://www.statista.com/markets/424/topic/540/social-media-user-generated-content/ [24.05.2014].

28. yStats (2013a), *Global B2C E-Commerce Market Report 2013*, Hamburg, yStats, http:// www.ystats.com/uploads/report_abstracts/1021.pdf [16.05.2014].

29. yStats (2013b), *Global B2C E-Commerce Trends Report 2013*, Hamburg, yStats, http://www. ystats.com/uploads/report_abstracts/1024.pdf [16.05.2014].

Chapter **32**

The Importance of the Internet in the Marketing Activities of Polish Companies

Krzysztof Kapera

1. Introduction

The tremendous rate of change taking place in the contemporary business forces companies to constantly seek new ways of operating in the competitive market. In recent years, one of the most visible trends in this field is the growing importance of the Internet as a business tool. Internet radically changed business practices in different areas of management. However, this applies particularly to marketing, as a field focused on meeting the needs of consumers whose preferences are changing faster and faster now. For marketing managers the Internet is a great source of market information, providing knowledge on customers and prospects, competitors, as well as changes in the macro environment of companies. Thanks to its unique characteristics such as global coverage, high interactivity and accessibility, the Internet network has become one of the most important communication channel with business environment. The importance of the Internet as a distribution channels of products is also gradually increasing.

The purpose of this article is to assess the importance of the Internet in marketing activities of Polish enterprises. In the first part, a brief characterization of the basic Internet marketing tools used in business practice was presented. The second section contains the selected results of a survey conducted in the third quarter of 2013 on a sample of 422 companies operating in the Polish market and employing at least 50 people. One of the objectives of the study was to collect opinions of the representatives of the companies concerning the importance of the Internet in various areas of marketing activity.

2. Internet usage in the marketing activities of enterprises

Since the beginning of the previous decade, the availability of the Internet in Poland has been increasing very rapidly. According to the results of Net Track survey, conducted periodically by the research institute Millward Brown SMG/KRC, the penetration rate of the Internet in Poland reached 61.4 percent at the end of 2013 (eGospodarka.pl, 2014). It means that the number of the Internet users in our country continues to grow each year. The steady increase in the number

of people using the Internet brings an increasing interest in the Internet among Polish enterprises. According to the latest data from the Central Statistical Office, 66% of Polish companies had its own website at the beginning of 2013, while in the group of large companies with at least 50 employees this percentage reached 86.3% (GUS, 2014). Own website is the basis for the presence of companies in the virtual space. Usually, it serves as a tool of communication with different groups of stakeholders. Extensive websites have separate sections with information dedicated for different groups of recipients, which often exist under very various names. The sections forming the substantive content of the enterprise's website may contain information about the company and its activities, information about the company's offer, press center, investor relations, information for potential employees and information on the company's activities in the area of corporate social responsibility (Kapera, 2013, pp. 113-124). Aside from communication with external and internal recipients of information, some websites may also allow conducting electronic sales of goods and services. This applies in particular to reservation or purchasing of products by customers through the company website. The online ordering system includes a set of functionalities enabling users to review the company's commercial offer, to choose the required product and to check its current availability, to choose delivery method, the preferred method of payment for the product and its eventual delivery to the indicated address. In some cases, the corporate website may also include additional features allowing customers to finalize the transaction *i.e.* to make payment electronically.

Marketing activities in the virtual environment may also include the use of tools in the area of online promotion. One of the most common forms of such actions are display ads, which can appear in various forms corresponding to different levels of intrusiveness to the users. Their main advantage is the ability to reach a wide range of precisely targeted groups of users, defined on the basis of system variables, location, as well as previous behavior related to the topic of visited websites or the types of actions performed. In recent years search engine advertising becomes also more and more popular. Paid links purchased by advertisers appear along with organic search results in specially designated areas of search engine result page. The emission of paid links in search engine results is based on defining keywords, which determine at what search queries specific ads to appear. The effectiveness of this form of advertising primarily result from its contextual fit to users' needs relating to the place and time of display. Another important tool of online promotion are advertisements based on the use of electronic mail, which in nature are similar to display ads. The selection of appropriate tools of online advertising depends to a large extent on the objective of the promotional campaign *e.g.* building awareness, creating a positive image of the company or the brand or calling a specific action, usually combined with a measurable effect. Generally, an indirect goal of the campaign is an increase in the number of visitors to a specific website.

Companies conducting marketing activities on the Internet increasingly use social media. This term refers to a very wide range of online services that allow users interacting with one another, exchanging information, content co-creation and grouping according to specific interests and preferences. One of the most popular forms of social media used in the marketing activities of companies are social networking sites that allow users to create private or public profile in order to establish and maintain contacts with others users (*e.g.* Facebook, Google+). Companies use such sites to create corporate profiles, applications involving users or even to conduct direct sale of products. Typical "fan page" (corporate profile within Facebook) includes information about products and special offers (promotions, contests, discounts), industry news, games, apps, photos

and multimedia materials about the company or its products. In addition, more and more companies are using specially designed functionalities that enable integration of its content with other materials published in the context of social media. An important role is also played by sites that allow users to share a wide variety of multimedia content in the form of photos, videos or presentations, along with the ability to comment and evaluate published materials. Content sharing sites (*e.g.* YouTube, Slideshare) are used primarily to carry out activities in the field of viral marketing, as well as to show product reviews and other promotional materials. Another important tool are blogs, that were one of the first forms of social media allowing users to interact with one another through comments system. The essence of this type of services is based on the systematic, separate and independent entries, which form a chronologically ordered online journal. Blogs are most commonly used by companies in the field of public relations and serves to provide information about the company or to conduct discussions with users. Another, however quite similar, form of social media is microblogging. This term refers to the practice of posting short messages in real time to a group of people watching a particular profile. Such services (*e.g.* Twitter) are used to keep less formal communication with the various stakeholders.

Appropriate use of Internet marketing tools allows companies not only to achieve communication or sales objectives, but can also affect the change in the behavior of customers and prospects. This is due to the fact that the Internet offers consumers a fast, convenient and almost unlimited access to information about companies and their products. Although in many cases the network is not the best distribution channel of goods and services, it is very often used as a primary source of information about searched products (Charlesworth, 2009, pp. 21-24). Contemporary buyers, before making a final purchase decision, use the various tools available on the Internet such as: Internet search engines, price comparison websites, websites of manufacturers or distributors, *etc*. This occurs at the stages of information gathering and assessment of alternatives, and also refers to the situation where the product is bought in a traditional store.

3. The opinions of representatives of companies on the importance of the Internet in marketing activities

The survey was conducted in the third quarter of 2013 on a sample of 422 companies operating in the Polish market and employing at least 50 employees. Due to the nature of the research, it was attempted to collect responses from many companies representing a broad spectrum of industries and being in various economic and legal conditions. Table 1 presents the characteristics of the surveyed companies. In the following section the selected results of a survey are presented concerning the importance of the Internet in various areas of marketing activity.

Representatives of medium and large companies operating in the Polish market declare that the Internet in general plays an important role in their marketing activities. On a scale of 0 to 4, where 0 means "no importance" and 4 – "of key importance", the average assessment of the significance of the Internet in marketing stands at 1.87, however the ratings of discussed issues indicate quite clear differentiation in the cross-section of different areas (Figure 1). According to the answers given by the respondents the Internet plays the most important role primarily in customer service (2.39) and advertising (2.17). On the third place in this ranking is sales of products (1.97) *i.e.* the ability of contracting agreements and finalizing of the transactions. Thereafter, the representatives of companies participating in the survey indicate: sales promotion (1.93),

product innovations (1.81), public relations (1.80) and marketing research (1.78). The Internet plays the relatively small role in the area of distribution of products (1.14) *i.e.* providing electronic services or delivering electronic products.

Table 1. The characteristics of the surveyed companies (% in column)

Description	Options	(%)
The number of employees (n = 422)	from 50 to 100 employees	46.2
	from 101 to 250 employees	30.3
	from 251 to 500 employees	12.1
	from 501 to 1000 employees	7.3
	above 1000 employees	4.0
The geographical coverage (n = 418)	local	10.3
	regional	14.8
	national	27.0
	international	47.8
The degree of diversification of customer needs (n = 417)	no greater diversification	24.7
	several groups of customers with specific requirements	38.8
	customers require an individual approach	36.5
The market volatility (n = 417)	customer requirements are changing rapidly	29.7
	significant but slow changes	57.1
	insignificant or no changes	13.2
The market growth (n = 420)	new market	2.4
	fast-growing market	21.2
	mature market	71.0
	declining market	5.5
The competition (n = 419)	strong	68.3
	moderate	27.7
	weak	4.1

Source: own work.

The obtained results of the study indicate that an important area of the use of the Internet is marketing research. The specific properties of the Internet network make it essential that this medium is gradually becoming one of the main sources of data, both from secondary and primary sources. In total, 57.7% of the representatives of the surveyed companies declare that the Internet has at least important meaning for marketing researches conducted by them, whereas 12.9% describe it as of key importance and 23.3% as very important. The importance of the Internet in this sphere of marketing activity depends on the market volatility and the degree of diversification of customer needs. The highest percentages of responses indicating that the Internet has at least important meaning in the area of marketing researches refer to companies operating in markets characterized by rapid changes in customer requirements (65%), where there are several groups of customers with specific requirements (66.9%).

Figure 1. The importance of the Internet in various areas of marketing activity (on a scale of 0 to 4, where 0 means "no importance" and 4 – "of key importance")
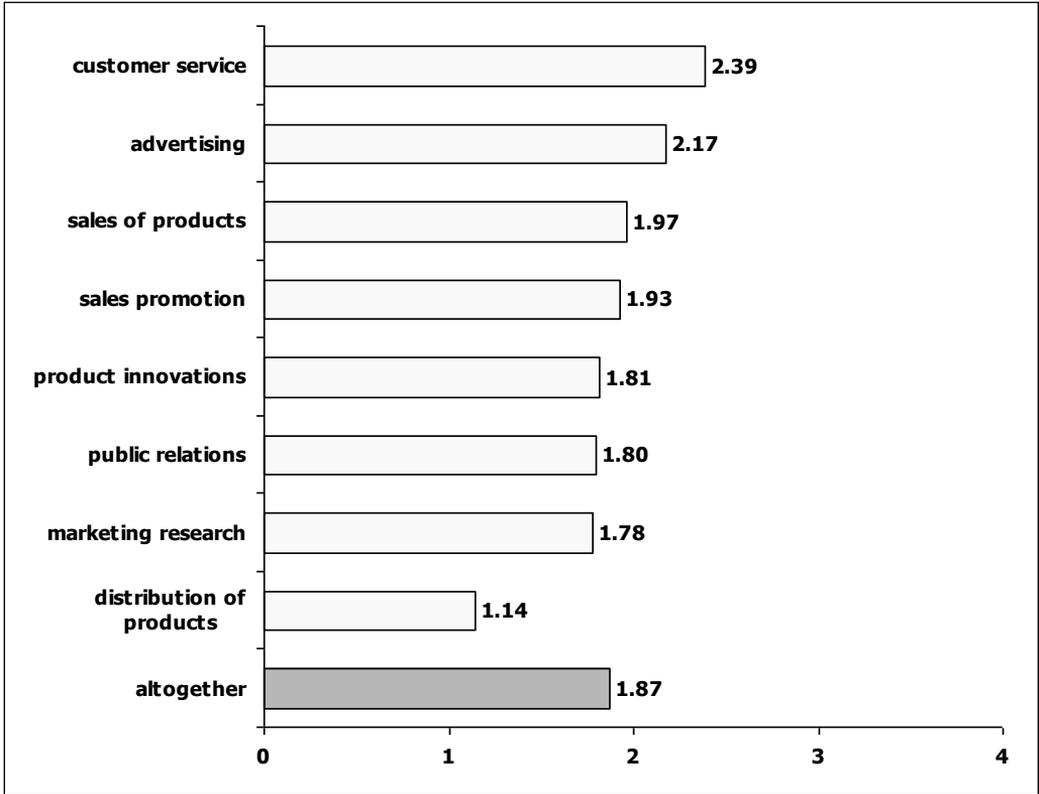
Source: own work.

The Internet also plays a comparable importance in the area of product innovations. With widespread access to the Internet network contemporary customers have the opportunity not only to engage in improving the quality of currently available products, but also in developing completely new products. In total, 59.3% of the representatives of the surveyed companies declare that the Internet has at least important meaning for product innovations implemented by them, whereas 11.1% describe it as of key importance and 25.9% as very important. The importance of the Internet in this sphere of marketing activity depends on the market volatility, the degree of diversification of customer needs, the geographical coverage of the company and the intensity of competitive activities. The highest percentages of responses indicating that the Internet has at least important meaning in the area of product innovations refer to companies with international coverage (68.1%), operating in markets characterized by the necessity of an individual approach to customers (68.1%), rapid changes in customer requirements (65.2%) and a strong intensity of competitive activities (62.6%).

The other very important area of use of the Internet in marketing activities of companies is promotion. Companies can conduct a wide range of activities in the field of marketing com-

munication using their own website, social media or e-mail. Of course, advertising plays here a fundamental role, which is confirmed by the results of this study. In total, 70.1% of the representatives of the surveyed companies declare that the Internet has at least important meaning for advertising activities conducted by them, whereas 18.3% describe it as of key importance and 24.9% as very important. The importance of the Internet in this sphere of marketing activity depends on the market volatility, the market growth and the intensity of competitive activities. The highest percentages of responses indicating that the Internet has at least important meaning in the area of advertising refer to companies operating in fast-growing markets (79.5%), where customer requirements are changing rapidly (76.3%) and there is a moderate (72.2%) or strong (71.4%) competition.

The surveyed companies increasingly use the Internet as a channel of communication in the implementation of activities in the area of sales promotion. In total, 61.7% of the representatives of the surveyed companies declare that the Internet has at least important meaning for sales promotion activities conducted by them, whereas 15.4% describe it as of key importance and 21.9% as very important. The importance of the Internet in this sphere of marketing activity depends on the degree of diversification of customer needs, the market volatility and the intensity of competitive activities. The highest percentages of responses indicating that the Internet has at least important meaning in the area of sales promotion refer to companies operating in markets characterized by rapid changes in customer requirements (69.8%), where there are several groups of customers with specific requirements (65.8%) and there is a moderate (65.7%) or strong (62.5%) competition.

The Internet plays so far a slightly less important role in the area of public relations. In total, 58.2% of the representatives of the surveyed companies declare that the Internet has at least important meaning in the field of public relations, whereas 11.6% describe it as of key importance and 24.5% as very important. The importance of the Internet in this sphere of marketing activity depends on the degree of diversification of customer needs and the market volatility. The highest percentages of responses indicating that the Internet has at least important meaning in the area of public relations refer to companies operating in markets characterized by significant but slow changes in customer requirements (62.7%), where there are several groups of customers with specific requirements (67.8%).

Evidently more and more companies are using the Internet as a means to sell their products. This can be done by means of popular auction sites, as well as using own website, that contains specially designed functionalities allowing users to make reservations and purchases or even to complete the transactions by making payments electronically. In total, 60.5% of the representatives of the surveyed companies declare that the Internet has at least important meaning in the area of sales of products, whereas 17.6% describe it as of key importance and 22.4% as very important. The importance of the Internet in this sphere of marketing activity depends on the degree of diversification of customer needs and the geographical coverage of the company. The highest percentages of responses indicating that the Internet has at least important meaning in the area of sales of products refer to companies with national (67.3%) or international (65.5%) coverage, operating in markets characterized by the necessity of an individual approach to customers (68%).

At present, the Internet plays a minor role in the area of distribution of products *i.e.* providing electronic services or delivering electronic products. In total, 34.9% of the representatives of the surveyed companies declare that the Internet has at least important meaning in the field

of distribution of products, whereas 8.4% describe it as of key importance and 15% as very important. In addition, 42.8% of respondents indicate that this issue does not apply to their companies at all. The importance of the Internet in this sphere of marketing activity depends on the market volatility and the market growth. The highest percentages of responses indicating that the Internet has at least important meaning in the area of distribution of products refer to companies operating in fast-growing markets (50%), where customer requirements are changing rapidly (48.6%).

The obtained results indicate that the Internet plays the most important role in the area of customer service. Particular popular are Internet customer service centers, in which communication with users can be carried out via e-mail, contact forms posted on websites, instant messaging, as well as additional tools such as chat rooms or online avatars fulfilling the role of a customer service agent. In total, 75.3% of the representatives of the surveyed companies declare that the Internet has at least important meaning in the area of customer service, whereas 23.8% describe it as of key importance and 30% as very important. The importance of the Internet in this sphere of marketing activity depends on the degree of diversification of customer needs, the market volatility and the geographical coverage of the company. The highest percentages of responses indicating that the Internet has at least important meaning in the area of customer service refer to companies with international coverage (82%), operating in markets characterized by the necessity of an individual approach to customers (85%) and rapid changes in customer requirements (80.3%).

Table 2. The importance of the Internet in various areas of marketing activities (% in rows)

Marketing activities	The importance of the Internet					
	of key importance	very important	important	of minor importance	no importance	not applicable
marketing research (n = 395)	12.9	23.3	21.5	13.4	6.8	22.0
product innovations (n = 386)	11.1	25.9	22.3	14.5	6.2	19.9
advertising (n = 398)	18.3	24.9	26.9	15.3	5.0	9.5
sales promotion (n = 397)	15.4	21.9	24.4	16.6	7.1	14.6
public relations (n = 380)	11.6	24.5	22.1	16.1	5.3	20.5
customer service (n = 400)	23.8	30.0	21.5	11.0	4.3	9.5
sales of products (n = 392)	17.6	22.4	20.4	18.1	5.6	15.8
distribution of products (n = 381)	8.4	15.0	11.5	12.3	10.0	42.8

Source: own work.

4. Conclusion

The results of the conducted survey show that medium and large companies operating in the Polish market attach considerable importance to the use of the Internet in the process of marketing management. According to the declarations of the respondents participating in the survey the Internet currently has the greatest impact on the following areas of marketing activities: customer service, advertising and sale of products. It is significant that the importance of the Internet in the marketing activities of surveyed companies generally increases with the pace of change taking place in the market and the degree of diversification of customer needs. It may be expected that soon the Internet will become one of the most important tools used in marketing.

Bibliography

1. Charlesworth A. (2009), *Internet Marketing. A Practical Approach*, Amsterdam, Butterwoth-Heinemann.
2. eGospodarka.pl (2014), *Internet w Polsce I-XII 2013*, http://www.egospodarka.pl/105705, Internet-w-Polsce-I-XII-2013,1,12,1.html [12.05.2014].
3. GUS (2014), *Wykorzystanie technologii informacyjno-(tele)komunikacyjnych w przedsiębiorstwach i gospodarstwach domowych w 2013 r.*, http://stat.gov.pl/download/gfx/portalinformacyjny/pl/defaultaktualnosci/5497/3/10/4/nts_wyniki_badan_wykorzystania_ict_2013_calosc.zip [12.05.2014].
4. Kapera K. (2013), Komunikacja działań z obszaru społecznej odpowiedzialności biznesu za pośrednictwem Internetu [in:] *Społeczne wymiary marketingu*, (eds.) R. Niestrój, J.W. Wiktor, Kraków, Wydawnictwo Uniwersytetu Ekonomicznego w Krakowie.

Controlling Computerization Processes in Selected Companies of Various Trades[1]

Janusz Nesterak

1. Introduction

In the contemporary world, computerization has become a key factor affecting the efficiency and effectiveness of actions undertaken by managers. This applies not only to strictly controlling solutions but also to other areas of the company's business activities. In the context of such a wide application of IT tools, we may speak not so much about the program but about a system supporting company management.

The cases presented in the publication approach the process of implementing the IT system in different ways. The largest scale of implementation took place in Kopalnia Soli "Wieliczka" SA ("Wieliczka" Salt Mine) since new ERP and Business Intelligence systems were implemented at the same time. In GH WAM Sp. z o.o. (WAM Hotel Group) an extensive BI system was designed, implemented and adapted to the existing ERP system. A similar case took place at Medicare Sp. z o.o. but the scope of implementation at the first stage was smaller.

2. IT system at "Wieliczka" Salt Mine

The main object of activities at "Wieliczka" Salt Mine is to protect and preserve mining sites which are unique on the global scale. The implementation of the IT system at KSW started with an obligation for all managers of the company's internal units to prepare a demand for computerization of the area under their management. The prepared material was the basis to form the Terms of Reference (SIWZ) during the procedure for awarding a public order and submitting bids for the computerization of "Wieliczka" Salt Mine. The managers developed a rich documentation which was so expanded in many places that certain requirements significantly exceeded the Mine's needs. During tests conducted for the needs of the execution of works it was

noticed that this is practiced in numerous companies. Managers, not wanting to omit some issues, enter over-standard needs to the system's requirements just in case. The error in such thinking results from the fact that no previous detailed analysis of the organizational-management needs was made and the development of SIWZ was based to a large extent on observations and presumptions. As a consequence, a tender was announced. After a formal analysis, three IT products were accepted for the tender: CDN Egeria Comarch SA, Impuls BPSC SA and Maks SPIN SA. The tender was not resolved due to protests from participating parties. This made it possible to begin the Mine's computerization in a proper manner. An external team of appointed experts, supported by the company's key employees, prepared a documentation which indicated the Mine's actual needs. It was based on the concept of implementing controlling at "Wieliczka" Salt Mine prepared previously. This made it possible to order such an IT system which was adjusted to the Mine's needs and not the other way round.

The initial analysis demonstrated the fact that the Mine used a financial-accounting IT system PONET and MS Excel. Despite its easy handling and high efficiency of the modules' functioning, the PONET system proved insufficient. A decision was made to purchase "the core" of an ERP class IT system containing the basic functionalities. It was decided that as new needs appear, the system will be expanded by additional modules. A correct principle was adopted that the software's implementation will take place no sooner than after a complete implementation of controlling products. This decision was a consequence of an opinion prevailing in the team that the IT system should match business needs as best as possible.

The IT system's core at "Wieliczka" Salt Mine is a financial-accounting system Impuls 5 from BPSC. This company was selected due to the fact that the offered product was back then one of the most complex and one of the most often selected MRP II/ERP class systems on the Polish market. The main purpose of the purchased software was an effective control of the information flow. This was achieved, among others, by minimizing the circulation of traditional documents and arranging the process of transferring information. The established base of documents currently facilitates the control over the implementation of tasks as well as makes it possible to identify persons dealing with a given case. The product from BPSC supports finance management, material management, human resources, fixed assets, the circulation of documents and logistics. The Impuls system, focusing mostly on gathering information, did not offer its users tools used for a multi-dimensional data analysis of available data. The large number of new reports as well as the introduced project approach made it necessary to implement a specialized software supporting controlling. For this reason an IT software Business Navigator from Archman was implemented. It supplements Impuls in the management field. The controlling designers managed to develop the controlling documentation at "Wieliczka" Salt Mine so that the implementation of this software was problem-free. A complete integration of the system's core and management modules took place at the same time. As a result, the system makes it possible to monitor all processes taking place in the company.

The tests conducted in the company demonstrate that the most often used module is the data warehouse. This period saw a fivefold increase in the number of users and many managers start their working day from monitoring the degree of realization of budget tasks. This should be considered a great success. The number of computerized analytical areas also doubled as a result of the software's permanent adaptation to the users' growing needs. The data warehouse, the system's heart, was also expanded. Its implementation was a project requiring a large intellectual effort both from external consultants and, first of all, from the company's employees. Apart from

standard benefits, the data warehouse works well in the budgeting process. It facilitates planning in the budgeting process to a large extent. The manager only needs to fill out the basic data sheets of the material plan. The system imports them to the data warehouse where budgets are aggregated and their correctness is checked. The budgeting process conducted in such a manner allows managers to focus on substantive aspects. Using Business Navigator made it possible to optimize the process of developing various reports prepared for government and EU institutions. Before its implementation, employees at "Wieliczka" Salt Mine needed much time to enter data from the accounting system and its manual processing in Excel. Today, the OLAP cube is used the dimensions of which are freely determined by them. This makes it possible to generate *ad hoc* reports in real time.

According to the Mine's managers as well as employees of the controlling department, the implemented IT tools are very useful and support employees, especially in the process of preparing, monitoring and settling projects which are key for "Wieliczka" Salt Mine. The adopted methodology of purchasing the core and expanding the system by subsequent modules, as needs emerge, is the most effective according to them.

3. Computerization of WAM Hotel Group in Kraków

WAM Hotel Group in Kraków is one of the largest hotel chains in Poland. The basic scope of activities of WAM Hotel Group is to provide hotel and gastronomical services along with accompanying services.

Prior to the commencement of IT works at WAM Hotel Group, aiming at supporting the developed concept of controlling at the company, IT systems used in the company were diagnosed. Then, WAM Hotel Group had a spread IT architecture. Soneta Sp. z o.o. delivered the Enova software which was classified as an ERP product but the company used it essentially for accounting and payroll. Another key area of the company's activities, selling hotel services, was operated by a supplier specializing in hotel applications. Triarte Sp. z o.o. administered the DM Plaza software.

The Enova system did not enable IT services of the methodology for calculating the unit cost on the basis of ABC designed for the needs of controlling. The Board of Directors at WAM Hotel Group recognized it then as the key tool making it possible to make effective management decisions. It was justified by the structure of costs which, to the greatest extent, were of an indirect nature. Therefore, assigning them to a specific service in a proper manner was of key importance at WAM Hotel Group. The Enova system had similar limitations in the field of supporting advanced budgeting methods. It was also not possible to create multi-dimensional data analyses which currently is a key functionality of modern IT systems. Despite the fact that the IT technology applied in the Enova system (NET and SQL Server) was prospective, the business area was seriously threatened that this product will not be able to adapt to the requirements of controlling products designed for WAM Hotel Group.

On the other hand, according to the team of consultants, the DM Plaza software had a satisfactory IT technological layer. It enabled complete integration with controlling modules, the Enova system and with *BI* class applications. Final conclusions from the analysis of this area made it possible to develop the existing IT system on the basis of area applications, accordingly integrated through a properly designed data warehouse.

The implementation of the Business Navigator data warehouse enabled complete integration of transaction systems existing at WAM Hotel Group. It was periodically fed with data from the following software: sales (DM Plaza), financial-accounting (Enova) and MS Excel files. It was assumed that the data warehouse would be updated on a daily basis. The key functionalities of the data warehouse module in the Business Navigator system applied at WAM Hotel Group include:

- a multi-dimensional analysis of data collected in the data warehouse,
- reports operating on the basis of pivot tables,
- the possibility of generating reports as part of OLAP cubes individually,
- access through a web browser,
- the possibility to export reports to MS Excel, preserving connections with the base,
- automatic updates for the data.

The manner of storing data in OLAP cubes specified at the stage of system designing made it possible to specify the manner of their presentation. Seven cubes were made available for WAM Hotel Group: analysis of costs, analysis of investments and repairs, analysis of settlements, analysis of payroll, analysis of results, analysis of sales, analysis of occupancy. All of them were made available through a web browser and the authorized user after logging in gains access to the data. This access is profiled so that the manager of a given responsibility center may use only this data which applies to him. Using the data warehouse is relatively simple for the users and comes down to browsing previously defined reports using the pivot table functionality. Among the implemented OLAP cubes used at GH WAM, the most often used cube is "results", listing generated costs and revenues for a selected cost center (MPK). In 2012 this cube was expanded by the possibility to calculate changes in the product's state. The number of its active users in 2013 exceeded 40 employees.

The data warehouse made it possible to increase the adaptation possibilities of subsequent controlling tools. The model of business processes present at WAM Hotel Group was developed at the beginning. On its basis, it was possible, among others, to: generate job descriptions, create a procedure for the circulation of accounting and management document as well as assess the effectiveness of using particular responsibility centers. This module made it possible not only to design processes but also to manage them effectively. As a result, the company became more dynamic and may efficiently adapt to the market's needs. The project's basic assumption was also its flexibility which made it possible to perform modifications following changes in the scopes of obligations and decision-making competences of particular units or changes to the circulation of documents. As a closed system, it forced the implementation of an IT tool which would coordinate the activities referred to above. When designing the IT module supporting process management, the following assumptions were adopted:

- each employee needs to have *on-line* access to all information which relates to his position through a web browser,
- a change to a procedure should be immediately visible for all authorized employees,
- job descriptions as well as the circulation of documents change dynamically after a procedure is updated and do not require additional work.

The key functionalities of the designed Business Process Modelling (BPM) module include the possibility to define: processes and subprocesses, numerous procedures for particular subprocesses, actions as part of procedures as well as the organizational structure at WAM Hotel Group. This was supplemented with the following functionalities: automatic generation of re-

sponsibility center cards, defining the documentation of actions as part of a procedure, automatic generation of reports on the circulation of documents, defining and browsing times and frequency of actions as part of a procedure, indexing actions, generating reports on center and process loads. A complete integration with the data warehouse, the module supporting the estimation of action costs (ABC) and the module supporting personnel management was also provided.

The next stage of the development of controlling was the decision to implement a controlling model of action costs ABC key for the company. Its basic task was to provide managers with reliable information from the areas: of sale (analysis of product groups, areas of sale, customer groups) as well as material and production management (among others, analysis of suppliers). The efficient functioning of the developed model was determined by relevant support from the IT side. The key functionalities of the designed module ABC Business Navigator included the possibility to:

- evaluate the costs of actions and processed according to the classic method and Time Driven ABC,
- automatically import financial data from external systems,
- calculate rates for potential and effective man-hours,
- define processes (projects), actions, division keys,
- export reports to the MS Office environment,
- operate the software through a web browser,
- complete integration with the data warehouse and the modules: BPM and Personnel Management.

The IT works referred to above were executed in 2008. In the years 2009-2011 the company's computerization slowed down which resulted from a change to the vision and strategy of activities of the company's new Board of Directors in this area. The dimensions of OLAP cubes in the data warehouse were only insignificantly expanded then. The remaining implemented IT systems were not developed further. Another change to the Board of Directors resulted in an increased interest in controlling products and IT systems supporting it. In 2012 the module Budgeting of the Business Navigator system was implemented. It makes it possible to create budgets for the company's organizational units, such as: hotels and particular departments comprising the company's Headquarters. Additionally, budgets for repairs and investments were implemented. They were connected with the OLAP cube "repairs and investments". This decision was triggered by the need for an individual analysis of this area of generating expenses and costs. Initial works on an increased use of the component leaves in the module personnel management BN were also started. This module is supposed to support the electronic circulation of documents, such as: leave applications as well as business trips.

The several years when IT tools supporting controlling function at WAM Hotel Group led to the growth in users awareness of benefits these tools have in the management decision making process. At the beginning, mainly simple domain modules were used but now the data warehouse is the leading tool.

4. Business Navigator at Medicare Sp. z o.o. in Katowice

The main scope of activities of the pharmaceutical wholesale store Medicare based in Katowice is wholesale trade in pharmaceutics, cosmetics and medical materials for pharmacies and clinics in southern and central Poland.

Development of the controlling project at Medicare was the foundation for an effective implementation of IT solutions supporting management. As part of this stage, the records of revenues and expenses were arranged, the concept of budgeting was established and workshops for managers at responsibility centers were organized.

Medicare chose the IT product Business Navigator from Archman. The basic assumption of the management was a gradual computerization of controlling and expanding its scope in correlation with the company's changing business needs. In the first place, the financial-accounting system was modified thus enabling the implementation of assumptions of the new records of revenues and expenses. Then, the modules Data Warehouse as well as budgeting were implemented on the basis of MS Excel spreadsheets. In the second half of 2009, the module personnel management was implemented.

Four OLAP cubes were implemented at the beginning as part of the data warehouse: costs, results, settlements and remuneration. Throughout the four years when the system has operated, practically all cubes were modified, *e.g.* by establishing new analytical dimensions in them. New cubes were also created which significantly expanded the scope of managerial information. The data warehouse implemented at Medicare makes it possible to generate dynamic and static reports. Managers using the reports according to their rights may create multi-dimensional analyses.

Budgets in the initial phase were prepared in Excel spreadsheets. Then, data from the spreadsheets was imported to the data warehouse (OLAP cubes: costs and results). Planned results were compared with actual results during the year. At the beginning, an annual horizon of budgeting was assumed which was finally shaped for the period of one quarter. This decision was triggered, first of all, by the high variability of the pharmaceutical market and difficulties in detailed planning of operational actions and budgets in a period longer than one quarter. The purchase and implementation of the module Budgeting in the Business Navigator system in 2010 completely automated the process of preparing budgets. Particular attention was paid to budgeting remuneration. The system makes it possible to plan them and precisely analyze deviations with accuracy to each employee and remuneration component. Such high care in this respect results from the importance of remuneration in the company's cost structure. Even without taking into account the purchase of commercial products, they constitute more than 50% of the remaining costs. The budgeting system is constantly developing and evolving along with changing conditions in which the company operates. The greater involvement of employees in the process of planning and analyzing deviations may be considered a positive tendency. This is fostered by the settlement of each manager from the realization of budgets.

The module Personnel Management supports the implementation of employee periodical assessments. It was based on job descriptions functioning at Medicare and the matrix of job competences. The system makes it possible to create employee competence profiles and then to conduct employee assessments on their basis, according to the 360° methodology. Data collected in the assessment process is available in the data warehouse where it is possible to create various lists, rankings and scenarios. The possibility to compare results obtained by employees in particular editions of employee assessments should also be emphasized. According to Medi-

care managers, the effectiveness of implementation was achieved as a result of efficient action of the consultants from the implementing company who quickly responded to comments.

Currently, the system Business Navigator at Medicare is actively used by approx. 30 managers managing responsibility centers as well as all employees of the HR department and the analysis department. Additionally, when employee assessments are conducted the system is used by all employees conducting the assessment of superiors or co-workers. The system also stores and shares documents related to the company's quality system.

From the point of view of persons managing Medicare, quick access to actual data and the possibility to compare it with planned values is important. Due to the special nature of activities, the most important thing, according to the financial director, is reporting costs with an extended area of remuneration and financial results. The Business Navigator system makes it possible to track these parameters on a current basis.

5. Conclusion

The empirical verification of methods for conducting the computerization of controlling products demonstrated the fact that it is worth making the effort at the beginning and conducting a thorough and in-depth analysis of requirements for the new system. All key managers at each organizational level of the company should be involved in this analysis. The conclusions from the analysis often affect the need to modify the previously determined manner of collecting information and the information flow. When deciding on a serious money expense to purchase the IT system, one should be aware that it will be operated for the next several years. Therefore, when formulating the present requirements towards the IT system, attention should be paid to the tasks and functions it is supposed to serve in the future.

Bibliography

1. The Medicare's implementation materials.
2. The WAM Hotel Group implementation materials.
3. The "Wieliczka" Salt Mine's implementation materials.

Authors

Małgorzata Adamska-Chudzińska	Cracow University of Economics, Poland
Mateusz Bocian	Grupa Onet.pl S.A., Poland
Andrzej Brożek	Cracow University of Economics, Poland
Artur Bujak	Cracow University of Economics, Poland
Urszula Bukowska	Cracow University of Economics, Poland
Katarzyna Cymbranowicz	Cracow University of Economics, Poland
Anna Dolot	Cracow University of Economics, Poland
Mikica Drenovak	University of Kragujevac, Serbia
Mateusz Dudek	Cracow University of Economics, Poland
Magdalena Gorzelany-Dziadkowiec	Cracow University of Economics, Poland
Mariusz Grabowski	Cracow University of Economics, Poland
Katarzyna Hys	Opole University of Technology, Poland
Magdalena Jajko	Cracow University of Economics, Poland
Zoran Kalinić	University of Kragujevac, Serbia
Maciej Komorowski	Cracow University of Economics, Poland
Jakub Kanclerz	Cracow University of Economics, Poland
Krzysztof Kapera	Cracow University of Economics, Poland
Daniel Kosiorowski	Cracow University of Economics, Poland
Ewa Kozień	Cracow University of Economics, Poland
Paweł Lula	Cracow University of Economics, Poland

Jan Madej	Cracow University of Economics, Poland
Dominik Mielczarek	AGH University of Science and Technology, Poland
Jan Ministr	VSB – Technical University of Ostrava, Czech Republic
Janusz Morajda	Cracow University of Economics, Poland
Janusz Nesterak	Cracow University of Economics, Poland
Beata Olszewska-Łabędź	Cracow University of Economics, Poland
Grzegorz Pamuła	Cracow University of Economics, Poland
Ewelina Pawłowska	Cracow University of Economics, Poland
Jacek Pera	Cracow University of Economics, Poland
Tomáš Pitner	Masaryk University, Czech Republic
Grażyna Plichta	Cracow University of Economics, Poland
Vladimir Ranković	University of Kragujevac, Serbia
Tomasz Rojek	Cracow University of Economics, Poland
Jerzy Rydlewski	AGH University of Science and Technology, Poland
Małgorzata Snarska	Cracow University of Economics, Poland
Halina Stoch-Parulok	Cracow University of Economics, Poland
Alicja Szczygieł	Cracow University of Economics, Poland
Damian Tracz	Cracow University of Economics, Poland
Jan Trąbka	Cracow University of Economics, Poland
Monika Trętko	Cracow University of Economics, Poland
Janusz Tuchowski	Cracow University of Economics, Poland
Małgorzata Tyrańska	Cracow University of Economics, Poland
Anna Wieczór	Cracow University of Economics, Poland
Sylwia Wiśniewska	Cracow University of Economics, Poland
Marta Wolska	Warsaw School of Economics, Poland
Jacek Wołoszyn	Cracow University of Economics, Poland
Paweł Wołoszyn	Cracow University of Economics, Poland
Katarzyna Wójcik	Cracow University of Economics, Poland
Monika Zasadnia	Cracow University of Economics, Poland
Marcin Zgoda	Cracow University of Economics, Poland