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# BUSINESS CHALLENGES AND TRANSFORMATIONS IN THE DIGITAL AGE

Edited by
Janusz Nesterak, Bernard Ziębicki

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**PART II** TRENDS AND CONCEPTS OF CONTEMPORARY MANAGEMENT IN THE DIGITAL AGE

# Introduction

Digital technologies have become a major determinant of modern business development. They make it possible to enhance the efficiency of business processes, introduce automation, as well as forms of online cooperation and global sales. The development of digital technologies is ever more rapid. Increasingly advanced solutions are being offered, creating further business opportunities. These solutions rely on intelligent systems with self-learning capabilities. Under these conditions, ensuring competitiveness and business development requires openness to change and ability to take advantage of the opportunities created by digital technology. These conditions change the approach to the management of a modern enterprise. There arise a range of challenges and necessary changes that managers need to face. These are the issues which are addressed in this monograph, which is the result of scientific cooperation between the College of Management and Quality Sciences of the Cracow University of Economics and other scientific and business circles, such as Andrzej Frycz Modrzewski Cracow University, Bright Domino Corporate University (Miami, USA), Catholic University of Ávila (Spain), Cracow University of Economics, Eurobent Sp. z o.o., Gdynia Maritime University, Jan Kochanowski University of Kielce, SGH Warsaw School of Economics, Technical University of Lodz, University of Economics in Katowice, University of Gdansk, University of South-Eastern Norway and Wroclaw University of Science and Technology.

The monograph deals with the issues from both a theoretical and practical perspective. The topics are divided into the following two complementary parts:

I. Economic challenges in the digital age.

II. Trends and concepts of contemporary management in the digital age.

The first part of the study is devoted to the demands of socio-economic development in the digital era. It presents the issue of the relationship between business competition, innovation and customer behaviour. Models for estimating the impact of investment in information and communication technologies on socioeconomic development were presented. The impact of the COVID pandemic on e-commerce was discussed. The issue of agricultural development from the perspective of technology 4.0 is also addressed. This part also characterizes the impact of digitization on the development of student entrepreneurship and educational processes in universities.

Part two of the study presents trends and concepts underlying modern management related to the development of digitization. This part addresses the changing concepts of management, eco-consumption, business models, and new challenges in controlling, marketing or lean management. The chapters present research results and proposed solutions to business practice. These issues are considered from the perspective of various categories of organisations, both business and public, as well as social development.

As scientific editors of this monograph, we wish to express our gratitude to all Authors for accepting the invitation to co-create it and share the results of their research with the readers. We would also like to thank the Reviewers: professors Agnieszka Bieńkowska, Liliana Hawrysz, Anna Surowiec and Magdalena Węglarz for their valuable contribution to the shape of the contents of this publication.

*Janusz Nesterak, Bernard Ziębicki*

# PART I ECONOMY CHALLENGES IN THE DIGITAL AGE

Chapter 1

# The Dynamic Interplay of Business Competition, Innovation, and Consumer Behavior

Bartolomeo Rafael Bialas

## 1. Introduction

One of the most critical concepts in business and management is the concept of competition. Most management scholars and economists tend to relate competition with improved productivity, innovativeness, and – consequently – consumer satisfaction and lower prices of products and services. There is a consensus among economists that business competition acts as a fundamental driver of output growth (Felix & Maggi, 2019, p. 1).

According to the White House economic report, "Healthy market competition is fundamental to a well-functioning U.S. economy. Basic economic theory demonstrates that when firms have to compete for customers, it leads to lower prices, higher quality goods and services, greater variety, and more innovation. Competition is critical not only in product markets, but also in labor markets. When firms compete to attract workers, they must increase compensation and improve working conditions" (The White House, 2021).

It follows then that weak, meager, or limited competition can allow dominant organizations to take advantage of their market position to impose higher prices, experiment with inferior quality, and – ultimately – erect strong barriers to entry preventing potential competitors from entering the market. Given the importance of competition in business, it shouldn't come as a surprise that business success can only be achieved if companies closely analyze competitors, anticipate competitive moves, and fastidiously dissect strategies of their closest rivals.

## 2. Rapidly Changing Competition – How to Cope With It

There is substantial evidence that indicates that the business environment has become more competitive. Recently Crayon, a market leader in competitive

intelligence software, had conducted a comprehensive survey on competitive intelligence among over 1000 managers and executives. According to this survey eighty-seven percent of respondents indicated that their market has become more competitive in the last three years, and forty-nine percent described it as much more competitive (Pring-Mill, 2019).

According to Harvard Business Review authors, Joan Schneider and Julie Hall, most entrepreneurs do not actively engage in market research. Moreover, "about 75% of consumer packaged goods and retail products fail to earn even $7.5 million during their first year. This is in part because of the intransigence of consumer shopping habits. …Less than 3% of new consumer package goods exceed first-year sales of $50 million – considered the benchmark of a highly successful launch" (Scheider & Hall, 2011). And for companies traditionally referred to as startups, the failure rate is staggeringly high – 90%. According to Startup Genome's 2019 report, only 1 in 12 entrepreneurs succeed in building a successful business (Ward, 2021).

This increasingly intensifying competition acts both as a catalyst and incentive for companies who want to achieve market success and attract loyal customers. Competition also forces companies to constantly innovate, heavily invest in market research, and focus on developing strong brands that resonate with consumers. There is no denying that competition actively promotes the emergence of pioneering, innovative, attractive – or newfangled – products and services. The constant pressure exerted by the hypercompetitive business environment drives companies – both incumbents and startups – to focus not only on the technological aspects, but also on the better understanding of consumer actions, behaviors, motivations, and cultural values.

In order to attract new customers, companies are continuously rethinking and experimenting with their business models, focusing more on new services that engage consumers' senses, and investing in personalized customer experiences. Managers increasingly understand that the new frontier of the competitive advantage will be found in innovation, which means that companies will compete more aggressively for the power of the human creativity that resides inside every employee's brain.

According to the 2010 IBM Global CEO Study, which focused on 1,500 face-to-face interviews with private sector CEO's (80%) and senior public sector leaders (20%) from 33 different industries spread over sixty countries, the single challenge that chief executives officers had grappled with is complexity. The vast majority of respondents expressed negative views about the exceptionally high levels of business competition. "CEOs told us they operate in a world that is substantially more volatile, uncertain and complex. Many shared the view that

incremental changes are no longer sufficient in a world that is operating in fundamentally different ways" (Wladawsky-Berger, 2010). Almost all respondents "stated that they believe that creativity is critical to navigating an increasingly complex world through volatile economic climates. Creativity is a key component of regional and global economic development and long-term success in all fields" (Hee Kim, 2019, p. 125). Moreover, "creativity is the most important leadership quality. Standouts practice and encourage experimentation and innovation throughout their organizations. Creative leaders expect to make deeper business model changes to realize their strategies. To succeed, they take more calculated risks, find new ideas, and keep innovating in how they lead and communicate" (Wladawsky-Berger, 2010).

According to the U.S. Chamber Of Commerce Global Innovation Policy Center, innovation and creativity are absolutely necessary in business. The United States Patent and Trademark Office has estimated that the value of intellectual property to the country's economy – patents, trademarks, copyrights, creative solutions, etc. – is more than US $ 6.6 trillion – equivalent to about 45% of US GDP. "The direct and indirect economic impacts of innovation are overwhelming, accounting for more than 40% of U.S. economic growth and employment" (U.S. Chamber Of Commerce Global Innovation Policy Center, n.d.).

## 3. The Importance of Creativity and Innovation in Business

Despite the existing – and overwhelming - evidence that innovation and creativity significantly contribute to the growth and performance of many organization, most managers are currently unable to freely experiment with innovation in their organizations. Von Stamm very clearly indicates that many "organizations tend to have a culture and strategy that fosters efficiency, cost-cutting, incremental changes, and a focus on day-to-day business. Innovation is not likely to flourish in such a culture. Organizations that do not value innovation tend to perpetuate that culture by recruiting and training managers based on their efficiency and effectiveness – not on their willingness to experiment or take a (calculated) risk. These, however, are important attributes for a manager who is charged with improving an organization's innovation performance" (Von Stamm, 2004, p. 11).

Creativity has been instrumental in improving human life conditions, survival, and wellbeing. But recently creativity has become the source of economic growth and prosperity. "It is not uncommon nowadays for writers to refer to it as a life or death issue (at least in a political, social, or economic sense) and to

use dramatic language as 'innovate or die'" (Patson, Kaufman, Cropley, Marrone, 2021, p. 208).

The scientific examination "of creativity within psychology begins with the J. P. Guilford's seminal address at the American Psychological Association" in 1950 (Li, Li, Ji, Zhang, Qiu, 2019, p. 1). In this address, Guilford commented that the systemic ignorance and neglect of the subject of creativity by psychologists and educators was appalling. Guilford explained that he had found only 186 academic articles dedicated to creativity, none of which, however, represented any scientific value (Dacey & Madus, 1969, p. 55).

A lot has changed since Guilford's seminal and illuminating address. The last decade had provided significant insights about the neural basis of creativity. Specifically, "brain imagining methods including positron emission tomography (PET), functional magnetic resonance imaging (fMRI) and electroencephalography (EEG and event related potentials [ERP]) have provided important implications regarding the neural basis of creativity" (Mullen-Raymond, 2017, p. 188).

Despite the growing interest in creativity and its neural correlates, there is no single measure method that can comprehensively capture the multifactorial complexion of this cognitive function.

It's noteworthy to understand that there exists a plethora of definitions of creativity. "Wallas proposed that creativity was a mental process that included phases such as preparation, incubation, illumination and verification. Torrence defined creativity as a process of becoming sensitive to problems, deficiencies, gaps in knowledge, disharmonies; identifying the difficulty; searching for solution, or formulation hypothesis about the deficiencies: testing and retesting these hypothesis and possibly modifying and retesting them; and finally communicating the results" (Mullen-Raymond, 2017, p. 188). There is a significant body of research that indicates that despite the fact that creativity involves the "process of conceiving and implementing useful and unique outcomes that often result in marvelous innovation, everyone is capable of learning the attitudes and skills that can produce innovation" (Hee Kim, 2019, p. 119).

Research on creativity and innovative thinking has revealed three factors that play a critical role in divergent as well as convergent thinking: climates (environment), attitudes, and thinking skills. "The creative thinking process had been further defined as the forming of associative elements into new combinations which either meet specified requirements or are in some way useful" (Li, Li, Ji, Zhang, Qiu, 2019, p. 1). Numerous research studies have also demonstrated the profound importance of "expertise over high intelligence as the foundation of creative thinking. The relation between intelligence and creativity becomes much weaker as novices become experts. (…) The thinking skills involved in expertise

are inbox memorization, comprehension, and application" (Hee Kim, 2019, p. 122). Although expertise development is profoundly relevant for creativity, imagination has also been recognized as an important component of creative thinking. The broad expertise both fosters and triggers imagination, which in turn allows for the identification of the hidden problem or challenge. Extensive expertise makes the imagination "fluent, flexible, and original. Fluent imagination is imagining many ideas spontaneously without judgment; flexible imagination is imagining different kinds or categories of ideas; and original imagination is imagining unique ideas beyond the current knowledge" (Hee Kim, 2019, p. 122-123).

While creativity often leads to breakthrough technological innovations, technology in and of itself doesn't constitute the only form of market innovation. There is a systemic problem that concerns the perception of what innovation is. Unfortunately, the traditional indicators of innovation performance are heavily biased toward investments in scientific and technological invention and so do not capture other forms of innovation. Innovation is about the successful exploitation of all new ideas, whether they are major cultural, organizational, managerial, processual, communication or technological changes, or incremental improvements that can keep an organization one step ahead of competitors. Scientific and technological advances can be an important element of innovation, but developments across the whole range of industrial and commercial activities, for example design, business philosophy, advertising ideas, business models, strategic brand management, market research methods, and marketing are extremely important and can – and often do – constitute the major innovations.

According to the UK Government white paper on competitiveness, "The effective use of design is fundamental to the creation of innovative products, processes and services" (Von Stamm, 2004, p. 11).

Let's consider the DIRT IS GOOD advertising campaign for the global brand of laundry detergent – OMO / PERSIL – by Unilever. This highly creative and innovative campaign was predicated on a wide-scale cross-cultural survey of 12000 parents in ten countries. The objective of this monumental research project was to learn more about the play habits of children ages seven to twelve. The insights gained from this project demonstrated a dramatic drop in outdoor play among children, in favor of playing games on their computers and other electronic devices. The DIRT IS GOOD advertising campaign – developed using aforementioned consumer insights - encouraged kids to go out and play. Parents reacted extremely enthusiastically to this advertising campaign and began looking differently at the concept of DIRT. As a result of this innovative brand message, dirt acquired a new meaning: dirt became a catalyst of children's healthy development. This innovative creative idea – obtained through innovative research

methodologies - resulted in a phenomenal financial success: sales increased nearly 1000 times over and grew from approximately US $ 4.73 million to about US $ 3.7 billion (Persil, n.d.). This example illustrates that highly creative and innovative ideas – not necessarily technological - transcend cultural and geographical boundaries. Creative ideas are universally compelling. They also contribute to the development of highly attractive, culturally meaningful brands.

## 4. Consumer Behavior, Market Research, and Neuroscience

The fast economic development of countries such as China, India and Brazil, precipitated the creation of new hotbeds of innovation. However, numerous research studies have offered very clear evidence that the vast majority of new products that enter the global market – especially from the aforementioned countries – constitute what is known in marketing vernacular as the me-too category of products (Chen, Guo, Zhu, 2012, p. 277). "A substantial amount of entry is by undifferentiated or me-too entrants, whose products are very similar to those of incumbent firms, as a quick trip around a grocery store or pharmacy will confirm. (…) Common examples of me-too products include house brands and generic drugs that seem to be based on lower marginal cost, weaker branding, and/or on free0riding on the national brands' category development investments" (Brander & Spencer, 2022, p. 1).

This market reality has a profound implications for consumer behavior. When there is a cornucopia of products and services that are virtually identical, consumers don't buy solely on price. They actively search for brands that can enrich their lives. Countless studies have demonstrated that consumers' relationships with brands are characterized by strong emotional attachments. These attachments include emotions such as bonding, companionship, and love (Rossiter & Bellman, 2012, p. 292).

Given the magnitude of the me-too market phenomenon, and its impact on consumer behavior, in addition to technological innovation managers, entrepreneurs, and strategists should pay more attention to strategic brand management, aesthetics, IP law, and consumer neuroscience in order to focus on the development of products and services that are highly differentiated and characterized by strong brand equity. "Product differentiation refers to the degree to which a firm's products are not substitutable. When a firm has a lower level of product differentiation, its products are more similar to competitors' products and are more substitutable. Thus, it is likely that the similarity in business environment and operations between a firm and its peers is greater when the firm's product

differentiation is low than when its product differentiation is high" (Cheng, 2021, p. 47).

Perhaps the most important business question is: what do consumers want? Over the years, many methodologies and academic disciplines have attempted to offer the answers and explanations. Ethnography, projective techniques, quantitative methods – they all significantly contributed to our understanding of consumer behavior, but the question, by and large, remains unanswered. In the recent times, there has been a great quest among psychologists, anthropologists, and marketers to crack the code of consumer psychology in order to effectively promote and sell the products and services to the consumers. Unfortunately, traditional "marketing has shown that is has certain limitations especially when collecting the respondent's answers by organizing focus groups" (Andronescu & Buiga, A. 2019, p. 132). Countless research studies and expert opinions indicate that traditional marketing research "is restricted to purely analyzing reported and/or behavioral data" (Hubert, Hubert, Sommer, Kenning, 2009, p. 28). Traditional market research techniques focus on measuring the attitudes of the consumers towards the brands. The reality, however, is that consumers' stated opinions rarely translate into the actual buying behavior. Whereas traditional market research methods are still playing an important role in marketing, the promising new discipline – consumer neuroscience – has recently gained "credibility and degree of acceptance by the wider marketing research community despite its contentious origins" (Harris, Ciorciari, Gountas, 2018, p. 239). Essentially, consumer neuroscience focuses on "neuroimaging techniques such as nuclear magnetic resonance, electroencephalography, and magnetoencephalography to study and define consumer responses to various marketing stimuli" (Dumitrescu & Dumitrescu, 2021, p. 41). Brand strategists – and other management professionals – deem this new research area of consumer neuroscience as promising due to the fact that it can "capture unconscious and emotional processes" (Hubert, Hubert, Sommer, Kenning, 2009, p. 28).

Given the fact that contemporary business environment – as was already discussed – is highly competitive and volatile, the ability to successfully respond to consumers' needs, wants, desires, and expectations- often latent ones and unable to be verbally expressed by consumers – has become the major objective for managers, marketers, and entrepreneurs. Consumer neuroscience can provide invaluable and unparalleled access to detailed patterns of activity in the human brain. As a consequence, businesses can develop more engaging brands, compelling advertising campaigns, and "provide consumers with a delightful experience in the consumption process" (Agarwal & Dutta, 2015, p. 457). The preponderance of evidence drawn from consumer neuroscience research shows that only strong

brands are able to "emotionalize the decision-making process. This so called 'winner-takes-all" effect is accompanied by an increased activation of the ventromedial prefrontal cortex" (Hubert, Hubert, Sommer, Kenning, 2009, p. 32). It has been recognized that the area of the brain responsible for evaluating rewarding stimuli is located in the aforementioned ventromedial prefrontal cortex. It follows then that consumer neuroscience tools can be successfully applied to market research in the hopes of identifying consumers' reactions to various products, advertising messages, and brand identities. "Human thoughts and emotions are the result of (…) subconscious activity, so the actions triggered by them cannot be explained in a conscious context, which is why most market research fails to reveal the true preferences of the subjects involved. According to new research, the consumer's response to advertising is based on cognitive efficiency rather than marketing manipulation" (Dumitrescu & Dumitrescu, 2021, p. 50).

## 5. Conclusions

Businesses today must actively look for ways to stay a step ahead of their competitors and potential entrants ready to encroach on incumbent's turf. Doing so is very often easier said than done, and no magic formulas and quick fixes exist to help managers outperform their rivals. Competition has become fierce, and many organizations experience the debilitating effects of the hypercompetition. Companies can – and often do - attempt to solve the 'competition challenge' by heavily investing in innovative – and ideally – proprietary technology. But technology in and of itself cannot become the source of sustainable competitive advantage. According to Harvard Business Review, "nothing breeds copycats like a successful business venture. When a new business idea is incubated and executed successfully, clones naturally emerge and imitate" (Ekekwe, 2012).

In order to beat the competition, companies need to better address the needs, wants, desires, and expectations of their customers. Developments in consumer neuroscience in the last 10 years have been outstanding, altering our understanding of the human brain, how it functions, and how it reacts to all sorts of marketing stimuli. "Neuroscience techniques seem to offer that most tantalizing of prizes – an objective view of what consumers really think, free from interviewer or questionnaire bias and respondent confabulation" (Page & Raymond, 2007, p. 132).

Businesses must focus on brand differentiation. Consumers are shying away from companies that sell the same, undifferentiated products, and don't provide them with new and exciting solutions. Companies that provide and sell interchangeable products elicit indifference in consumers. Producing and pro-

moting interchangeable products very often lead to price wars among companies because the only thing left to compete for is the price. Price wars, in turn, tend to result in lower net profit. By focusing on differentiation, businesses can develop brands that are predicated on credibility, which in turn can considerably affect consumer loyalty towards their favorite brands. There is no doubt that the only way a company can truly become successful and profitable is through a well-thought-out differentiation. Going beyond mere technology obsession, managers, strategists, and entrepreneurs should heavily invest in consumer neuroscience research and brand differentiation.

## Bibliography


1. Agarwal, S. & Dutta, T. (2015). Neuromarketing and Consumer Neuroscience: Current Understanding and the Way Forward. *Springer Science* & *Business Media B.V.*, *42*(4), 457-462
2. Andronescu, D. A., & Buiga, A. (2019). Marketing And Neuroscience – A Future Winning Tandem. *Academic Journal of Economic Studies. 5*(4), December 2019, 132-138
3. Boushey, H., & Knudsen, H. (2021, July 09). The Importance Of Competition For The American Economy. The White House.
4. Brander, J. A., & Spencer, B. J. (2022). Differentiated Entry or "Me-Too" Entry in Bertrand and Cournot Oligopoly. *Review of Industrial Organization*, *60*, 1-27.
5. Chen, J., Guo, Y., Zhu, H. (2012). Can me-too products prevail? Performance of new product development and sources of idea generation in China – an emerging market. *R* & *D Management*, *42*(3), 273-288.
6. Cheng, M. (2021). Product Differentiation and financial Statement. *The Journal Of Corporate Accounting* & *Finance,* 44-60.
7. Dacey, J.S., & Madus, G.F. (1969). Creativity: Definitions, Explanations and Facilitation. *The Irish Journal of Education*. *3*(1), 55-69.
8. Dumitrescu, C. & Dumitrescu, M., (2021). Neuromarketing – A Scientific Tool To Handle Consumer Brain Information. *Internal Auditing* & *Risk Management*. *1*(61) 39-53.
9. Ekekwe, N. (2012, May 14). When You Can't Innovate, Copy. HBR.org. https://hbr.org/2012/05/when-you-cant-innovate-copy)
10. Felix, S. & Maggi, Ch. (2019). What is the Impact of Increased Business Competition? *International Monetary Fund Working Papers*, pp. 1-55
11. Harris, J.M., Ciorciari, J., & Gountas, J. (2018). Consumer Neuroscience For Marketing Researchers. *Journal Of Consumer Behavior,17*,239-252.
12. Hee Kim, K. (2019). Demystifying Creativity: What Creativity Isn't and Is?. *Roeper Review.*119-128
13. https://www.whitehouse.gov/cea/written-materials/2021/07/09/the-importance-o*f-competition*-for-the-american-economy/#:~:text=Healthy%20market%20competition%20is%20fundamental,greater%20variety%2C%20and%20more%20innovation.

14. Hubert, M., Huber., M., Sommer, J., & Kenning, P. (2009). Consumer Neuroscience – The Effect of Retail Brands on the Perception of Product Packaging. *Marketing Review*, *4*, 28-33.
15. Li, W., Li, G., Ji, B., Zhang, Q., & Qiu, J. (2019). Neuroanatomical Correlates Of Creativity: Evidence From Voxel-Based Morphometry. *Frontiers In Psychology*, February. 10, 1-10.
16. Mullen-Raymond, S. (2017). Neural Foundations Of Creativity: *A Systematic Review*. *46*(3). 187-192.
17. Page, G. & Raymond, J. (2007). Neuroscience and Marketing: It's what it means that counts, not how it's done. *International Journal Of Advertising*, *26*(1), 132-134.
18. Patson, T., Kaufman, J.C., Cropley, A.J., & Marrone, R. (2021). What Is Creativity In Education? A Qualitative Study Of International Curricula. *Journal of Advanced Academics*, *32*(2), 207-230.
19. Persil. Dirt Is Good. (n.d.). https://www.persil.com/uk/our-commitments/people/dirt-is-good-and-always-will-be.html
20. Pring-Mill, D. (2019, February 25). Business is becoming more competitive. DMNews. https://www.dmnews.com/business-more-competitive/
21. Rossiter, J., & Bellman, S. (2012). Emotional Branding Pays Off. How Brands Meet Share of Requirements through Bonding, Companionship, and Love. *Journal Of Advertising Research*, September , 291-296.
22. Scheider, J. & Hall, J. (2011, April). Why Most Product Launches Fail. HBR.org. https://hbr.org/2011/04/why-most-product-launches-fail
23. U.S. Chamber Of Commerce Global Innovation Policy Center. (n.d.). Why Is IP Important? Retrieved 10.16.2022. https://www.theglobalipcenter.com/resources/why-is-ip-important/#:~:text=America%27s%20IP%20is%20worth%20%246.6,amounts%20to%20nearly%20%24842%20billion.
24. Von Stamm, B. (2004). Innovation – What's Design Got To DO With It? Design Management Review. pp. 10-19. Design Management Institute. Winter.
25. Ward, P. (2021, June 29). Is It True That 90% Of Startups Fail? NanoGlobals.https://nanoglobals.com/startup-failure-rate-myths-origin/#:~:text=Startups%3A%2090%25%20failure%20rate&text=The%20exact%20origins%20of%20this,about%20a%2010%25%20success%20rate.
26. Wladawsky-Berger, I. (2010, May 31). The 2010 IBM Global CEO Study. Irvingwb. https://blog.irvingwb.com/blog/2010/05/the-2010-ibm-global-ceo-study.html

Chapter 2

# Digital Entrepreneurship in Web 3.0: Main Conditioning Factors in University Students[1]

Javier Jorge-Vázquez, Sergio Luis Náñez Alonso,
Bernard Ziębicki, Wojciech Szymla

## 1. Introduction

The role of entrepreneurship as a lever driving economic growth and job creation has traditionally been of interest to the academic community (Jorge-Vázquez, J; Echarte Fernández, M.A.; Reier Forradellas, R.F.; Chivite Cebolla, M.P and Garay Gallestegui, 2022). It is also present in the political agenda of most governments and international institutions as an indispensable pillar for the development and prosperity of modern societies. On the other hand, the current context of digital disruption has emerged as a catalyst for a multitude of entrepreneurial initiatives that, based on taking advantage of the latest technological developments, are generating a technology-based entrepreneurial ecosystem whose size and scope is advancing at the same time as new technological developments and innovations are taking place. Precisely, there are several works published that have focused their interest on the study of the characteristics of such technological entrepreneurship ecosystem (Zapata-Huamaní, Ferández-López and Neira-Gómez, 2018; Jorge- Vázquez, 2019). Interest in the economic impact of the incorporation of technologies into the productive process and, in particular, research on technological entrepreneurship has been consolidating in the last two decades. One of the most plausible contributions to the definition of this phenomenon can be found in the work of Bailetti (2012), who conceives it as "an investment in a project that brings together and deploys specialized in-

[1] This manuscript is the result of a research stay conducted by the authors during 2022 at the Cracow University of Economics. The authors would like to thank the Dean of the College of Management and Quality Sciences, Prof. PhD. Bernard Ziębicki, for all the help and support provided during the research stay.

dividuals and heterogeneous assets that are intrinsically related to advances in scientific and technological knowledge for the purpose of creating and capturing value for a company". Along the same lines, Ferreira, Ferreira, Fernandes, Jalai and Marques (2016) offer a more open definition of the concept by linking it broadly to technology-based innovation. Beckman, Eisenhardt, Kotha, Mayer and Rajagopalan (2012) point out that the differential objective of technological entrepreneurship is to take advantage of the opportunities derived from the latest advances in science and engineering. On the other hand, much of the existing literature on the study of the determinants of entrepreneurship, has addressed the problem under an approach focused particularly on the characteristics and skills of the entrepreneur (Lee, 2018; Evers, Cunningham and Hoholm, 2020; Herron, 2020; among others). However, the phenomenon of entrepreneurship transcends the entrepreneur's profile and is conditioned, also and very especially, by the context or environment in which entrepreneurs relate to and develop their business project. In particular, in the case of technological entrepreneurship, some authors such as Húlsbeck and Kitzinger (2011); Petti and Zhang (2011) or more recently Malen and Marcus (2017) and Fuentelsaz, Maicas and Montero (2018) agree in pointing out the important influence exerted by local social, political, economic, and institutional factors on technological development and the launch of technology-based entrepreneurial initiatives.

The rapid evolution that the Internet is experiencing since its inception has provided a multitude of opportunities for those people who are willing to undertake and execute their business idea, opening up a whole world of possibilities (Reuber & Fischer, 2011). And this, to a large extent, is due to the evolution that the web has undergone. We have heard the words Web 1.0, 2.0...; and these are nothing more than words that reflect the evolution of the Internet and how it has been changing the way we use it.

Web 1.0: in the early days, Internet users only had one role: to consume information hosted on computer servers. Navigation was purely textual, and queries were very limited. When the web programming language HTML (Hyper Text Markup Language) appeared, the organization of the elements displayed on the screen became more attractive. However, interactions were still very limited because the user could only read the information and not comment on it, for example (Hsu & Han Woo Park, 2010).

Web 2.0: around the year 2000, Web 2.0 began to be referred to as Web 2.0, as interaction between web pages and users was encouraged. The Internet is understood as a collaborative platform, in which all users participate (Al-Qallaf & Ridha, 2018). Now, in addition to reading, Internet users can also generate in-

formation and publish it on websites, in user forums, blogs, social networks and wikis (pages that can be edited by any user).

Web 3.0: It refers to the fact that web pages can be related in a semantic way, adding metadata that add value to the information and improve the search and the possibility of finding information on the web by understanding the meaning of words (Alabdulwahhab, 2018). In wWeb 3.0 appears the so-called crypto economy where cryptocurrencies, tokens or NFT's to name a few examples have meant a real revolution and a new range of possibilities related to entrepreneurship (Sapkota & Grobys, 2019). And it is here where the study is focused.

Finally, we are starting to talk about Web 4.0: the Internet can function predictively, not only by receiving commands from the user, but also by using artificial intelligence to anticipate user requests and even predict future behavior (Kollmann, 2020). Voice interactions are also becoming more widespread, with the use of intelligent devices that allow spoken searches.

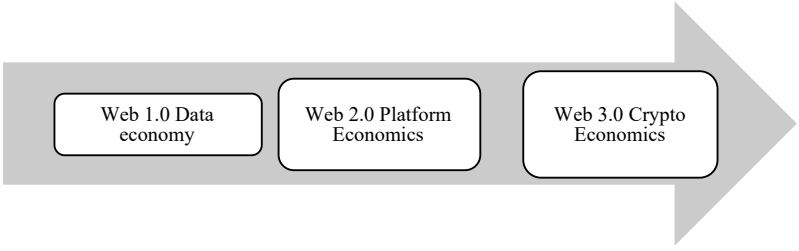


Figure 2.1. Evolution of the Web.
Source: Own elaboration.

As it has become clear, Web 3.0 has brought with it the cryptoeconomy, this being a fantastic opportunity for entrepreneurship (Natora, 2021). Today the number of digital currencies is around 10,000 worldwide. What differentiates the types of cryptocurrencies are the projects behind them. Blockchain technology used by cryptocurrencies can be used for many different purposes. From using a cryptocurrency as a means of payment, as in the case of Bitcoin, to the smart contracts of the Etehereum network, there are also currencies that use completely different formulas. According to the report "Crypto Market Sizing" (Crypto.com, 2022) during 2021 the number of cryptocurrency users increased by 178%, from 106 million in January to 295 million in December worldwide. According to the Bank of Spain, the volume of transactions with this type of assets in 2021 was put at around €60 billion, which is equivalent to around €1,275 per inhabitant (Bank of Spain & Delgado, 2022). Moreover, according to Finder's Cryptoasset Adoption

Index, which conducts a periodic survey in 27 countries, it is estimated that 12% of adults have invested in them in Spain (Finder, 2022). Most of them are men, but with less difference than it might seem at first glance if we look at barometers such as participation in social networks or in calls on the subject (13%, compared to 10% of women). Young people between 18 and 24 years of age are more accustomed to moving through the digital universe. All this opens up a wide range of possibilities when it comes to launching new businesses and ideas.

Table 2.1. Entrepreneurship opportunities in the crypto economy by sector.

| Sector | New opportunities |
|---|---|
| Real Estate | Rentals via Smart Contract<br>Real estate tokenization<br>Purchase and sale of digital "land" in Metaverse |
| Sports | Tokenization of assets |
| Education | Teaching in Metaverse |
| Content Creators | Metaverse |
| Artists (painters, designers, fashion designers...) | Metaverse<br>NFTS |
| Industry | Computer/graphics card manufacturing |
| Services | Trading companies, custody, vending machines, cryptocurrency mining, mining pools. |
| Advocacy | Litigation arising from Smart Contracts, Metaverse, DAOS and ICOS, Tax advice, Compliance. |

Source: Own elaboration.

As can be seen in the table above, the crypto economy presents a large number of new entrepreneurial options in very diverse sectors. In this way, it is expected that in the future many of the traditional companies will be pushed aside; new organizations will emerge structured under the paradigms of the so-called DAOs (Decentralized Autonomous Organizations) that operate in the Blockchain network and that are characterized according to (Ethereum, 2022).

However, many more will appear in the future in the wake of other innovations such as CBDCs (Náñez Alonso et al., 2020) (Náñez Alonso et al., 2021), the large-scale implementation of the so-called Decentralized Autonomous Organizations (DAOs) (Hassan & De Filippi, 2021) that can bring about a real revolution in terms of entrepreneurship. And they can even serve to relaunch areas geographically punished by depopulation, as is the case of Castilla y León (Náñez Alonso et al., 2022a) since an improvement in payment systems via digitalization can be a good help to these areas and can boost entrepreneurship, even more so after the numerous closures of offices that further aggravate depopulation; always without losing sight of the fulfillment of the SDGs (Náñez Alonso, Jorge-

Vazquez, Echarte Fernández, et al., 2022) and sustainability and respect for the environment; especially those activities that may be more harmful to the environment, such as proof of work (Náñez Alonso, Jorge-Vázquez, et al., 2021).

## 2. Objectives and Methodology

In this context, the objective of this research is to:

1. Identify sectors of the digital economy based on web 3.0 that represent an opportunity for entrepreneurship, especially for young people.
2. Identify and analyze the impact of certain external conditioning factors on the dynamics of technological entrepreneurship from the evaluation of the perception of a sample of 75 university students on the influence exerted by the social and institutional environment on the development of technology-based entrepreneurial initiatives.

This work develops a descriptive analytical cross-sectional study. The survey-based method is used as the main research technique that allows, through standardized research procedures, to collect and analyze a diverse set of data from a representative sample. In particular, in this research, in accordance with the principle of accessibility, a non-probabilistic and non-random convenience sampling is adopted, the application of which yields a purposive sample composed of 75 university students whose characteristics are shown in the following table:

Table 2.2. Sociodemographic characterization of the sample.

| Gender | Age | Education level |
|---|---|---|
| Male (44.6%)<br>Female (55.4%) | 18-25 years (24.6%)<br>26-35 years (23.1%)<br>>35 years (52.3%) | Higher education (100%) |

Source: Own elaboration.

In relation to the information collection instruments, this research adopted an ex post facto design with surveys and resorted to the design of a questionnaire as the main instrument for the collection of information in a standardized way on the variables involved in the study to allow the development of an intra-group analysis of the sample. The Likert scale was used as the measuring instrument.

Once the questionnaire was designed under an organized structure and after verifying that the questions were drafted taking into account their capacity to obtain reliable and quantifiable responses that would report accurate and truthful information, a pilot test was carried out prior to its formal application for the initial validation of the content to ensure the representativeness and relevance of

the questions. Finally, the statistical procedure was carried out using SPSS statistical software (Released 2020. IBM SPSS Statistics for Windows, Version 27.0. Armonk, NY: IBM Corp, n.d.) to evaluate the reliability and validity of the instrument, for which the internal consistency coefficient, Cronbach's (George D., & Mallery, 1995) and also through expert judgment were used. Data collection was carried out during the first semester of the year 2022.

## 3. Analysis and Discussion of Results

Following the collection, analysis and processing of the information gathered through the questionnaire, the main results obtained in accordance with the objectives formulated in this research are presented below. Firstly, in relation to the entrepreneurial intention of the university students who formed part of the sample under study, it should be noted that the option of entrepreneurship and self-employment after completing university studies occupies the fourth place in the future career path projected by the students. In particular, the civil service turns out to be the most preferred option as a professional outlet, compared to the option of starting an entrepreneurial activity, which obtained the lowest score. In any case, there is not a very marked difference between the different options proposed as career options (see Figure 2.2).

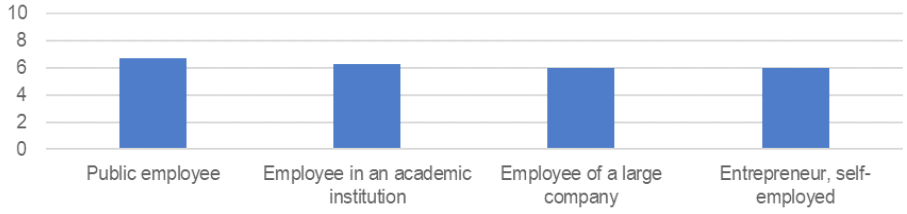


Figure 2.2. Expected career path at the end of university studies (Measurement: Likert Scale (0-10)
Source: own elaboration.

An approach to technology-based entrepreneurship among university students necessarily requires identifying the main reasons underlying the decision to start an entrepreneurial activity. The results obtained in this research (see Figure 2.3) reveal that the achievement of greater personal fulfillment is the main motivation given by students for entrepreneurship. In particular, three out of four students consider this reason as a favorable determinant for entrepreneurship. The contribution to society through the value generated by entrepreneurial activity is another of the most highly valued motives. Finally, obtaining a greater volume of income and the possibility of developing a professional career in con-

ditions of greater freedom and autonomy are two of the other reasons given by university students that condition the dynamics of entrepreneurship.

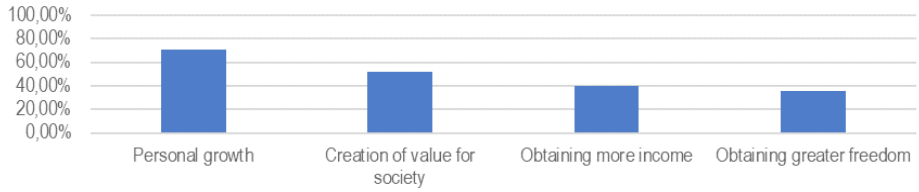


Figure 2.3. Reasons for starting an entrepreneurial activity in the digital area. Perception of university students. Measure: Percentage of students.

Source: own elaboration.

On the other hand, following other previous studies that have examined the impact of the environment on entrepreneurship (Húlsbeck and Kitzinger, 2011; Petti and Zhang, 2011; Malen and Marcus, 2017; Fuentelsaz, Maicas and Montero, 2018; among others), in this study, the influence of the social environment, local policies to support entrepreneurship and the training received have been identified as conditioning factors of technological entrepreneurship. In relation to the first factor, it is found that the existence of a favorable environment for the development of entrepreneurial initiatives by university students is determined by the family environment and the closest circle. Other authors have expressed the same opinion. For example, Vázquez, Álvarez, Zurita and Moreno (2020) find the existence of a strong influence of the family, as responsible for the formation of the entrepreneurial spirit, and of friends, in decisions on the development of entrepreneurial initiatives. On the other hand, it is also verified that the existing facilities at the local level that can start an entrepreneurial project act as a determining factor in entrepreneurial activity. These facilities, in turn, are conditioned by the policies of support and promotion of entrepreneurship existing in each territory. The first results obtained reveal a favorable perception of the students regarding the support of their closest circle in the event of adopting the final decision to start an entrepreneurial project. This support is expressed in the students' perception of the probability of obtaining certain responses from the family environment to the possibility of entrepreneurship, as shown in Figure 2.4. However, the results obtained collide in part with those obtained in previously published studies (Renzulli, Aldrich, and Moody, 2000; or Shelton and Daphne, 1996), which demonstrate the determining role of the family in the development of entrepreneurial activities, but which act as a limiting factor.

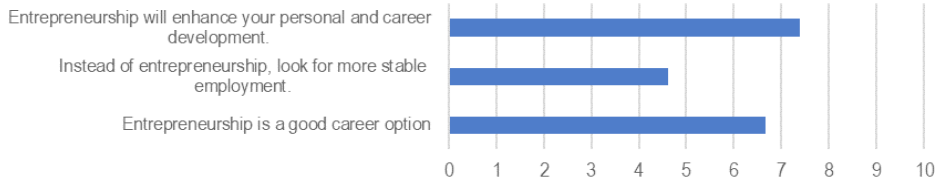


Figure 2.4. Probability of response of the family environment to the possibility of starting an entrepreneurial project in the digital area. Likert scale rating (0 not very likely - 10 very likely).
Source: own elaboration.

As for the existing facilities at the local level to develop entrepreneurial activity in the digital field, more than half of the students consider that they are insufficient compared to 15% who maintain that they are adequate to promote entrepreneurship.

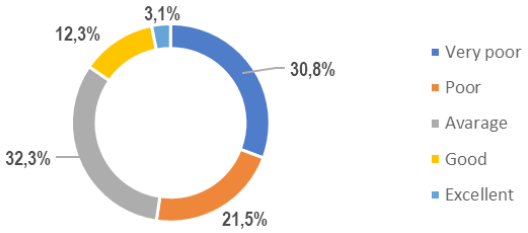


Figure 2.5. Perception of the ease of entrepreneurship in the place of residence.
Source: own elaboration.

Finally, the available evidence demonstrates the favorable impact of training on entrepreneurial intention (Cárdenas, Guzmán, Sánchez and Venegas, 2015; Baručić and Umihanić, 2016; Fragoso, Rocha-Junior and Xavier, 2020, among others). In this regard, in the present research, as shown in Figure 2.5, 66.2% of the students claim to have never received specific training on entrepreneurship, which undoubtedly conditions their entrepreneurial initiative.

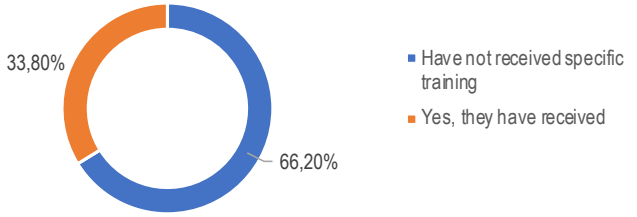


Figure 2.6. Specific training received on entrepreneurship in the digital area.
Source: own elaboration.

## 4. Conclusions

Words like Web 3.0, tokens or metaverse are becoming increasingly popular among the population, the media, etc. The entrepreneurial ecosystem cannot turn its back on this reality, quite the contrary. It must take advantage of this new window of business opportunities that is opening up thanks to the so-called crypto economy.

The crypto economy, still incipient in many aspects, has opened new business options to traditional sectors such as real estate, thanks to tokenization or Smart contracts; to the legal sector, with advice in these new areas; or to the art sector, thanks to the creation and sale of the famous NFTs.

Despite the initial difficulties involved in entrepreneurship, not only in traditional sectors, but also in the crypto economy, there are already companies that have managed to start up and succeed in this field. These will serve as a guide for future entrepreneurs who can learn from their successes and experience. Entrepreneurs in this area should expect some difficulties, such as the lack of specific legislation in many areas that sometimes makes the operation be performed in an "illegal" way, or also the possible difficulty of accessing aid (because the administration may not consider these areas), or funding through the usual channels (traditional banking). However, the latter can be saved thanks to the liquidity that can be obtained through the crypto economy itself via cryptocurrency lending platforms.

In short, this is an area with a very high business potential for entrepreneurs; but not exempt from possible difficult situations, given its novelty and lack of knowledge by a large part of the population.

The potential and opportunities offered by digital technologies grow vigorously, driven by the development of a strategy based on continuous innovation. The purpose of this research was to identify the main conditioning factors of technology-based entrepreneurship among university students.

The results obtained made it possible to identify, based on the perception expressed by the university students who participated in the study, the influence exerted by the family environment, the facilities, and policies for the promotion of entrepreneurship in the region and the training in entrepreneurship of young university students. These results led to the conclusion that the support of the family environment and the closest social circle, the facilities, and plans for the promotion of entrepreneurship existing at the local level and training act as strong predictors of the university students' technology-based entrepreneurial intention.

## Bibliography


1. Alabdulwahhab, F. A. (2018, April). Web 3.0: The Decentralized Web Blockchain networks and Protocol Innovation. 2018 1st International Conference on Computer Applications & Information Security (ICCAIS). http://dx.doi.org/10.1109/cais.2018.8441990
2. Al-Qallaf, C. L., & Ridha, A. (2018). A comprehensive analysis of academic library websites: Design, navigation, content, services, and web 2.0 Tools. *International Information & Library Review*, *51*(2), 93–106. https://doi.org/10.1080/10572317.2018.1467166
3. Bailetti, T. (2012). Technology entrepreneurship: overview, definition, and distinctive aspects. *Technology Innovation Management Review*, *2*(2), 5-12.
4. Banco de España, & Delgado, M. (2022). Presentación del 9o Informe PwC Unión Bancaria: "Un clima de cambio" (pp. 1–15). Banco de España.
5. Baručić, A., & Umihanić, B. (2016). Entrepreneurship education as a factor of entrepreneurial opportunity recognition for starting a new business. *Management: Journal Of Contemporary Management Issues*, *21*(2), 27-44.
6. Beckman, C. M., Eisenhardt, K., Kotha, S., Meyer, A., & Rajagopalan, N. (2012). Technology Entrepreneurship. *Strategic Entrepreneurship Journal*, *6*(2): 89–93. https://doi.org/10.1002/sej.1134
7. Cárdenas, J., Guzmán, A., Sánchez, C., & Vanegas, J. D. (2015). ¿Qué se crea al fomentar el emprendimiento? Los principales impactos de la formación en este campo. *Universidad & Empresa*, *17*(28), 173-190.
8. Crypto.com. (2022, January 19). Crypto market sizing report 2021 and 2022 forecast. https://crypto.com/research/2021-crypto-market-sizing-report-2022-forecast
9. Ethereum. (2022). Decentralized autonomous organizations (DAOs). Ethereum. https://ethereum.org/en/dao/
10. Evers, N., Cunningham, J., & Hoholm, T. (2020). *Technology entrepreneurship: bringing innovation to the marketplace*. Bloomsbury Publishing.
11. Ferreira, J. J. M., Ferreira, F. A. F., Fernandes, C. I. M. A. S., Jalali, M. S., Raposo, M. L., & Marques, C. S. (2016). What Do We [Not] Know About Technology Entrepreneurship Research? *International Entrepreneurship and Management Journal*, *12*(3): 713–733. https://doi.org/10.1007/s11365-015-0359-2
12. Finder. (2022, January 24). Índice de Adopción de Criptomonedas de Finder . Finder. https://www.finder.com/ar/indice-de-adopcion-de-criptomonedas-de-finder
13. Fragoso, R., Rocha-Junior, W., & Xavier, A. (2020). Determinant factors of entrepreneurial intention among university students in Brazil and Portugal. *Journal of Small Business & Entrepreneurship*, *32*(1), 33-57.
14. Fuentelsaz, L., Maicas, J. P., & Montero, J. (2018). Entrepreneurs and innovation: The contingent role of institutional factors. *International Small Business Journal*, *36*(6), 686-711.
15. Hassan, S., & De Filippi, P. (2021). Decentralized Autonomous Organization. *Internet Policy Review*, *10*(2). https://doi.org/10.14763/2021.2.1556
16. Herron, L. (2020). *Do skills predict profits?: a study of successful entrepreneurship*. Routledge.

17. Hsu, C., & Han Woo Park. (2010). Sociology of hyperlink networks of web 1.0, Web 2.0, And twitter: A case study of South Korea. *Social Science Computer Review, 29*(3), 354–368. https://doi.org/10.1177/0894439310382517
18. Hülsbeck, M., & Kitzinger, E. N. (2011). The impact of regional industries and universities on (high) technology entrepreneurship (No. 03-11). UO Working Paper Series.
19. Jorge-Vázquez, J. (2019). *La economía colaborativa en la era digital: fundamentación teórica y alcance económico*. Università degli Studì Suor Orsola Benincasa UNISOB.
20. Jorge-Vázquez, J., Fernández, M. A. E., Forradellas, R. R., Cebolla, M. P. C., & Gallastegui, L. M. G. (2022). *El emprendimiento en tiempos de crisis económica: Oportunidades de la digitalización en una sociedad en transformación*. En Miradas sobre el emprendimiento ante la crisis del coronavirus (pp. 752-757). Dykinson.
21. Kollmann, T. (2020). Grundlagen des Web 1.0, Web 2.0, Web 3.0 und Web 4.0. In Handbuch Digitale Wirtschaft (pp. 133–155). Springer Fachmedien Wiesbaden. http://dx.doi.org/10.1007/978-3-658-17291-6_8
22. Lee, B. (2018). Human capital and labor: the effect of entrepreneur characteristics on venture success. *International Journal of Entrepreneurial Behavior & Research*, *25*(1), 29-49.
23. Malen, J., & Marcus, A. A. (2017). Promoting clean energy technology entrepreneurship: The role of external context. *Energy Policy*, 102, 7-15.
24. Náñez Alonso, S. L., Echarte Fernández, M. Á., Sanz Bas, D., & Kaczmarek, J. (2020). Reasons fostering or discouraging the implementation of central bank-backed digital currency: A review. *Economies*, *8*(2), 41. https://doi.org/10.3390/economies8020041
25. Náñez Alonso, S. L., Jorge-Vazquez, J., & Reier Forradellas, R. F. (2021). Central banks digital currency: Detection of optimal countries for the implementation of a CBDC and the implication for payment industry open innovation. *Journal of Open Innovation: Technology, Market, and Complexity*, *7*(1), 72. https://doi.org/10.3390/joitmc7010072
26. Náñez Alonso, S. L., Jorge-Vazquez, J., Echarte Fernández, M. Á., Kolegowicz, K., & Szymla, W. (2022). Financial exclusion in rural and urban contexts in Poland: A threat to achieving SDG eight? *Land*, *11*(4), 539. https://doi.org/10.3390/land11040539
27. Náñez Alonso, S. L., Jorge-Vázquez, J., Echarte Fernández, M. Á., & Reier Forradellas, R. F. (2021). Cryptocurrency mining from an economic and environmental perspective. Analysis of the most and least sustainable countries. *Energies*, *14*(14), 4254. https://doi.org/10.3390/en14144254
28. Náñez Alonso, S. L., Jorge-Vazquez, J., Reier Forradellas, R. F., & Ahijado Dochado, E. (2022). Solutions to Financial Exclusion in Rural and Depopulated Areas: Evidence Based in Castilla y León (Spain). *Land*, *11*(1), 74. https://doi.org/10.3390/land11010074
29. Natora, M. (2021). *Change through crypto-economics. In Theories of Change* (pp. 295–305). Springer International Publishing. http://dx.doi.org/10.1007/978-3-030-52275-9_17

30. Petti, C., & Zhang, S. (2011). Factors influencing technological entrepreneurship capabilities: Towards an integrated research framework for Chinese enterprises. *Journal of technology management in China*, September 13-15.
31. Renzulli, L.A., Aldrich, H., & Moody, J. (2000). Family Matters: Gender, Networks, and Entrepreneurial Outcomes. *Social Forces*, *79*(2),523546.
32. Reuber, A. R., & Fischer, E. (2011). International entrepreneurship in internet-enabled markets. *Journal of Business Venturing*, 26(6), 660–679. https://doi.org/10.1016/j.jbusvent.2011.05.002
33. Sapkota, N., & Grobys, K. (2019). Blockchain consensus protocols, energy consumption and cryptocurrency prices. SSRN *Electronic Journa*l. https://doi.org/10.2139/ssrn.3403983
34. Shelton,B.A., & John, D. (1996). The Division of Houshold Labor. *Annual Review of Sociology*, *22*, 241270.
35. Vázquez, K. F. T., Álvarez, J. C. E., Zurita, I. N., & Moreno, V. P. (2020). El emprendimiento juvenil en función al perfil psicosocial y las condiciones del entorno familiar. *Revista Arbitrada Interdisciplinaria Koinonía*, *5*(10), 729-756.
36. Zapata-Huamaní, G. A., Fernández-Lopéz, S., & Neira-Gómez, I. (2018). Ecosistema del emprendimiento tecnológico: una propuesta. *European Journal of Applied Business and Management*, *4*(3), 127-141.

Chapter 3

# Towards a Procedure of Continuous Alignment of University ICT Related Curricula to Labor Market Needs[1]

Grażyna Paliwoda-Pękosz, Lasse Berntzen, Kim Normann Andersen, Tove Bøe, Svitlana Didkivska, Dariusz Dymek, Mariusz Grabowski, Marius Rohde Johannessen, Paweł Konkol, Katerina Mangaroska, Dariusz Put, Piotr Soja, Janusz Stal

## 1. Introduction

Students should have skills aligned with the expectations of the labor market. The way of shaping study programs is institutionally formalized, but there is some flexibility in shaping it, provided that appropriate procedures / mechanisms are developed. These procedures should include systematic and continuous (repeated each year) analyses of the labor market needs and incorporation of the results of these analyses into the mechanisms of university functioning in terms of shaping study programs and teaching methods (Kwon, 2020). The field of information and communication technologies (ICT) is particularly important in this matter, as it is subject to the fastest changes, shaped by the market and not by top-down regulations. Hence, the speed of responding to changes in the labor market needs for ICT competences is very important for universities. The alignment of the educational offer with the labor market expectations includes the adjustment of two components: the curricula and the form of education. The recent experience with the COVID-19 pandemic has increased the importance of distance learning (DL) (Sari & Nayır, 2020). It is very likely that DL will play an important role even after the pandemic. The pandemic has accelerated the development of Education 4.0 and Industry 4.0, increasing the demand for remote learning and

[1] The project "Alignment of ICT Related Curricula with Labour Market Expectations" benefits from a grant of EUR 117 602 received from Iceland, Liechtenstein and Norway under EEA Grants. The aim of the project is to align the ICT educational offer with the labour market expectations.

work skills. One of the methods of universities' response to the changing needs regarding ICT competences may therefore be supporting distance education (development of remote learning skills and preparation for remote work) and supporting open education (MOOC, *Massive Open Online Course*) which facilitates life-long learning (Vollbrecht et al., 2020). According to the recommendation of the Council of the European Union (2018/C 189/01), member states should support the right to quality and inclusive education, training and lifelong learning and ensure opportunities for all to develop key competences.

This was the main motivation for undertaking the joint project by the Cracow University of Economics, Poland (CUE) and the University of South-Eastern Norway (USN). The goal of the chapter is to provide an overview of the project and its to-date outcomes. The project aims to analyze the current situation at the partner universities and adjust the educational offer in the field of ICT to the labor market's expectations. The need for the project's implementation stems mainly from the specificity of the ICT industry undergoing dynamic, unregulated changes, which entails a change in the expectations of employers regarding ICT skills and the necessity for universities to respond to the changes in these needs so that graduates have competences adequate to the labor market expectations. CUE is a university with an economic profile, while USN provides education for specialists in a wide range of fields, including engineers working in industry. Both universities offer courses for future ICT specialists and ICT-related modules for students of other areas of study. Joint activities aimed at achieving the project's goal will include the exchange of experiences in shaping ICT curricula and development of procedures for continuous adaptation of these programs to the labor market's needs. Special efforts will be directed towards the integration of modern e-learning tools in education. The procedures will have a continuous nature, so even after the project's completion, their effects will bring benefits to the main stakeholders, i.e. students, universities and businesses.

In the next section, the project background will be provided, followed by its detailed goals, to-date results and future plans.

## 2. Project Background

### 2.1. Partners

CUE and USN have cooperated for over 12 years in the field of student and staff exchange. To some extent, both universities recruit similar groups of students as they offer courses for future ICT professionals at the undergraduate and graduate levels (Applied Informatics at CUE and IT and Information Systems at

USN), and conduct ICT-related modules for business students. Thanks to this, they can exchange experiences in areas related to the project.

The ICT labor market is global (ICT specialists can provide services on a global scale, not only in their country of residence), therefore, a thorough understanding of the expectations of this market, going beyond the limits of one country, will be crucial for achieving the project's goal. The contacts between university faculties have so far shown that USN uses different teaching methods than CUE, e.g. more emphasis is placed on group projects, so that students acquire the teamwork-related skills needed in the labor market. Besides, work has already started at USN to identify the possibility of introducing micro-credentials (a system of additional activities, going beyond the formal education framework, for which students could receive ECTS credits - *European Credit Transfer System*). Hence, the exchange of experiences in the field of teaching programs and methods of ICT modules will be valuable.

### 2.2. Motivation

The project implementation will meet the actual needs of CUE and USN, as the SWOT analysis shows (unless otherwise stated applies to both organizations).

Strengths:

(1) lecturers with extensive experience in conducting blended-learning courses,
(2) lecturers with business experience,
(3) organizations cooperating with local business (institutional contacts), lecturers with private contacts in business.

Weaknesses:

(1) ICT programs at CUE are unsatisfactorily adapted to the requirements of employers (this is indicated by the results of a CUE graduate survey conducted between June and September 2020, discussions between project participants and students, and contacts between project participants and the business community),
(2) lack of procedures for systematic updating of ICT programs to the changing needs of the labor market,
(3) lack of a comprehensive and long-term strategy for the coordination of educational goals with the DL form of education.

Opportunities:

(1) implementation of the project will broaden the horizons of partner institutions, and thanks to the exchange of experiences will allow for a joint development of procedures for updating ICT programs,
(2) complementary e-learning experiences of both organizations (CUE – practical experience, USN – extensive research experience, numerous publications

in reputable journals), which give the opportunity to develop a comprehensive and long-term strategy for using DL in education,
(3) the developed solutions will be international in nature, in line with pan-European trends (micro-credentials), and thus their implementation is an opportunity for the quality development of universities and for universities to fit in with pan-European trends.

Threats:
(1) cultural differences between Poland and Norway,
(2) the situation with COVID-19 (unless it is brought under control, direct contacts between partners may be difficult),
(3) institutional resistance to changes in the organizations.

### 2.3. Project Goals

Technological progress influences changes in the needs of the labor market concerning ICT skills. In the context of the pandemic, the importance of DL has been strengthened. Hence, in the course of the partners' talks, an important goal for both institutions was set, which is to align the ICT educational offer with the labor market expectations. Detailed goals are as follows:
G1. Cooperation and exchange of good practices in shaping ICT programs and teaching methods at CUE and USN.
G2. Creation of new opportunities for contacts between universities and business that could be incorporated into the ECTS structure (micro-credentials).
G3. Introducing procedures of continuous adaptation of ICT programs at CUE and USN to the expectations of the labor market.
G4. Development of a comprehensive and long-term strategy for the use of DL in ICT education at CUE and USN.

The project is innovative as it does not concern one study program, but an ICT domain across universities. As part of the project, the concept of micro-credentials, so far not used at partner institutions, will be developed. Both universities see the need for updating the educational offer. The project will contribute to the implementation of common goals and the development of quality culture. Target groups of the project include:

- students - will receive education better suited to the market needs,
- lecturers - will receive guidance on the delivery of relevant content and the use of adequate forms of teaching,
- partner universities - increasing the attractiveness of the educational offer and strengthening their position on the educational market.

## 3. Overview of To Date Project Outcomes

### 3.1. Analysis of the Needs of CUE and USN in the Field of Distance Teaching of ICT-related Modules

*Universities' characteristics and project opportunities*

Both universities, USN and CUE, are similar as far as the areas of their specialization and competences are concerned. They offer courses on ICT and Information Systems, and therefore they may be classified as applied science higher education institutions (HEIs). Both universities are qualified and experienced in blended-learning, business-oriented faculty. However, in the case of CUE the discrepancy between teaching programs and market expectations, as well as the lack of long-term procedures and strategies for the updating of the teaching programs and unifying with DL is observed. USN and CUE are in the process of implementing regulations concerning DL which are aligned with the governmental strategies for building digital society and Industry 4.0.

The project gives the opportunities for broadening the scope of teaching of each university. It also constitutes the background for the development of a comprehensive and long-term, quality-oriented strategy for using DL in education. It will help to overcome the resistance to change of project stakeholders, HEIs, in general, and students and faculty, in particular. The project, since it is developed by two countries, has, thanks to the cultural differences, a potential to generalize the findings on the international scale.

The project is focused on the comparative analysis of the teaching and learning content between the traditional and dedicated remote courses. This is a new approach and such analyses have not been carried out at the partner universities.

*Distance learning needs and challenges, and students' opinions*

The literature analysis concerning the needs of DL indicated a continuous growth of interest in this subject. This has intensified during the COVID-19 pandemic, which greatly increased the necessity of DL usage across various organizations over the world, including HEIs. The reason for this interest comes, on the one hand, from the COVID-19 pandemic, but on the other from expanding access and convenience, innovation and availability of adaptive learning technologies.

The relevant literature indicates a range of parameters that may be considered as attributes for the quality of DL. They include (Bdair, 2021; Kapustina et al., 2020; Kwon, 2020): (1) learning environment, (2) learning materials,

(3) developing and testing of the DL software, (4) quality feedback from students, teachers, and technicians, (5) motivational system, and (6) level of preparedness of teachers.

There are various requirements that are essential for the success of DL implementation. These are (Mangaroska et al., 2021, Murillo & Jones, 2020): (1) expanding access, convenience, (2) spread of digital fluency, (3) variety in the learning experience and (4) greater reach to wider and more diverse crowds of learners, as well as (5) greater adaptability to learners by the teachers.

On the other hand, the concerns towards DL include (1) inability of recreating the teaching-learning interaction from the traditional, face-to-face instruction and (2) curriculum designs that cannot follow paradigms that still lean on traditional practice as well as the fact that (3) technology alone cannot cultivate educational transformation (Murillo & Jones, 2020). There are also challenges of DL as a form of teaching and learning. These include the necessity of the teacher's and learners' adjustment to new forms, tools and methods of teaching and collaboration, constant pressure on the educator's development of appropriate methods and tools, and adjustment of the educator's non-verbal behavior to mention some.

The research conducted prior to the project's start (at CUE) and during the project (at USN) has indicated similar student opinions concerning DL. Most of the students at both universities do not see the difference between lectures conducted face-to-face and in distance form or think that distant lectures are better or optimal. They also shared the opinion that they are not going to avoid the DL after the pandemic and that the hybrid form of learning will dominate in the future.

*Final outcomes and further data analysis*

The needs and challenges of DL (from literature analysis) indicated in the previous section and student opinions (from conducted research) constitute the benchmark for performing the gap analysis using the data collected. This allows to specify the requirements for DL at both universities that is planned in the future.

### 3.2. Analysis of ICT Curricula Development at CUE and USN

The difference between procedures of launching a new study program is visible between Poland and Norway. In Norway, universities have some autonomy in this matter (they can shape bachelor studies without the need of national body approval, whereas master and PhD studies have to be approved), whereas in Poland there are some national regulations that must be followed in regard to studies at all levels.

The review of national and university regulations concerning the changes in study programs in Poland and Norway revealed that university and national systems are making barriers for quick changes in curricula. The whole system is not agile – it is more like waterflow. It takes a number of years to get approval of a new study program, while changes in courses (subjects) require at least a year to be implemented. On top of that, the study plan might be perceived as a contract between a student and university: the study plan is fixed for the student during the whole time span of his/her studies (what they see in the study plan when they start the study should be fixed during their whole study). This promise of the study content's stability is difficult to maintain, especially in relation to ICT-related subjects. In practice, some contradictions might be observed – want to finish what they started but, on the other hand, they want to learn something new and relevant to current trends in industry. In general, teachers know what is going on in industry mainly thanks to their private contacts and initiatives. With this respect, some procedures should be developed at university level to help teachers with curricula adjustments.

It should be noted that the university combines to some extent two different worlds: (1) research environment, whose main feature should be freedom, and (2) educational environment that is rather rigid, with a number of rules and procedures that need to be followed, sometimes not understandable by researchers. University lecturers need to have some freedom but, at the same time, they need to comply with a set of educational rules. One way of coping with this situation is, for example, the formulation of subject/module content in a subject/module program in a general way, which will allow teachers to adjust the detailed subject content when it is needed. However, it should also be noted that there is some university authority guidance related to study programs that advises to make curricula even more detailed, imposing control at a formal level. Such an additional regulation will actually not have a positive effect on the quality of teaching and the relevance of the subject content to the current situation on the job market and in relevant industry.

As far as DL is concerned, the following concluding remarks might be formulated:

- at CUE applying DL to a given subject is at the discretion of the lecturer (apart from the pandemic period) and the lecturer is responsible for its implementation. The information about DL is not included in the study program (description of the subject). Besides, usage of DL in a given subject does not need to be accepted by a Study Program Committee. Hence, the form of classes is not under formal control,

- at CUE there is a lack of incentives or obligatory procedures to conduct DL classes. It is just a decision of a lecturer and not a matter of the university policy concerning a specific study course (*pol. kierunek studiów*). This might even be perceived as a discouraging procedure since incorporating DL into a subject requires a lot of work. At CUE, there is an E-learning Centre that monitors e-learning classes and issues certificates for lectures (allowing them to conduct e-learning classes), however, going through this procedure is the sole responsibility and willingness of a lecturer,
- CUE does not have any procedure of facilitating the students' access to e-learning platforms with valuable courses. Besides, there is a lack of any procedure that would endorse online resources recommended for students by lecturers,
- at CUE there is a lack of a central library (at the university level) that would contain a list of e-learning platforms endorsed by the university (that CUE students may use).

The issues related to DL listed above are of vital importance for the future of universities and education, as the university should be prepared for facilitating the life-long learning phenomenon enforced by the labor market needs.

### 3.3. Analysis of the Teaching Methods in ICT-related Areas at CUE and USN

Four aspects of the teaching process were analyzed in the research: digital competencies acquired by students, tools used in DL, teaching methods and assessment methods. Data were collected using a questionnaire. On this basis, the methods and tools used at CUE and USN were reviewed and compared. The study resulted in a number of detailed conclusions regarding the teaching process of IT subjects at the universities in the first and second degree programs in IT and non-IT fields of study.

The analysis of the competences achieved allows the conclusion to be drawn that the analyzed studies with an IT profile do not differ significantly from one university to another. The number of competences obtained in the course of study is similar, only in a few cases these differences are meaningful.

The analysis of the courses at CUE and USN of IT and non-IT studies at bachelor and master level resulted in several important conclusions related to the usability of various features and tools which might bring practical benefits for the organization of the teaching process based on the DL approach. The data gathered using the questionnaire disseminated at both universities enabled to identify the most popular tools used at CUE and USN at particular types and levels of study programs. The list of possible tools presented to respondents in the questionnaire was prepared based on a discussion on DL experiences and practices

at both universities. The preliminary list of tools to be included in the questionnaire contained, for example, assignment, survey, quiz, chat, or interactive lessons. One of the final conclusions from the analysis is the similarity of tools used in DL at CUE and USN. For instance in the case of IT bachelor studies, where both CUE and USN found the assignment, forum, and quiz as the most useful tools for DL. The similarity of opinions has been also identified as far as the least useful tools for DL are concerned. From the broader perspective, the outcome of this analysis also pointed to the usability of e-learning platforms which offer solutions supporting the DL process.

As far as teaching methods are concerned, the most significant difference that characterizes IT and non-IT studies is the unsuitability of the teaching methods to the current trends that require project-based learning and a rather marginal role of DL. In addition, the most important similarity that characterizes the bachelor and master IT studies is the suitability for the teaching methods: case study, gamification, and discussion for DL, and flipped teaching was identified as neither suitable nor unsuitable.

The analysis shows that the top three assessment methods used at the two universities are written exam, project, and the combination of the two. In total, 64 out of 130 courses are using either one or the two in combination. This constitutes approximately 49% of the courses. In addition, CUE has a much greater variation in the use of assessment methods compared to USN.

## 4. Plans for the Future

In the coming months we plan to:

- perform a comparative analysis of the ICT labor market expectations in Norway and Poland,
- examine the possibilities of strengthening cooperation between the universities and business in the form of implementing micro-credentials: students will have the opportunity to earn ECTS points for additional activities related to the practice, e.g. for participation in lectures with business representatives, participation in webinars (USN will play a leading role in this activity due to the fact that work in this area has already been conducted at this university),
- develop best practices/procedures for the continuous adaptation of ICT curricula to the expectations of the labor market (including the concept of micro-credentials),
- develop recommendations for the application of DL at USN and CUE,

- develop MOOCs-based on the analysis of the labor market needs, exemplary, publicly accessible ICT-related MOOCs will be developed. It is planned to create one MOOC for ICT students and one for students for whom ICT skills are not key competences.

The description of the project and the links to the project outcomes might be found at icam.uek.krakow.pl. The project started on the 1st of January of 2022 and will be completed by the 31st of December 2023.

## Bibliography


1. Bdair, I. (2021). Nursing students' and faculty members' perspectives about online learning during COVID-19 pandemic: A qualitative study. *Teaching and Learning in Nursing*, *16*(3), pp. 220-226. https://doi.org/10.1016/j.teln.2021.02.008
2. Kapustina, L., Izakova, N., & Makovkina, E. (2020). Higher education services market: new trends in sustainable development, In E3S Web Conf., 208: 09016.
3. Kwon, E. (2020). Review of online learning in physical education teacher education (PETE) program. *Journal of Physical Education and Sport*, *20*(6), 3560-3568. https://doi.org/10.7752/jpes.2020.06480
4. Mangaroska, K., Martinez-Maldonado, R., Vesin, B., & Gasevic, D. (2021). Challenges and opportunities of multimodal data in human learning: The computer science students' perspective. *Journal of Computer Assisted Learning*, *37*(4), 1030-1047. https://doi.org/10.1111/jcal.12542
5. Murillo, A., & Jones, K. (2020). A "just-in-time" pragmatic approach to creating Quality Matters-informed online courses. *Information and Learning Science*, *121*(5-6), 365-380. https://doi.org/10.1108/ILS-04-2020-0087
6. Sari, T., & Nayır, F. (2020). Challenges in distance education during the (Covid-19) pandemic period. *Qualitative Research in Education*, *9*(3), 328-360. https://doi.org/10.17583/qre.2020.5872
7. Vollbrecht, P., Porter-Stransky, K., & Lackey-Cornelison, W. (2020). Lessons learned while creating an effective emergency remote learning environment for students during the COVID-19 pandemic. *Advances in Physiology Education*, *44*, 722-725. https://doi.org/10.1152/advan.00140.2020

Chapter 4

# COVID-19 Pandemic and its Impact on E-commerce and the Interest in Handling Administrative Matters in the Electronic Form

Grażyna Plichta

## 1. Introduction

The COVID-19 pandemic has affected numerous socio-economic processes in most societies worldwide, including Poland. It has significantly influenced a change in customers' shopping attitudes, communication forms, as well as relationships between entities. It has disturbed the functioning of the majority of the sectors of economy and severely affected the public sphere. The scale and consequences arising from such phenomena bear the hallmarks of an exogenous shock.

Restrictions resulting from the pandemic situation, including drastic reductions in traditional contact, forced businesses to adapt to operate in the new conditions. This meant that the majority of firms were either launching or expanding the execution of remote transactions. In the first quarter of 2020, as the COVID-19 pandemic emerged, the interest in online shopping increased rapidly. Thus, paradoxically, the pandemic accelerated the development of e-commerce on the Polish market. During the pandemic, customers' physical access to most businesses, including offices, was restricted. When dealing with official matters, stakeholders were ordered to submit their documentation to letterboxes. During the pandemic restrictions, there was also a possibility to contact offices remotely. Petitioners Stakeholders could communicate, for example, via email, telephone or the ePUAP (Electronic Platform of Public Administration Services) platform. During the pandemic, it was recognised that when shopping and official matters were carried out online, lower costs were incurred compared to physical contact. Far less time was also spent and less physical effort was incurred. Services were used digitally because it was convenient. In terms of preference for the digital channel, the desktop version was used most often. It can be hypothesised that in a pandemic period, the remote mode is a convenient as well as a secure way of do-

ing shopping and dealing with official matters. The broadly understood convenience of the remote mode contact in many sectors influenced increased interest in this form also after the lifting of pandemic restrictions.

The paper presents the problem of the effects of the Covid-19 pandemic on the shopping attitudes of consumers and the preferred communication forms between entities. An attempt was made to show how the threat caused by the exogenous shock affects e-commerce, preferred contacts with authorities, a change in the forms of communication and relations between stakeholders. The assumption was made that the crisis situation caused by the Covid-19 pandemic had positive effects in certain industries, among others in e-commerce. In order to present the issue in depth, the verification of the assumptions made was based on theoretical assumptions, an analysis of available reports and the results of own research (CAWI survey).

## 2. The Exogenous Shock Caused by the Covid-19 Pandemic Versusthe Dynamics of E-commerce Growth

The Covid-19 pandemic has significantly affected all areas of socio-economic life. Due to the rapidity of its spread, unpredictability and the reaction of the international community, it has the characteristics of an exogenous shock (Kohlscheen et al., 2020; McKibbin & Fernando, 2021; Noy & Nualsri, 2007). The concept of shock is most identified with economic phenomena of a transnational nature that trigger crisis situations. Shock, which induces a state of collective social upheaval, can be part of a phenomenon described as shock doctrine (Klein, 2009). Any situation that triggers a shock results in a crisis situation at the level of individuals, entities and social structures, understood as a state of imbalance, breakdown, fluctuation, disruption, etc. Disruptions in the relationships between entities also arise.

The situation triggered by the pandemic has led to an increase in the use of digital technologies. According to McKinsey & Company's 'Digital Sentiment Survey 2021', in Poland, due to the pandemic restrictions, about 5.3 million consumers have expanded their digital experience to include more sectors and new digital services. This represents one of higher results in Europe relative to the population. E-commerce is one of the few industries that has been positively affected by the pandemic. It should be noted that Polish e-commerce was among the fastest growing in the world in 2019, i.e. before the pandemic. During that period, as many as 62% of Internet users declared that they shopped remotely. The choice of this form was mainly determined by: 24-hour access, delivery of the product to the indicated address, parcel machines and payment methods, including BLIK, fast transfers, deferred payments ("E-commerce in Poland 2019.

Gemius for E-commerce Poland"). E-commerce is also stimulated by digital wallets, the development of mobile and augmented reality technologies (FedEx 2021 Trade Trends Report). Already in 2019, the Polish e-commerce market was worth more than PLN 61 billion and accounted for almost 11% of the entire retail market. According to forecasts, its share is expected to reach 20% in 2025 („Handel internetowy w Polsce 2020. Analiza i prognoza rozwoju rynku e-commerce na lata 2020-2025" („Online trade in Poland 2020. Analysis and forecast of e-commerce market development for 2020-2025"). In the following years, the interest in e-commerce grew. In 2020, when the pandemic began, 73% of people using digital channels were shopping remotely. In 2021, as many as 77% of all Internet users carried out transactions remotely, that is 4% more than in 2020 and as much as 15% more than in 2019. (Gemius 2022 Report). According to PMR report, „Handel internetowy usługami w Polsce 2022. Analiza rynku e-commerce i prognozy rozwoju na lata 2022-2027" ("Internet service trade in Poland 2022. E-commerce market analysis and development forecasts for 2022-2027"), the value of the e-commerce market in 2021 was over PLN 111 billion. The greater part of it is the sale of products (56%), while the smaller part is the purchase of services (44%). The pandemic has resulted in a clear loss in terms of online service trade, as opposed to product sales. However, in 2021, the value of the e-services market increased to PLN 48.7 bn and was higher than in 2020. According to PMR forecasts, the market will grow at a compound annual average growth rate (CAGR) of 12% between 2022 and 2027. E-customers are mostly middle-aged people, i.e. 35 - 49 years old (34%). A slightly less numerous group are those aged 25-34 (22%). The youngest (15-24 years) are only 16%. This is somewhat surprising as this generation 'lives' in the virtual space. Potentially, this group should be larger. On the other hand, it is interesting to note that by far the largest group of people buying remotely are seniors, i.e. people aged 50 + (28%). During the pandemic, interest in online shopping in this group increased by 12%. When COVID-19 emerged, as many as 15 million new e-buyers were identified in Europe. Among these, those were exactly the representatives of the Silver generation that was a significantly growing group. For companies operating online, this is information that, among other things, remote contact channels should be adapted to the customers of this generation. It is likely that the pandemic has contributed to the fact that people aged 55+ are now using the Internet more frequently. According to research by Gemius, people over 50 spend up to four hours a day online. Almost 39% of them have a social media account, mainly on Facebook. On the other hand, as many as 94% of users aged 55-64 declare that they use e-banking. (E-IZBY 2022 report 'MR&MRS e-commerce'). According to research by Gemius, people over 50 spend up to four hours a day online. Almost 39% of them have

a social media account, mainly on Facebook. On the other hand, as many as 94% of users aged 55-64 declare that they use e-banking. (E-CHAMBER 2022 report "MR&MRS e-commerce"). According to the Central Statistical Office (CSO), elderly people currently account for around 25% of the population, and this figure is expected to rise to 40% by 2050. Due to the change in the age structure of the Polish society, including the growing group of elderly e-customers, it is necessary to take into account the needs, expectations and factors influencing the purchasing decisions of representatives of this generation as well. The research by the Mobile Institute from December and January 2021/2022, shows, among other things, that customers are mainly attracted to online shops by: free delivery, low prices, fast delivery, delivering products home. Also good quality pictures and product descriptions, as well as modern solutions, e.g. virtual fitting rooms, payment by phone. New digital sales channels were also developed during the pandemic period, e.g. through social media live shows. There are companies that regularly organise 'live' meetings where potential customers can view products, receive discounts and get in touch with a stylist. There are also places where customers can find selected products, the most interesting brands or current trends.

It should be emphasised that the continuous digital transformation, which will result, among others, in new technologies, will influence the shape of e-commerce in the future. The appearance of this industry will depend on the implementation of new modes of action, solutions, tools, as well as the approach to the customer (Gregor, Kalińska-Kula, 2020, p.16). Modern e-commerce should be customer-oriented. The recipient should be at the centre of attention. Therefore, it is important to be aware that there may be a situation in which the customer, although wanting to use online shopping, may not be able to do so. In this aspect, the customers' age, background, income and their unequal access to education are relevant. This may be manifested in the lack of digital skills, poor connectivity, low levels of trust (including security and privacy concerns), or the lack of access to online payments. During the pandemic period, many of these problems were noticed. As suggested by the OECD in the document entitled "E-commerce in the time of COVID-19" of 7.10.2020, in order to make e-commerce accessible to those concerned, it is important, among other things, to work towards closing the existing digital divide between individuals. There should also be an extension of affordable, high-quality broadband to rural and underserved areas.

## 3. Contact in the Remote Mode Versus Relationships Between Entities

At every stage of remote contact between entities, whether in e-commerce or in official establishments, uncertainty exists alongside risk. A way to reduce

uncertainty is to build trust between entities. Trust is a great value for any business. Its presence is essential, as it accelerates the building of relationships and determines their quality (Rudzewicz, 2018, p. 56). Businesses undertake various activities to build customers' trust. They use, for example, positive marketing messages in social media or content marketing. Trust-building is also fostered by, among other things, generating a positive customer experience, personalising communication channels, or the availability of platforms with significant information (Bylok, 2012).

As noted earlier, mature e-customers are a growing group in e-commerce. For this group, trust in the seller and safe delivery of ordered goods are very important. Their priority is, among other things, comfort, so the shopping process should be easy and convenient. According to the report by the Chamber of Electronic Commerce "Omni-commerce. I Buy Conveniently 2021", as many as 79% of representatives of the Silver generation check whether a company is responsible before choosing an online shop. For 65% of e-seniors, data security is very important. On the other hand, 92% take into account the opinions of other customers.

The role of trust in shaping relationships between entities is particularly important when new media are used for large-scale remote contact (Plichta, 2020). This is the case today. The shaping of relationships is supported by, for example, personalised offers, satisfaction and convenience. Shortening the distance and various customer facilities are also important, in addition to honouring commitments or comprehensive assistance, etc. Nowadays, this is supported by automated chatbots, which help with complaints and product returns, among others, and also answer questions. Aspects such as the User Experience (UX) and User Interface (UI) have a strong influence on customers, too. User Experience refers, among other things, to the properties, structure and use of a website, the user's online behaviours and emotions, and the shaping of positive experiences. It helps build lasting relationships.

Companies operating in the hypermedia space should do everything to convince customers that they can trust them. This is essential, as it will enable relationships to be built both in e-commerce and when contacting officials remotely. Building positive relationships is a vital and important process. Their level is supported by a reliable exchange of information, professional service and empathetic cooperation. Relationships should also be gradually deepened and made more personal and permanent (IAB Poland „Zaufanie internautów a COVID-19" ("Trust of Internet users and COVID-19". Report on the 2020 research).

## 4. The Evaluation of Remote Shopping and Contact With Authorities During the Pandemic Restrictions – Own Research Findings

The data referred to below are a partial result of the main research carried out within the framework of the research project titled: „Uwarunkowania i czynniki wpływające na trwałość postaw podmiotów indywidualnych w relacjach do pozostałych interesariuszy w warunkach niepewności i ryzyka wynikających z zagrożeń spowodowanych wstrząsem egzogenicznym" ("Determinants and factors influencing the sustainability of individual entities' attitudes towards other stakeholders under conditions of uncertainty and risk resulting from exogenous shock-induced threats") (No. 211/20/MSAP; implemented under REV 4.0.)[1]. It validated, among others, descriptors describing the category of pandemic as an exogenous shock and created a multivariate structural model enabling to explore the relationship between the exogenous variable and endogenous variables, concerning both individual and relational factors. The survey was conducted in March 2021 through a research company with a representative group of respondents (selected on the basis of current data from the Central Statistical Office) using the CAWI research tool on a sample of 578 respondents. The research sample was selected according to the following criteria: age, sex, place of residence (city / village), area of residence (voivodship). A seven-point Likert scale was used to reflect respondents' opinions towards the statements in the formulated survey questions.

The data obtained confirms the interest in remote shopping during the pandemic. According to 63.32% of respondents (mean 4.95), during the pandemic the Internet is a safer form of contact with vendors, suppliers of goods and services (e.g.: text, voice, video communication) than the traditional, direct form of offline communication. During the pandemic, a great number of people used electronic tools for various purposes. A significantly higher number of respondents said that during the pandemic constraints, online or mobile phone shopping was a better form of shopping compared to the traditional form (57.61%; mean 4.68). Respondents confirmed that they are more likely to shop online during the pandemic than they did before (55.02%; mean 4.60). Most of them believe (54.84%; mean 4.60) that this form allows them to adjust the time (time of day, day of week) of shopping better than the traditional form (table 4.1).

[1] This project has been financed by the Minister of Education and Science within the "Regional Initiative of Excellence" Programme for 2019-2022. Project no.: 021/RID/2018/19. Total financing: PLN 11 897 131.40.

Table 4.1. List of positive indications, statements about making purchases and remote communication during the COVID-19 pandemic

| List of statements | mean | % positive indications |
|---|---|---|
| During a pandemic, I shop online more than before | 4,60 | 55,02 |
| During a pandemic, I buy more online than I do traditionally | 4,28 | 47,06 |
| Thanks to the Internet, during a pandemic, I make purchases faster and more efficiently than in the traditional offline way | 4,38 | 50,00 |
| During a pandemic, I become more attached to companies (brands) and places (websites) and shopping online than before | 3,72 | 34,95 |
| During a pandemic, I have more time to research goods and services than before | 4,10 | 42,91 |
| During a pandemic, the Internet is a safer form of contact with sellers, suppliers of goods and services (e.g. text, voice, video communication) than in the case of traditional, direct forms of offline communication | 4,95 | 63,32 |
| During a pandemic, the Internet allows me to better adjust the time (time of the day, day of the week) in which I can make purchases than in the case of traditional, direct forms of communication and offline contact | 4,60 | 54,84 |
| During a pandemic, the Internet allows me to verify information to a greater extent (including about goods and services) compared to direct contact in an offline store | 4,57 | 53,98 |
| During the pandemic, the Internet and mobile phones are a better form of shopping compared to traditional offline shopping | 4,68 | 57,61 |
| In the future, I will use the Internet more often than before when shopping for goods and services | 4,52 | 51,38 |

Source: own work.

During the pandemic period the high interest in e-shopping spurred the rapid growth of new e-shopping sites. However, this does not mean that all existing e-customers will stay in contact with a particular company for a long time and build a long-term relationship with it. The data obtained during the research process in a way confirm the existence of this problem. The majority of respondents stated that shopping mainly online during the pandemic period does not make them more attached to companies (brands) or websites than before. Only 34.95 percent of respondents (mean 3.72) said that this was different and that they would stay longer with the brand they had interacted with during the pandemic. However, this was the lowest percentage of positive responses.

Nowadays, due to a lot of competition in e-commerce, many companies are aware that in order to keep their e-customers, they need to gain their trust and build a lasting relationship with them. Without proper, adequate tools used for this purpose, e-customers will not stay with a given online shop for long. This is especially true at a time when pandemic restrictions no longer apply and customers, due to their preferences, are able to choose where and how they want to complete their transactions (traditional or remote).

During the period of pandemic restrictions, the access to practically all offices was also largely restricted. However, the possibility to deal with matters remotely (e.g. by e-mail, telephone or ePUAP platforms) emerged. In view of the data obtained in the process of conducting the survey, it can be concluded that many customers expected access to this form of contact. The possibility to deal with official matters remotely earned their approval. The majority of respondents stated that during the Covid-19 pandemic they preferred to deal with official matters via the Internet and/or telephone (61.42%; mean 4.94). They indicated that during the Covid-19 pandemic, dealing with official matters via the Internet or telephone, i.e. remotely, was more convenient (59.86%; mean 4.80). The data obtained make it possible to conclude that stakeholders were satisfied with this form of communication. It seems that they had a positive experience during the pandemic, because as many as 62.80% of the respondents stated (mean 4.99) that in the future they would like to deal with majority of official matters over the Internet or by telephone. This was the highest number of positive responses (table 4.2).

Table 4.2. List of positive indications, statements regarding remote provision of services by public administration offices during the COVID-19 pandemic

| List of statements | mean | % positive indications |
|---|---|---|
| During the Covid-19 pandemic, I prefer to deal with official matters via the Internet and / or telephone | 4,94 | 61,42 |
| During the Covid-19 pandemic, more official matters can be dealt with over the Internet and /or telephone. | 4,74 | 57,44 |
| During the Covid-19 pandemic, offices handle matters transferred via the Internet and / or telephone faster than in the traditional way | 4,07 | 37,02 |
| During the Covid-19 pandemic, dealing with official matters via the Internet and / or telephone is more convenient | 4,80 | 59,86 |
| In the future, I would like to deal with most official matters via the Internet and / or telephone | 4,99 | 62,80 |

Source: own work.

Considering the data obtained, it can be concluded that the interest in remote contact during the pandemic is the result of finding this form of contact convenient and safe. It should be noted, however, that the lowest number of positive responses concerned the speed of handling matters by officials. It would seem that in a remote form, matters could be dealt with more quickly. It turned out that this is definitely not the case. Only 37.02% of respondents confirmed (mean 4.07) that offices dealt with matters via the Internet and/or telephone faster than in the traditional manner. Therefore, it seems that this area of the offices' work should be modified. All the more so as, according to the message from respondents, they

prefer convenient remote contact with officials also after the lifting of pandemic restrictions. Therefore, it seems that the remote form of contact between the interested party and the office should continue to be available and developed.

## 5. Conclusions

During the pandemic, the intensification of remote transactions and contacts is the result of choosing a safe and convenient form. This was mainly due to the restrictions in place and the parallel need to meet needs. Today, e-commerce is at a high level and the positive customer experiences during the pandemic period are stimulating its development. Artificial intelligence is more and more often used to help personalise the shopping experience for customers. Automated and intelligent mechanisms learn consumer behaviours and tailor offers to individual users. Handling official matters remotely also seems set to grow in the future (this is what customers expect). Direct contact between the customer and an official is very important. However, the pandemic experience has led to expectations of a convenient, i.e. remote, form of access to offices. The pandemic period showed how important the digitalisation of public administration is. The use of an electronic document to deal with matters and the use of ICT tools to access public services highlighted the importance of office computerisation (Pepłowska, 2021). It therefore seems that measures should be taken to also enable remote access to offices. It is also important to provide a comprehensive and multi-channel customer service and to ensure that services are convenient to use on both computers and phones.

As pointed out, in e-commerce and in the public sector, customer satisfaction and a 'positive perception' from the customer should be at the heart of the measures taken. Successful investment in activities that meet customer expectations not only influences the achievement of companies' set goals. It is necessary in order to achieve what is essential for companies, i.e. to build reciprocal relationships with customers, preferably long-term.

## Bibliography

1. Bylok, F. (2012). Budowa zaufania konsumenckiego jako czynnik determinujący sukces przedsiębiorstwa w warunkach kryzysu. *Zarządzanie i Finanse*, *10*, 4, part 1, 95-110.
2. Gregor, B., & Kalińska-Kula, M. (2020). *Handel internetowy. Perspektywa e-konsumenta*, Wyd. Uniwersytetu Łódzkiego, Łódź 2020, p.16.
3. Klein, N. (2009). *Doktryna szoku*. Warszawa: Warszawskie Wydawnictwo Literackie MUZA SA.

4. Kohlscheen, E., Mojon, B., & Rees, D. (2020). *The Macroeconomic Spillover Effects of the Pandemic on the Global Economy*. SSRN Electronic Journal. Access 10 June 2022 from https://doi.org/10.2139/ssrn.3569554.
5. McKibbin, W., & Fernando, R. (2021). *The Global Macroeconomic Impacts of COVID-19: Seven Scenarios*. Asian Economic Papers; Asian Economic Panel and the Massachusetts Institute of Technology; p. 43. Access 10 June 2022 from https://doi.org/10.1162/asep_a_00796.
6. Noy, I., & Nualsri A. (2007) *What do Exogenous Shocks Tell Us about Growth Theories?* Access 10 June 2022 from https://www.researchgate.net/publication/5082309.
7. Odpowiedź polityki OECD na koronawirusa (COVID-19). OECD 2020. *E-commerce w czasach COVID-19.* Access 3 August 2022 from https://read.oecd-ilibrary.org/view/?ref=137_137212-t0fjgnerdb&title=E-commerce-in-the-time-of-COVID-19.
8. Pepłowska, K. (2021). *Biurowość w czasach pandemii. Wpływ epidemii COVID-19 na informatyzację biurowości w jednostkach administracji samorządowej*. ARCHEION, ISSN 0066-604, CXXII, 281–309
9. Plichta, G. (2020). *Role of new media in shaping relationships in e-commerce on B2C market* In: Jaki A. & Ziębicki B. (eds). *Knowledge Economy Society. External and Internal Determinants of Modern Business Management* (pp.179-194). Toruń: Wyd. TNOiK.
10. Research report (2019). „*E-commerce w Polsce 2019. Gemius dla E-Commerce Polska*". Report on the research conducted by Gemius in cooperation with Chamber of Electronic Commerce.
11. Research report (2020). *Handel internetowy w Polsce 2020. Analiza i prognoza rozwoju rynku e-commerce na lata 2020-2025*.PMR. Access 10 July 2022 from https://mypmr.pro/products/handel-internetowy-w-polsce-2020.
12. Research report (2020). „Zaufanie internautów a COVID-19" Iab Polska, Warszawa. Access 15 lipca 2022r. od https://www.iab.org.pl/baza-wiedzy/raport-zaufanie-internautow-a-covid-19.
13. Research report (2021). *FedEx 2021 Trade Trends Report*. Access 20 July 2022 from https://www.fedex.com/content/dam/fedex/eu-europe/campaigns/h1-2020/trends-report/fedex_trade_trends_report_en-gb.pdf
14. Research report (2021). *Omni-commerce. Kupuję wygodnie.* The report by Chamber of Electronic Commerce, developed by Mobile Institute. Access 15 June 2022 from https://eizba.pl/wp-content/uploads/2021/06/Omni-commerce-Kupuje-wygodnie-2021.pdf
15. Research report (2021). "*Digital Sentiment Survey 2021".* Research by McKinsey & Company. Access 15 July 2022 from https://www.mckinsey.com/pl/our-insights/digital-consumer-survey-2021
16. Research report (2022). "E-commerce w Polsce". Report by Gemius. Access 5 July 2022 from https://www.gemius.pl/wszystkie-artykuly-aktualnosci/raport-e-commerce-w-polsce-2021.html
17. Research report (2022) „*MR&MRS e-commerce*" Report by E-Chamber 2022; Chamber of Electronic Commerce. Access 30 July 2022 from https://eizba.pl/wp-content/uploads/2022/01/Raport-Mr-Mrs-e-Commerce.pdf

18. Research report (2022). „Handel internetowy usługami w Polsce 2022. Analiza rynku e-commerce i prognozy rozwoju na lata 2022-2027". Research by PMR. Access 10 July 2022 from https://mypmr.pro/products/handel-internetowy-uslugami-w-polsce-2022.
19. Rudzewicz, A. (2018). *Wpływ zaufania do marki na zachowania konsumentów.* Olsztyn: Wyd. Uniwersytetu Warmińsko – Mazurskiego w Olsztynie, p. 56.

Chapter 5

# Technologies in Agriculture 4.0

Anna Karmańska

## 1. Introduction

Food security and nutrition are one of the most pressing global issues today (Aamer et al., 2021). Drop damage that has occurred due to climate change, land and water availability problems, and the COVID-19 pandemic are already affecting the food and agriculture sector (Jung et al., 2021). Moreover, the Ukraine War is deepening global food insecurity (Husain, 2022).

Recent estimates from the report of The State of Food Security and Nutrition in the World 2021, prepared by the Food and Agriculture Organization of the United Nations (FAO), the International Fund for Agricultural Development (IFAD), the United Nations Children's Fund (UNICEF), the UN World Food Programme (WFP), and the World Health Organization (WHO) put the actual number of chronically undernourished people in the world at between 720 and 811 million (FAO, IFAD, UNICEF, 2021). According to statistics (FAO, IFAD, UNICEF, 2021), of the total number of undernourished people in 2020 more than half (418 million) live in low-income countries in Asia and more than one-third (282 million) in Africa, while Latin America and the Caribbean account for about 8 percent (60 million).

The unequal distribution of food caused by gender and economic inequality (amongst other forms) is perceived as the major cause of food insecurity in both developing countries and within unequal developed societies (Rose et al., 2021).

FAO proposes the concept of a sustainable food system that delivers food security and nutrition for all in such a way that the economic, social, and environmental bases to generate food security and nutrition for future generations are not compromised (Nguyen, 2018). Environmental aspects comprise reduction of carbon and water footprint, keeping water, soil, animals, and plants healthy, and mitigation of food waste. Meanwhile, the economic impact translates into increasing incomes for employees, profits for entrepreneurs, and tax revenues to

governments. Finally, the social benefits are related to added value distribution (gender, youth, indigenous people), cultural traditions, nutrition and health of the society, workers' rights and safety, and animal welfare (Nguyen, 2018).

The concept of a sustainable food system is in line with the Sustainable Development Goals (SDGs), which were adopted by the United Nations in 2015 as a universal call to action to end poverty, protect the planet, and ensure that by 2030 all people enjoy peace and prosperity (United Nation, 2021).

As the number of chronically starving people continues to rise, it is essential to transform food systems to achieve food security, improve nutrition, and make healthy diets accessible to all. For this purpose, policymakers should tackle poverty by boosting food value chains in poor communities through technology transfers (FAO, IFAD, UNICEF, 2021).

The same conclusions are drawn by academia. For instance, Sinha and Dhanalakshmi claimed that modern technologies, such as Artificial Intelligence (AI), Machine Learning, Blockchain, UAVs (Unmanned Aerial Vehicles) or AFRs (Autonomous Field Robots), Big Data, Cloud Computing, can boost agriculture to new heights (Sinha & Dhanalakshmi, 2022).

Although digital transformation in agriculture is widely discussed in the academic literature, there is still an existing gap, especially in the area of the adoption of financial innovations. The literature search, which was performed with the terms „FinTech" AND „agriculture" in the bibliographic databases of Emerald Management (135 articles) and the ISI Web of Knowledge (31 papers), clearly confirms the research gap.

The main aim of this chapter is to measure knowledge, importance, and perspective of usage of technological innovations in agriculture. Seven modern technologies, namely the Internet of Things, Remote Sensing, Artificial Intelligence, Big Data Analytics, Global Positioning Systems, Blockchain, and FinTech toward Agriculture 4.0 are discussed. Furthermore, the study identifies the benefits of FinTech in the field of agriculture.

The chapter reads as follows: Section 1 is the introduction, and the literature review is presented in Section 2. The methodology used in this research and the results are described in Section 3. Finally, a discussion and limitations, and recommendations for future research are drawn in Section 4.

## 2. Literature Review

It must be highlighted that food is a specific product. As consumers may regard new technologies as riskier than traditional ones in food, therefore perceived risk is negatively correlated with willingness to buy a product (Siegrist, 2008). Siegrist divided the hazards into three categories: biological, chemical, and

technological (Siegrist, 2008). The hazard can be defined as a source of potential damage. Technological hazards are associated with the usage of new methods and technologies, biological hazards are related to bacterial pathogens, while chemical hazards are mainly pesticides, animal drug residues, heavy metals, and environmental contaminants (FDA, 2018).

Numerous theories were proposed by researchers to explain consumers' acceptance of new technologies and their intention to use them (Lai, 2017). The first version of the Technology Acceptance Model (TAM); adopted by Davis in 1989, indicated two primary factors influencing an individual's intention to use new technology: Perceived Ease of Use and Perceived Usefulness (Davis, 1985). Perceived Usefulness is defined as the potential user's subjective likelihood that the use of a certain system will improve their action and Perceived Ease of Use refers to the degree to which the potential user expects the target system to be effortless (Lai, 2017).

Agriculture 4.0 evolved to produce crops differently by applying emerging technologies based on Industry 4.0. (Eashwar & Chawla, 2021). The three previous industrial revolutions thoroughly transformed the agricultural sector from indigenous farming to mechanized farming and recent precision agriculture (Liu et al., 2021). Precision agriculture can be defined as an integrated crop management system that attempts to match the kind and amount of inputs with the actual crop needs for small areas within a farm field (Shanwad et al., 2002).

The predominant technology of Industry 4.0. is the Internet of Things (IoT), which is also a core of Agriculture 4.0. Thanks to the use of sensors, cameras, and actuators farmers can regulate agricultural processes by remotely monitoring the crops and collecting data in the form of videos and pictures. The researchers reported that productivity can potentially be increased by 70% by 2050 through the implementation of IoT in the agricultural sector (Aamer et al., 2021).

However, the literature findings suggested the challenges of adopting IoT in agriculture. For example, Aamer et al. (2021) indicated barriers in five areas. Technical challenges comprise internet availability and reliability, interoperability and integration with existing information technology, and Big Data management and analytics capability. The financial barriers encompass capital investments, and operation and maintenance costs. On the other hand, social challenges are cooperation and integration, and coordination of information. Operational themes consist of administering the supply chain of IoT networks and data security. Educational challenges are related to the low level of knowledge of emerging technologies and technical skills. Finally, governmental barriers are not sufficient regulations and politics. The barriers are difficult to overcome in developing countries, therefore precision agriculture is used most and is most advanced amongst arable farms, particularly large ones with large field sizes in

the main grain growing areas, and where a business approach (maximization of profitability) has long been practiced (European Commission, 2017).

The term Remote Sensing (RS) generally refers to nonintrusive Earth observation using electromagnetic waves from a platform some distance away from the object of the study (Fu et al., 2020). In agriculture, RS applications allow the observation of crops on a large scale in a synoptic, non-destructive manner (Martos et al., 2021) and are used in field monitoring, irrigation management, nutrient, disease and pest management, and yield prediction (Sishodia et al., 2020). Sensors are typically mounted on satellites, aerial, and ground-based platforms and differ based on the spatial, spectral, radiometric, and temporal resolution they offer (Sishodia et al., 2020). An example can be the IKONOS satellite sensor launched at Vandenberg Air Force Base, California, the USA in 1999.. Satellite Imagery analysis combined with Geographic Information Systems (GIS) tools for agriculture production allows for: a fast and accurate overview, quantitative green vegetation assessment, and underlying soil characteristics (Romeijn, 2008).

Global Positioning System (GPS) satellites broadcast signals that allow GPS receivers to calculate their position in real-time (Shanwad et al., 2002). Access to a precise location at any time allows crop, soil, and water measurements to be mapped. GPS-based instruments are used in monitoring and performing agricultural practices over a large spatial coverage, especially when advanced and accurate positional information to optimize the operational costs and reduce the estimated time of completion is required (Chandra Pandey et al., 2021).

Devices used in IoT, GPS, and RS technologies generate a huge amount of data at every stage of the agricultural value chain. A formal definition of big data does not exist yet (Lassoued et al., 2021), so Big Data Analytics (BDA) can be described as an ecosystem of several technologies that support data acquisition, storage, and advanced analytic techniques as well as visualization. Access to data provides insights into farming practices, helps make real-time decisions, and motivates to incorporate new methods of farming operations (Javaregowda, Indiramma, 2019).

The complexity of big data is associated with its typical characteristics, the four Vs of big data: volume (the data needed to solve the problem are very large in size, and increasingly growing), velocity (decision-making based on big data has to happen in real-time), variety (multiple formats of data need to be processed together for decision-making) and veracity (uncertainty involved in the data) (Osinga et al., 2022).

Cloud Computing provides farmers with access to data and their applications over the internet. Farmers can also use the cloud to access information from predictive analysis institutes, and knowledge-based repositories containing a wealth of farming information (Ferkoun, 2015).

Artificial Intelligence (AI) is based on studying how the human brain thinks, and how humans learn, make decisions, and work while solving a problem (Talaviya et al., 2020). Bringing AI into agriculture and using AI-based machines such as Unmanned Aerial Vehicles (UAVs) or Autonomous Field Robots (AFRs) could automate such processes as irrigation and weeding. An example can be The Carbon Robotics Autonomous LaserWeeder. It is a robot that can distinguish weeds from crops and remove 100,000 weeds per hour, using high-resolution cameras that scan fields, crops, and weeds in real-time. The onboard computer performs artificial intelligence procedures to identify invasive weeds and eight simultaneously operating laser modules that target thermal energy at each weed's meristem (Https://Carbonrobotics.Com/Autonomous-Weeder). The solution brings many benefits for farmers, among others: increased crop quality and yields cost reduction. Moreover, the elimination of herbicides has an enormous impact on the environment and contributes to organic farming, and increased crop yield, and quality.

Machine Learning (ML) can be defined as a learning process to learn from „experience" (training data) to perform a task (Liakos et al., 2018). There are available many learning models, for example, Regression, Clustering, Decision Trees, and Artificial neural networks (ANNs), which are based on human brain functionality and emulate its comprehensive functions, such as pattern generation, cognition, learning, and decision-making (Liakos et al., 2018).

The Blockchain (BL) is a ledger of accounts and transactions, written and stored by all participants (Xiong et al., 2020). There are many agricultural start-ups that develop BL technology available on the market. One of them is AgriChain, a platform that connects and transfers information between agricultural supply chain participants across Australia and Asia (Https://Agrichain.Com/Blockchain/). At each point along the supply chain, AgriChain creates a historical record of all transaction data, which is next duplicated across a network of computers many thousands of times and validated, ensuring that no single node can corrupt or falsify the information. This decentralized, unhackable and distributed application improves productivity, increases visibility, reduces costs of the transaction, manages stock, automates freight orders, and eliminates manual paperwork.

Research findings confirm that the finance sector has a key role to play in allowing agriculture to contribute to economic growth and poverty reduction (Mclntosh & Mansini, 2018).

Agriculture in Africa has an enormous social and economic impact, because more than 60% of the population are smallholder farmers, and about 23% of sub-Saharan Africa's GDP comes from agriculture (Goedde et al., 2019). Digital technologies have a transformative effect on improving the livelihoods of smallholder farmers, especially concerning the so-called „five A's", namely: „Aggregation" to achieve economies of scale, „Awareness" of improved farming

practices, „Availability" and „Affordability" of quality inputs, „Access" to credit and markets (EY & Syngenta Foundation for Sustainable Agriculture, 2020).

The development of Agriculture 4.0 is a comprehensive process, which faces a series of barriers (da Silveira et al., 2021). Some of the challenges seem insurmountable in contemporary developing countries, for example, lack of infrastructure and financing, the need to foster Research & Development and innovative business models, and lack of digital skills.

Nonetheless, African countries, such as Nigeria and Kenya, have recently emerged as FinTech hotbeds because consumers are using inexpensive, accessible financial applications in ways never seen before (Chitavi et al., 2021).

Sub-Saharan Africa is the world's fastest-growing mobile phone market. By the end of 2018, the region had 456 million unique mobile subscribers, a number that is expected to jump by a further 167 million by 2025 (Mitchell, 2020). In the region, smartphones are general-purpose devices that are used in business to access information and process transactions (Anshari et al., 2019).

FinTech is a combination of „financial technology" and refers to the latest technologies used in innovative financial products and services which can make businesses more sustainable overall by promoting green finance (Vergara & Agudo, 2021). FinTech includes new applications, processes, and business models delivered by the internet in the area of electronic payments, crowdfunding, insurance, and management in different sectors and industries, also in the field of agriculture.

AgriTech, „FinTech within agriculture" relates to financial innovations in the area of agriculture. Researchers list the benefits of FinTech adoption in agriculture. For example, a crowdfunding and digital payment system proposed by Anshari et al. (Anshari et al., 2019) transforms agriculture's business process into more sustainable in terms of funding and distribution. The marketplace becomes digital with FinTech, crowdfunding, and payment systems used to conduct business transactions in agriculture conveniently at any time from everywhere by farmers using smartphones to access, and process information (Anshari et al., 2019).

Another example is a Blockchain system for placing orders, which improves information asymmetry, builds a smooth information transmission channel, improves transaction reliability and efficiency, and at the same time, reduces costs of the traditional agricultural financing of orders (Zhang, 2020).

In addition to academic papers, several FinTech websites from Sub-Saharan Africa were visited for actual examples. One of them is the Apollo Agriculture start-up, which was founded in 2016 in Kenya and helped to solve credit and operation problems of more than 40,000 small-scale farmers (Kene-Okafor, 2020). FinTech delivers a complete bundle of services: financing, farm inputs, mobile payments, agronomic advice, insurance, and market access, and uses cutting-

edge tools such as satellite imagery and remote sensing. (Apollo Agriculture, 2021). For this purpose, it verifies the identity of farmers and takes satellite coordinates of their fields. The data obtained are then employed to build credit profiles for farmers using machine learning. In this way, FinTech automates digital processes for each step in a farmer's lifecycle from customer acquisition through training to a collection of the payment.

MyAgro, another successful project, was founded in 2011, and currently serves 115,000 farmers in Africa, of which 70% are women (MyAgro, 2021). The idea is based on the concepts of microcredit and microfinance, introduced by Muhammad Yunus and the Grameen Bank, who were jointly awarded the Nobel Peace Prize in 2006. MyAgro is a mobile layaway platform that allows farmers to use mobile phones to purchase seeds and fertilizer in small increments. After several months of paying increments, MyAgro delivers high-quality inputs directly to the farmers right in time for planting season. Additionally, farmers are offered training sharing harvest-improving agricultural techniques tailored to specific regions and crops. FinTech claims that the MyAgro model enabled an increase in the net income by $150 – $300 per farmer (MyAgro, 2021).

## 3. Research Hypotheses, Methodology, and Results

This study contributes to the literature by exploring the adoption of emerging technologies in agriculture. The paper focuses on addressing the following questions:

Q1: Do consumers accept the hazards of emerging technologies in agriculture?

Q2: Which emerging technologies are most useful in agriculture in the opinion of consumers?

Q3: In what area does FinTech bring benefits for farmers?

Based on the above research questions, the following hypotheses were posed:

H1: Consumers accept hazards of modern technologies in food production to a greater extent than biological and chemical hazards.

H2: According to consumers, Remote Sensing is the most useful technology in agriculture.

H3: FinTech brings benefits mainly in the area of mobile payments.

The study was conducted in September and October 2021 and employed a questionnaire. Data were collected through the use of a noninterventional, anonymized, self-administered, web-based survey, which was distributed using Social Media and groups devoted to survey exchanges. The eligibility criteria were interest of respondents in emerging technologies and agriculture. The final sample consisted of 180 international consumers, from the following countries:

Australia, Bangladesh, Canada, Croatia, the Czech Republic, Denmark, Egypt, France, Germany, Hungary, India, Italy, Kenya, Lithuania, Malaysia, Mauritius, the Netherlands, Pakistan, the Philippines, Poland, Portugal, Russia, Serbia, Singapore, Switzerland, Taiwan, the United Kingdom, the United States of America, and Zimbabwe. The answers collected in a spreadsheet did not allow for the subsequent identification of respondents.

The detailed demographic characteristics are presented in Table 5.1. The data on demographic characteristics indicated that, among the participants surveyed, 73.9% were female, 74.4% were aged from 21 to 30 years, 76.1% were living in urban areas, 62.8% were employed, and 69.4% had a least a Bachelor's degree.

Table 5.1. Respondents' demographic data.

| Age of respondents | Frequency | Percentage | Place of employment | Frequency | Percentage |
|---|---|---|---|---|---|
| Up to 20 years | 8 | 4.4% | Unemployed | 67 | 37.2% |
| 21-30 years | 134 | 74.4% | Microenterprise (1-9 employees) | 26 | 14.4% |
| 31-45 years | 25 | 13.9% | Small enterprise (10-49 employees) | 21 | 11.7% |
| 46-60 years | 10 | 5.6% | Medium-sized enterprise (50-249 employees) | 21 | 11.7% |
| Not specified | 3 | 1.7% | Large enterprise (250 employees and more) | 45 | 25.0% |
| Gender of respondents | | | Place of residence | | |
| Female | 133 | 73.9% | Rural | 37 | 20.6% |
| Male | 42 | 23.3% | Urban | 137 | 76.1% |
| Not specified | 5 | 2.8% | Not specified | 6 | 3.3% |
| Education level | | | Work experience | | |
| high school | 49 | 27.2% | none | 34 | 18.9% |
| Bachelor's degree | 74 | 41.1% | in agriculture | 10 | 5.6% |
| Master's degree | 51 | 28.3% | other | 129 | 71.7% |
| other | 3 | 1.7% | Not specified | 7 | 3.9% |
| Not specified | 3 | 1.7% | | | |

Source: own elaboration based on analyzed data

In the questionnaire, a five-level Likert scale was used. The format of the five-level Likert item is as follows: 1 – strongly disagree, 2 – disagree, 3 – neither agree nor disagree, 4 – agree, and 5 – strongly agree.

The study employed the quantitative research methodology with the support of the SPSS software. First, Cronbach's alpha coefficient for the entire scale,

which in the final version included 31 items, was calculated. This coefficient, which provides an overall assessment of the reliability of the measure and internal consistency, was acceptable (0.88).

The first question of the questionnaire was related to the level of public acceptance of threats in food production. Table 5.2 presents the results. The respondents disapproved of chemical hazards the most (median=4.5), while technological hazards were neutral (median=3), the result confirmed H1.

Table 5.2. Public acceptance of hazards in food production

| Disapproval of threats | Frequency | | | | | Median | Mode |
|---|---|---|---|---|---|---|---|
| | Strongly disagree (1) | Disagree (2) | Neither agree nor disagree (3) | Agree (4) | Strongly Agree(5) | | |
| biological | 0 | 6 | 20 | 86 | 68 | 4 | 4 |
| chemical | 1 | 2 | 20 | 67 | 90 | 4.5 | 5 |
| technological | 25 | 37 | 45 | 45 | 28 | 3 | 3 |

Source: own elaboration based on analyzed data

The next question of the questionnaire concerned the level of knowledge of Agriculture 4.0. Only 24.5% of respondents declared knowledge, the knowledge score was 2.0 (median and mode).

Next, the respondents were asked to assess their knowledge, acceptance, and usefulness of eight emerging technologies. The medians and mods were calculated. The statistics are presented in Table 5.3.

Table 5.3. The scores of respondents' knowledge, acceptance, and usefulness of new technologies in agriculture

| Technology | Knowledge score | | Acceptance score | | Usefulness score | |
|---|---|---|---|---|---|---|
| | Median | Mode | Median | Mode | Median | Mode |
| Artificial Intelligence (AI) | 3 | 4 | 4 | 5 | 4 | 4 |
| Cloud Computing (CC) | 3 | 4 | 4 | 4 | 4 | 4 |
| Internet of Things (IoT) | 3 | 3 | 4 | 5 | 4 | 5 |
| Remote Sensing (RS) | 3 | 3 | 4.5 | 5 | 4 | 5 |
| Blockchain (BL) | 3 | 2 | 4 | 4 | 4 | 3 |
| Big Data Analysis (BDA) | 3 | 4 | 4 | 5 | 4 | 4 |
| Global Positioning System (GPS) | 4 | 4 | 4 | 5 | 4 | 5 |
| Fintech | 3 | 3 | 4 | 5 | 4 | 4 |

Source: own elaboration based on analyzed data

The results confirm that the level of acceptance and usefulness of new technologies in agriculture are higher than the knowledge degree. The respondents accepted the most Remote Sensing. H2 can be confirmed.

Subsequently, the respondents were asked to indicate if they agree or disagree with statements regarding the benefits of FinTech in the field of agriculture. The frequencies and sums were calculated. The statistics for benefits are presented in Table 5.4, including responses to the items of the questionnaire and ranks using the sum.

Table 5.4. The benefits of FinTech in the agriculture field

| The benefits of FinTech | Frequency | | | | | Sum | Rank |
|---|---|---|---|---|---|---|---|
| | Strongly disagree (1) | Disagree (2) | Neither agree nor disagree (3) | Agree (4) | Strongly Agree(5) | | |
| contribution to reducing poverty in developing countries | 1 | 13 | 59 | 72 | 35 | 667 | 7 |
| increased productivity in agriculture, e.g., higher yields and profits | 1 | 12 | 48 | 86 | 33 | 678 | 6 |
| positive effect on the quality and prices of the produced food | 2 | 12 | 59 | 74 | 33 | 664 | 8 |
| reduction of the environmental impact | 5 | 15 | 69 | 60 | 31 | 637 | 10 |
| farmers from developing countries have access to cash, through micro-loans, crowdfunding | 2 | 4 | 50 | 87 | 37 | 693 | 4 |
| farmers can better manage their farms through access to data | 3 | 6 | 39 | 89 | 43 | 703 | 3 |
| farmers have access to mobile payments | 1 | 5 | 40 | 81 | 53 | 720 | 1 |
| contribution to the development of rural areas through investments | 2 | 5 | 45 | 82 | 46 | 705 | 2 |
| contribution to the increase of knowledge through access to advice | 2 | 9 | 52 | 69 | 48 | 692 | 5 |
| contribution to social development, e.g., it promotes the employment of women | 3 | 15 | 57 | 74 | 31 | 655 | 9 |

Source: own elaboration based on analyzed data

The top benefit of FinTech used by farmers, as perceived by the respondents, was access to mobile payments, the second top-ranked benefit was a contribution to the development of rural areas. Conversely, the least potential benefits were environmental aspects and contribution to social development. The results confirmed H3, assuming that AgriTech brings benefits for farmers, mainly in the area of mobile payments.

## 4. Conclusion

Nowadays, the digitalization of agriculture is an inevitable process. Novel technologies are essential for food security, safety, and sustainability (Siegrist & Hartmann, 2020). The results of the study indicated that hazards associated with technological advances are accepted by consumers to a greater extent than chemical and biological hazards.

The outcomes of the research clearly indicate that the notion of Agriculture 4.0 is unknown because only 24.5% of respondents declared their knowledge in this area. The knowledge scores for all eight analyzed technologies were significantly lower than the acceptance and usefulness scores. Researchers confirm that people with more food knowledge seem to have lower food technology neophobia scores compared with people with less food knowledge (Cavaliere & Ventura, 2018). Food technology neophobia can be defined as a personality trait that influences consumers' willingness to accept new food technologies, (Siegrist & Hartmann, 2020). It means that there is a need to educate consumers on the use of emerging technologies in agriculture to improve their acceptance of the advancement in food production.

The technology of Remote Sensing was pointed out by respondents as particularly promising in the field of agriculture. However, neither of these technologies can be analyzed in isolation from the others, because they are interdependent and farmers usually implement solutions based on many technologies.

Respondents perceived the benefits of AgriTech mainly in the area of mobile payments. The results are in line with the research that digital and mobile payments are the most often used products of the FinTech sector worldwide (Karmańska, 2021). However, the results indicate that FinTech also plays an important role in rural communities as a catalyst for innovations.

The findings are proved by the opinion of consumers; an example can be the following statement of a respondent from one of the developing countries: "Artificial intelligence + Big data, drone usage, and centralized information systems for farmers, these advances have the capability to increase per hectare yield, give the farmers information about which kind of soil, the effectiveness of the

same, FinTech accelerates the process of digitization in agriculture, making it beneficial to consumers, farmers, and society at large".

These research findings contribute to the literature and practice in several ways. First, they expand the literature. Second, they can be useful for practitioners to understand the benefits of adoption new technologies in food supply chains.

The identification of benefits provides an important basis for further surveys aimed at risks of implementing emerging technologies in agriculture.

The findings of the study have to be interpreted in light of certain limitations, the main one being a small sample size – only 180 respondents from 29 countries. Further limitations are related to a questionnaire as a data collection method, because some variables could have been omitted due to closed-ended questions and their lower validity rate. Finally, only eight technologies were discussed.

## Bibliography


1. Aamer, A. M., Al-Awlaqi, M. A., Affia, I., Arumsari, S., & Mandahawi, N. (2021). The internet of things in the food supply chain: adoption challenges. *Benchmarking*. https://doi.org/10.1108/BIJ-07-2020-0371
2. Anshari, M., Almunawar, M. N., Masri, M., & Hamdan, M. (2019). Digital marketplace and FinTech to support agriculture sustainability. *Energy Procedia*, *156*, 234–238. https://doi.org/10.1016/j.egypro.2018.11.134
3. Apollo Agriculture. (n.d.). https://www.apolloagriculture.com/
4. Cavaliere, A., & Ventura, V. (2018). Mismatch between food sustainability and consumer acceptance toward innovation technologies among Millennial students: The case of Shelf Life Extension. *Journal of Cleaner Production*, *175*, 641–650. https://doi.org/10.1016/j.jclepro.2017.12.087
5. Chandra Pandey, P., Tripathi, A. K., & Sharma, J. K. (2021). An evaluation of GPS opportunity in market for precision agriculture. *GPS and GNSS Technology in Geosciences*, 337–349. https://doi.org/10.1016/b978-0-12-818617-6.00016-0
6. Chitavi, M., Cohen, L., & Hagist, S. C. N. (2021). Kenya Is Becoming a Global Hub of FinTech Innovation. *Harvard Business Review Digital Articles*, 1–8. http://search.ebscohost.com/login.aspx?direct=true&db=bth&AN=148962024&site=ehost-live&authtype=ip,uid
7. da Silveira, F., Lermen, F. H., & Amaral, F. G. (2021). An overview of agriculture 4.0 development: Systematic review of descriptions, technologies, barriers, advantages, and disadvantages. *Computers and Electronics in Agriculture*, *189*, 106405. https://doi.org/10.1016/j.compag.2021.106405
8. Davis, F. D. (1985). *A technology acceptance model for empirically testing new end-user information systems: Theory and results*. *Management*, Ph.D., 291. https://doi.org/oclc/56932490

9. Eashwar, S., & Chawla, P. (2021). Evolution of Agritech Business 4.0 - Architecture and Future Research Directions. *IOP Conference Series: Earth and Environmental Science*, *775*(1). https://doi.org/10.1088/1755-1315/775/1/012011
10. European Commission. (2017). Precision Agriculture: an opportunity for EU farmers - Potential support with the cap 2014-2020. European Parliament, 91, 399–404.
11. EY, & Syngenta Foundation for Sustainable Agriculture. (2020). Can digital innovation help end hunger ?
12. FAO, IFAD, UNICEF, W. and W. (2021). The State of Food Security and Nutrition in the World 2021. In The State of Food Security and Nutrition in the World 2021. https://doi.org/10.4060/cb4474en
13. FDA. (2018). Hazard Analysis and Risk-Based Preventive Controls for Human Food: Draft Guidance for Industry| Chapter 3 (Potential Hazards). *Food and Drugs Administration*, 317. https://www.fda.gov/regulatory-information/search-fda-guidance-documents/draft-guidance-industry-hazard-analysis-and-risk-based-preventive-controls-human-food
14. Ferkoun, M. (2015). Cloud computing helps agriculture industry grow - Cloud computing news. https://www.ibm.com/blogs/cloud-computing/2015/01/23/cloud-computing-helps-agriculture-industry-grow/
15. Fu, W., Ma, J., Chen, P., & Chen, F. (2020). Remote Sensing Satellites for Digital Earth. *In Manual of Digital Earth* (pp. 55–123). https://doi.org/10.1007/978-981-32-9915-3_3
16. Goedde, L., Ooko-Ombaka, A., & Pais, G. (2019). Winning in Africa's Agricultural Market. Agricultural Practice, February, 13. https://www.mckinsey.com/industries/agriculture/our-insights/winning-in-africas-agricultural-market
17. https://agrichain.com/blockchain/. (n.d.).
18. https://carbonrobotics.com/autonomous-weeder. (n.d.).
19. Javaregowda, M., Indiramma, M. (2019). Role of Big Data in Agriculture. *International Journal of Innovative Technology and Exploring Engineering, 9*(2), 3811–3821. https://doi.org/10.35940/ijitee.a5346.129219
20. Jung, J., Maeda, M., Chang, A., Bhandari, M., Ashapure, A., & Landivar-Bowles, J. (2021). The potential of remote sensing and artificial intelligence as tools to improve the resilience of agriculture production systems. *Current Opinion in Biotechnology*, *70*, 15–22. https://doi.org/10.1016/j.copbio.2020.09.003
21. Karmańska, A. (2021). *Critical success factors for FinTech. In The Digitalization of Financial Markets* (pp. 101–122). Routledge. https://doi.org/10.4324/9781003095354-6
22. Kene-Okafor, T. (2020). How Apollo Agriculture is solving small- scale farmers, credit problem in Kenya. https://techpoint.africa/2020/07/27/apollo-agriculture-feature/
23. Lai, P. (2017). the Literature Review of Technology Adoption Models and Theories for the Novelty Technology. *Journal of Information Systems and Technology Management, 14*(1). https://doi.org/10.4301/s1807-17752017000100002
24. Lassoued, R., Macall, D. M., Smyth, S. J., Phillips, P. W. B., & Hesseln, H. (2021). Expert insights on the impacts of, and potential for, agricultural big data. *Sustainability (Switzerland)*, *13*(5), 1–18. https://doi.org/10.3390/su13052521

25. Liakos, K. G., Busato, P., Moshou, D., Pearson, S., & Bochtis, D. (2018). Machine learning in agriculture: A review. *Sensors (Switzerland)*, *18*(8). https://doi.org/10.3390/s18082674
26. Liu, Y., Ma, X., Shu, L., Hancke, G. P., & Abu-Mahfouz, A. M. (2021). From Industry 4.0 to Agriculture 4.0: Current Status, Enabling Technologies, and Research Challenges. *IEEE Transactions on Industrial Informatics*, *17*(6), 4322–4334. https://doi.org/10.1109/TII.2020.3003910
27. Martos, V., Ahmad, A., Cartujo, P., & Ordoñez, J. (2021). Ensuring agricultural sustainability through remote sensing in the era of agriculture 5.0. *Applied Sciences (Switzerland)*, *11*(13). https://doi.org/10.3390/app11135911
28. Mclntosh, C., & Mansini, C. S. (2018). The Use of Financial Technology in the Agriculture Sector. *In ADBI Working Paper* (Issue 872). https://www.adb.org/publications/use-financial-technology-agriculture-sector
29. Mitchell, J. (2020). Will mobile phone penetration maintain African momentum? FDI Intelligence. https://www.fdiintelligence.com/article/76565?saveConsentPreferences=success
30. myAgro. (n.d.). https://www.myagro.org/
31. Nguyen, H. (2018). Sustainable food systems - Concept and framework. Fao, 1–8. http://www.fao.org/3/ca2079en/CA2079EN.pdf
32. Osinga, S. A., Paudel, D., Mouzakitis, S. A., & Athanasiadis, I. N. (2022). Big data in agriculture: Between opportunity and solution. *Agricultural Systems*, 195. https://doi.org/10.1016/j.agsy.2021.103298
33. Romeijn, L. J. (2008). Agriculture Crop Management and Production Improved by Satellite Remote Sensing Technology and Geographic Information Systems (GIS). https://www.prweb.com/releases/2008/06/prweb1044924.htm
34. Rose, D. C., Wheeler, R., Winter, M., Lobley, M., & Chivers, C. A. (2021). Agriculture 4.0: Making it work for people, production, and the planet. *Land Use Policy,* 100. https://doi.org/10.1016/j.landusepol.2020.104933
35. Shanwad, U., Patil, V., Dasog, G., Mansur, C., & Shashidhar, K. (2002). Global Positioning System (GPS) in Precision Agriculture. *The Asian GPS Conference*, November 2014, 24–25. https://www.researchgate.net/profile/Ghulappa-Dasog/publication/261035926_Global_Positioning_System_GPS_in_Precision_Agriculture/links/5473041a0cf216f8cfae953e/Global-Positioning-System-GPS-in-Precision-Agriculture.pdf
36. Siegrist, M. (2008). Factors influencing public acceptance of innovative food technologies and products. *Trends in Food Science and Technology, 19*(11), 603–608. https://doi.org/10.1016/j.tifs.2008.01.017
37. Siegrist, M., & Hartmann, C. (2020). Consumer acceptance of novel food technologies. *Nature Food*, *1*(6), 343–350. https://doi.org/10.1038/s43016-020-0094-x
38. Sinha, B. B., & Dhanalakshmi, R. (2022). Recent advancements and challenges of Internet of Things in smart agriculture: A survey. *Future Generation Computer Systems*, 126, 169–184. https://doi.org/10.1016/j.future.2021.08.006
39. Sishodia, R. P., Ray, R. L., & Singh, S. K. (2020). Applications of remote sensing in precision agriculture: A review. *Remote Sensing*, *12*(19), 1–31. https://doi.org/10.3390/rs12193136

40. Talaviya, T., Shah, D., Patel, N., Yagnik, H., & Shah, M. (2020). Implementation of artificial intelligence in agriculture for optimisation of irrigation and application of pesticides and herbicides. *Artificial Intelligence in Agriculture, 4*, 58–73. https://doi.org/10.1016/j.aiia.2020.04.002
41. United Nation. (2021). the Sdgs in Action. United Nations Development Programme. https://www.undp.org/sustainable-development-goals?utm_source=EN&utm_medium=GSR&utm_content=US_UNDP_PaidSearch_Brand_English&utm_campaign=CENTRAL&c_src=CENTRAL&c_src2=GSR&gclid=Cj0KCQjwrJOMBhCZARIsAGEd4VHF-i9adVmYRfebMBV_jD9yykYUs_EzwLAFiUctC_314v2BoqTWON
42. Vergara, C. C., & Agudo, L. F. (2021). Fintech and sustainability: Do they affect each other? *Sustainability (Switzerland)*, *13*(13). https://doi.org/10.3390/su13137012
43. Xiong, H., Dalhaus, T., Wang, P., & Huang, J. (2020). Blockchain Technology for Agriculture: Applications and Rationale. *Frontiers in Blockchain*, 3. https://doi.org/10.3389/fbloc.2020.00007
44. Zhang, D. (2020). The Innovation Research of Contract Farming Financing Mode under the Block Chain Technology. *Journal of Cleaner Production*, 270. https://doi.org/10.1016/j.jclepro.2020.122194

Chapter 6

# Models for Estimation of Investment in Information and Communication Technology Effects on Socioeconomic Development

Kazimierz J. Wojtowicz

## 1. Introduction

ICT has transformed the way individuals connect, obtain critical data, work, conduct business, deal with government authorities, and manage their personal life. As a consequence, ICT influences everyday life and macroeconomic development, which has an influence on society by sanctioning structure and living standard enhancements. Even though the term „socioeconomic development" is frequently used in study and practice, its significance is not always apparent. Therefore, it is critical to determine the impact of investment in ICT on socioeconomic development to develop a complex model (models) involving more variables and maybe more paths capturing the impact between variables.

### 1.1. Research Problem Description

The global socio-economic spectrum always presents information and communication technologies (ICTs) as key factors for development. The optimistic view that ICT plays an instrumental role in employment, capacity development, growth in gross domestic product (GDP), economic development, alleviation of poverty, organizational restructuring, and democratic citizen participation, has greatly become widespread and globalized (Bahrini & Qaffas, 2019) more so with special attention to the developing countries. Simultaneously, international bodies such as the International Telecommunications Union (ITU), the World Bank and the OECD posit that investment in ICT is a key driver for sustainable development (Palvia, Baqir & Nemati, 2018). Per the OECD (Bahrini & Qaffas, 2019), the role of ICT in reducing poverty by creating new jobs, adding diverse sources of income, reducing the cost of access to education and health services cannot be downplayed.

### 1.2. Justification

The focus on ICT can be justified by the significance attributed to ICT as a factor for economic growth as it is linked with production mechanisms typical of rapid technological processes, and strong and solid demand in volumes development (Bahrini & Qaffas, 2019). It must be added that with the intensive utilization of ICT within the economic and social spheres, economic growth is predominantly affected by a focus and emphasis on various service sectors such as government, business services, distribution and finance.

## 2. Literature Review

The definition of socio-economic development relies entirely on the understanding of development as a concept that is closely related to, and commonly interchanged with economic growth. Nonetheless, the distinction between these terms is ultimately achieved via the consideration of the concepts of vertical advancement and horizontal distribution (Jakimowicz, 2020). Jakimowicz (2020) defines development as a progressive course of growth.

Table 6.1. Study of Investment in ICT – Results, Similarities and Differences

| Studies | Results of Study | Country Development Stage / Effects of Study |
|---|---|---|
| Toader et al. (2018) | ICT infrastructure has a substantial positive effect on economic development among EU members, although the effect varies based on the form of technology investigated. | – Developed<br>– Positive effect |
| Osundina, (2018) | ICT had no long-term equilibrium path for the OECD region. However, the study's causality interaction investigation found a bidirectional impact of ICT on electricity consumption, financial development and the economy at large. | – Developed<br>– Positive effect on market efficiency, economic opportunities, and productivity |
| Aghaei & Rezagholizadeh (2017) | The findings show that ICT is a significant and positive determinant of GDP per capita in OIC countries. An increment in ICT investments leads to a corresponding increase in the average per capita GDP. | – Developed, emerging, and developing<br>– Positive effect |
| Imasheva & Kramin, (2019) | The findings confirm the general hypothesis from previous research that broadband internet impacts economic development and growth at Russia's regional level. | – Emerging<br>– Positive effect |
| Kamel, Rateb & El-Tawil, (2009) | Improved and steady ICT investments contribute to Egypt's economic growth, reflecting a potential economic development to other emerging economies in the region. | – Emerging<br>– Positive effect |
| Andrianaivo & Kpodar (2011) | ICT development (represented by the usage rates of mobile and communication expenses) contributes to economic development in Africa. Financial inclusion benefits economic development. | – Emerging and developing<br>– Financial inclusion has significant, positive effect |

table 6.1 cnt'd

| Studies | Results of Study | Country Development Stage / Effects of Study |
|---|---|---|
| (Bahrini& Qaffas, 2019) | In SSA nations, the findings suggest that mobile phone usage had the most substantial positive effect on economic development. Results show that internet use and broadband adoption are two of the most critical drivers of wealth creation in emerging economies. | – Emerging and developing<br>– Significant, positive effect |
| (Cheng, Chien & Lee, 2021) | Growth has a substantial adverse effect on economic development, with a more pronounced negative impact in higher-income states | – Developed and developing<br>– Significant, negative effect |
| Adeleye, Adedoyin, & Nathaniel (2021) | The research shows that trade openness, mobile phone subscribers, and fixed telephone usage are significant determinants of Africa's economic development. ICT is still underdeveloped and the gains of global trade have not been fully realized. | – Developing<br>– Effect dependent on trade openness |
| (Lee, Hong & Hwang, 2017) | ICT diffusion is among the fundamental determinants of human progress; the magnitude and effect of ICT diffusion on human prosperity vary based on an economy's income level, and the effects of ICT on human development vary based on technological medium. | – Not specified<br>– Mixed effects |
| (Majeed & Ayub, 2018) | It was found that a single unit increase in mobile phone users and subscribers increased 0.02 units growth in GDP per capita. | – Not specified<br>– Positive effect |

Source: own study.

Toader et al. (2018) reported that several global institutions (the United Nations, the International Telecommunications Union, the OECD, and the World Bank) found the ICT sector plays a key role in sustainable economic growth. In developing countries, the two key factors that enhance economic growth are foreign direct investment and ICT, with the latter favored as the key driver (Adeleye, Adedoyin & Nathaniel, 2021). Emerging and developing countries can obtain macroeconomic gains, such as economic growth, by using ICT to skip over stages in their development (Adeleye, Adedoyin & Nathaniel, 2021).

Multiple studies examined ICT's contribution to economic growth, indicated economic development, measured by GNI[1], that is represented by the per capita GNI expressed in American dollars at current prices and PPPs (Toader et al. 2018; Cheng et al. 2021; Imasheva & Kramin, 2019; Kamel et al. 2009). In these studies, ICT investment is expressed as total revenuve earned annually in the telecom industry as a percentage of GNI.

Alderete (2017) examined the ICT access effect on socioeconomic development. She examined Global Competitiveness Indicator (GCI) which involves

[1] Gross national income (GNI) is defined as gross domestic product, plus net receipts from abroad of compensation of employees, property income and net taxes less subsidies on production

static and dynamic components of competitiveness that are grouped into 12 pillars: institutions, infrastructure, macroeconomic environment, health and primary education, higher education and training, goods market efficiency, labor market efficiency, financial market development, technological readiness, market size, business sophistication, and innovation. Total revenue earned annually in telecom by investment in ICT as a percentage of GCI is one of the components of GCI.

Existing theories have argued that capital factors, staff, and technology advancement are the primary drivers of long-term economic growth. Technology is viewed as an external component in the growth model (Roztocki, Soja & Weistroffer, 2019). Because every economy has continual access to technical innovation, one should anticipate income to converge between nations over time in this circumstance (Alderete, 2017). As a result, the theory backs up the concept of declining marginal returns on investments. More significant returns on investment are expected in areas where capital and staff stocks are expected to be smaller (Acemoglu, 2009). Given this relation, four significant elements related to socio-economic growth were therefore studied in the construction of the framework, demonstrating how the variables build complicated models. Society, technology, business, and policy all reflect them.

*Policy dimension*

Three aspects of policies that significantly impact socio-economic growth were included in the dimension: capital markets, international bodies, and administration. How these financial markets are run and managed has a significant impact on how various entities function (Roztocki, Soja & Weistroffer, 2019). Consequently, international bodies significantly influence socio-economic growth since they are endowed with significant resources and may define load conditions and arrange rescues for distressed economies given various control variables such as the inflation rate, unemployment rate, local credit, population and foreign direct investment and expenditure consumption. Hence the policy dimensions have a significant impact on capital resource availability (Roztocki, Soja & Weistroffer, 2019). Furthermore, multinational groups may use international accords to exert authority over specific countries and compel local governments to modify their policies. As a result, international organizations modify their strategy and policies regularly. Additionally, it is impossible to characterize policy approaches as steady and safe for brief times when ideological consistencies are displayed. Consequently, global benchmarks are produced and offered by global organisations such as the OECD to assess country performance on various topics (Roztocki, Soja & Weistroffer, 2019). In international politics, benchmarking may be a substantial source of indirect influence.

*Business dimension*

The business activities and commercial base established are differentiated in the business dimensions to emphasize the foundations that enable specific undertakings. The factors in the business dimension are represented by various variables such as investments in ICT and staff, which in themselves are independent variables (Roztocki, Soja & Weistroffer, 2019). Additionally, the annual telecom revenue concerning GNI, GDP and GCI per capita falls under the business dimension and is represented as dependent variables (Roztocki, Soja & Weistroffer, 2019). Different variables in the study thus represent commercial based activities.

*Technological dimension*

ICT and supporting technologies are included in the technology component to help individuals and organizations to get the most out of ICT. These further boosts socio-economic development. The definition of technology has evolved, and topics now discussed in terms of innovation were formerly defined (Roztocki, Soja & Weistroffer, 2019). Nonetheless, the research uses a far broader definition of technology, arguing that it cannot be reduced to a few exteriors of primarily mechanical forms. Additionally, most variables represented independently, such as a fixed broadband, fixed telephone, the internet, and cellular subscriptions, fall under the technological dimension (Roztocki, Soja & Weistroffer, 2019). Therefore, technological components help entities get the most out of ICT.

*Societal dimension*

Education, human capital, and social capital are all part of the societal dimension. In this concept, social capital is defined and comes off as the capacity to have access to people who are vital to the success of a project (Roztocki, Soja & Weistroffer, 2019). In principle, social capital is the goodwill that people or organizations have, and it is derived from the form and content of each actor's social relationships. The study shows how ICT-enabled knowledge may help a person enhance their skills and experience, which is a crucial aspect of human and social capital (Roztocki, Soja & Weistroffer, 2019). Therefore, the societal dimension is essential since it deals with human and social capital.

The business activities and commercial base established are differentiated in the business dimensions to emphasize the foundations that enable specific undertakings. The factors in the business dimension are represented by different variables such as investments in ICT and staff, which in themselves are independent variables (Roztocki, Soja & Weistroffer, 2019). Additionally, the annual telecom revenue concerning GNI, GDP and GCI per capita falls under the business dimension and is represented as dependent variables (Roztocki, Soja & Weistroffer, 2019). Various variables in the study thus represent commercial based activities.

## 2.1. Research Gap

The largest economic gains of ICT are experienced in countries characterized by high levels of ICT diffusion and penetration (Palvia, Baqir & Nemati, 2018). While this has received considerable levels of attention from available studies (Bahrini & Qaffas, 2019), the effect of other vital elements such as legal regulation, adequacy of foreign and local investments, the availability of skills and human capacity as well as social awareness has been superficially studied as it concerns and affects the impact of ICT investments on socioeconomic development and sustainability.

*Significance of the research gap*

The research gaps highlighted above lay a pathway for this study to investigate, assess and make conclusive findings that piece up what is already known to the existing body of research regarding investment in purposfully identified ICT projects and their product components, and the unknown sphere which per the reviewed literature, points towards the socioeconomic impacts of ICT diffusion and investment, and how they differ among various country groups.

## 2.2. Sample Selection

In terms of geography, previous studies were limited to specific regions of the world and used small sample sizes. In this study, the proposed sample size of 164 countries is much larger than all of the samples used in the literature review. Within the proposed sample, there are: 54 OECD countries and a high spectrum of developing countries, 54 emerging and 56 developing countries. By using larger data, we will be able better analyze each coutry's socioeconomic development due to investment in ICT. Thus the relevant limitations of the previous studies will be eliminated.

# 3. Research Methodology

### 3.1. Research Design

Quantitative studies can be categorized as either experimental or non-experimental (Khaldi, 2017). Whereas experimental research entails manipulation of the independent variable and random allocation of observations to conditions, nonexperimental research lacks the manipulation of the independent variable and random assignment of observations to conditions (Creswell, 2014). Considering that the dependent variable of the research (in this case socioeconomic development) cannot be manipulated, nor observations randomly assigned to the

three country groups, non-experimental research will be more appropriate in this study. The tenets of post-positivism are that truth is not absolute, data is viewed rationally, and causal relationships are described (Khaldi, 2017).

## 3.2. Theoretical Framework of the Study

### 3.2.1. Framework Regarding ICT and Socio-Economic Development

Socio-economic development involves upgrading social and financial conditions related to societies. Therefore, the countries in question form a community and are used to describe the diffusion of ICT between high-income countries, countries with upper-middle-class economics and low-income countries (Farooqi, Makhdum & Yaseen, 2020). Furthermore, it is emphasized that socio-economic development plays the overall role of the dependent variable in the framework, thus necessitating the use of the Solow model, Value Added Model, and the Romer model, which relate to the technological factors in the framework (Greene, 2018).

Another important finding arising from prior research is that there is a correlation between the Internet – one of the key ICTs – and socioeconomic development (Postuła et al., 2021). In this regard, the Internet impacts four critical factors which, in turn, have a direct or direct bearing on socioeconomic development. These are the physical environment (by way of sustainable development), political wellbeing by way of democracy, social wellbeing via poverty alleviation, education provision, and provision of health, and economic growth via economic productivity (Majeed, M. T., & Ayub, T. 2018). However, it is also emphasized that the effects of the Internet on socioeconomic development are more likely to be indirect than direct, occurring mainly through intermediary institutions (Toader et al., 2018).

The impact of ICTs on socioeconomic development has also been explained in terms of different theoretical or conceptual frameworks. For instance, there are four different dimensions through which socioeconomic development is impacted by ICTs. These are society, technology, business, and policy (Roztocki et al., 2019). The four are effectively a summary of the different ways that ICTs have impacted human life, including the way people find new and important information, communicate, interact with each other and with agencies of the government, carry out their business operations, and manage social lives. Because ICTs affect virtually every aspect of the human life, they also tend to impact macroeconomic growth which, in turn, impacts the development of the society at large by enabling improvements in standards of living and infrastructure (Toader et al., 2018).

### 3.2.2. Variable Definition

The relationship between variables poses a challenge regarding patterns formed between the dependent, independent, and control variables necessitating the formation of complex models to define them. The variables are essential since they drive the research process. These variables are habitually considered given how they relate to each other in a social-economic influence and consequence (Allen, 2017). Additionally, the relationships mainly considered are based on various manipulations done. For instance, the three dependent variables alter as an outcome of independent variable manipulation. In the described study, the annual telecom revenue as a percentage of GNI, GDP and GCI per capita shows the contribution of telecom to economic development in regard to total earnings and how it is applied to each person (per capita) (Karlsson & Liljevern, 2017). Other variables are also considered, such as the control and independent variables (Jones & Vollrath, 2013). A practical approach is therefore needed to put ICT capital as an explanatory variable for GDP growth, mainly describing the data selected by the chosen variables. In the analysis, the influence of investments and communication innovations relies on a comprehensive dataset consisting of variables assessing the economic inputs of the OECD nations (Karlsson & Liljevern, 2017). Various models can now define how ICT investments impact on socio-economic development.

Additional variables such as income level, education, technology, and cost of ICT investment were to be considered resulting in a total of 21 variables. Each variable plays a noteworthy role in socio-economic development and their relation emphasizes various aspects as described below:

- The rate at which ICTs spread is linked to the overall degree of socioeconomic growth. ICTs can have a direct impact on industry production, cost efficiency, and competitive intensity (Palvia et al., 2018). The sectoral strategy focuses on leveraging ICT as a sector to build socio-economic growth. Human capital as inputs and marketplaces are essential for success in the near term (Roztocki, Soja & Weistroffer, 2019). Both issues are handled through a variety of techniques for industry advocacy, investment incentives, and human resource training and development.
- The theoretical framework connects ICT artifacts, such as computer systems, telecommunications, cellular telephones, and other goods and services, to a country's successes. Personal, societal, and environmental conversion elements determine the skills that may be derived via ICT (Palvia et al., 2018). The actual implementation of functionality from accessible capabilities is a matter of human preference and societal variables (Roztocki, Soja & Weistroffer, 2019). As previously stated, there are several stakeholders in socioeconomic growth.

### 3.3. Variables and Data Sources

The study will use secondary annual data which will be collected from 164 countries drawn from the three country groupings. This is made up of countries from each of developed (OECD countries), emerging (highest GNI of 3rd-world countries) and developing (lowest GNI of 3rd-world countries) countries. The purpose of this research is to obtain a better understanding of how ICT impacts economic development differently in high-, medium-, and low-income countries. This study focuses on a 7-year period from 2015 to 2021. ICT is proxied by ICT investment, fixed telephone lines, cellular phone users, and internet users – all per 100 members of the population. These proxies were chosen to simplify analysis of socioeconomic development in developing and emerging countries and because data is more likely to be available than for other possible measures of ICT. The ICT measures are the independent variables, while economic development is the dependent variable, which is proxied by annual revenue as percentage GNI, GCI and GDP per capita. Data for ICT variables (independent) will be obtained online from World Bank World Development Indicators.

The model will consider 21 (twenty-one) variables that will comprise three dependent variables, eight independent variables, and ten control variables. Description of the variables is as represented in Table 6.2.

Table 6.2. List of Variables

| Variables | Dependent Variable |
|---|---|
| Annual revenue as percentage of GNIper capita | Economic development, measured by GNI, that is represented by the per capita GNI expressed in American dollars at current prices and PPPs. Annual GNI revenue tells the contribution of ICT to economic development as GNI per capita. GNI has come to be preferred to GDP by organizations such as the World Bank. It is also used by the European Union to calculate the contributions of member nations" (Cheng, 2021). |
| Annual revenue as percentage of GDP per capita | Economic development, measured by GDP, the total value of goods and services produced within the boundries of an economy in a year divided by total population. Total revenuve earned annually by investment in ICT as % of GDP |
| Annual revenue as percentage of GCI per capita | Global Competitiveness Indicator (GCI) which involves static and dynamic components of competitiveness that are grouped into 12 pillars: institutions, infrastructure, macroeconomic environment, health and primary education, higher education and training, goods market efficiency, labor market efficiency, financial market development, technological readiness, market size, business sophistication, and innovation. Total revenue earned annually in telecom by investment in ICT as a percentage of GCI is one of the components of GCI. |
| | Independent Variables |
| ICT investment | ICT investment (%) i.e. acquisition of equipment and computer software |
| ICT staff investment | For the period of, let us say, 10 years we have ten values of relative efficiency and productivity of utilization of investments in telecoms by full-time telecom staff |
| Income level | Income was used to predict level accessibility of ICT equipment which directly influenced socio-economic development |
| Fixed Broadband subscriptions | Fixed broadband subscriptions (per 100 individuals) |

table 2 cnt'd

| | Independent Variables |
|---|---|
| Fixed Telephone subscriptions | Fixed telephone subscriptions (per 100 individuals) |
| Internet subscriptions | Mobile cellular subscriptions (per 100 individuals) |
| Cellular subscriptions | Individuals using the Internet (per 100 individuals) |
| Technology | Technological change leads changes in social patterns |
| | Control Variables |
| GDFCF | Gross Domestic Fixed Capital Formation (GDFCF) as a GNI percentage |
| Inflation Rate | The rate of inflation that will be expressed as an annual average change |
| Unemployment Rate | The rate of unemployment that will be expressed as annual average unemployment rate |
| FDI in agriculture | Foreign direct investment in the agricultural sector considered as net inflows and GNI percentage component |
| Cost of ICT investment | Range of investments related to the increase in provision services of ICT related products |
| Education | Education level affect economic growth |
| Consumption expenditure by government | Final consumption expenditure by the government as a GNI |
| Local credit | Financial development is determined using local credit offered to the private sector as a GNI component in percentage |
| Country Population | Country population is the total population of the country |
| Proportion of Urban Population | The proportion of urban population is the ratio of urban population to the total population |

Source: own study

### 3.4. Data Analysis

Analysis will be conducted using the STATA. (STATA is a statistical software package used for data science, data manipulation, visualization, statistics, and automated reporting) and RStudio (RStudio is an Integrated Development Environment (IDE).

### 3.5. Model Estimation

To determine the impact of investment in information and communication technology on socioeconomic development, this study will use different panel method estimation techniques to find out the best estimates. The study will use Fixed Effects Model (FE), Random Effects Model (RE) and General Method of Moments (GMM)[2] for different group of countries as different so that we can

[2] GMM is a method that combines observed data with the information in population moment conditions to estimate parameters.

have a clear picture of each group of countries separately in term of impact of ICT investment.

Fixed Effects (FE) model is the statistical model in which fixed model parameters are non-random quantities.

To tackle heterogeneity across the different individuals, instrumental variables will be used in a cross-sectional setting. But in a panel data set, the Least Square Dummy Variable (LSDV) or fixed-effects model provides a way to account for the heterogeneity. It allows each individual to have a different constant term in their regression models.

The model is expressed as:

For Developed Economies $$Y_D = B_{0i} + B_1 X_D + B_2 W_D + \mu_D \quad (1)$$

For Emerging Economies $$Y_{EC} = B_{0i} + B_1 X_{EE} + B_2 W_{EE} + \mu_{EE} \quad (2)$$

For Developing Economies $$Y_{DE} = B_{0i} + B_1 X_{DE} + B_2 W_{DE} + \mu_{DE} \quad (3)$$

For each individual, the constant term $B_{0i}$ varies with the individual, but all the regressors' coefficients are the same across different individuals. $X_D$, $X_{EE}$, $X_{DE}$, $W_D$, $W_{EE}$, $W_{DE}$ are the values of regressors.

The Random Effects Model allows the constant term to vary across individuals, but assumes that this constant is drawn as a random draw from a common pooled distribution. This assumption creates some similarity between the constant terms, which does not exist in the fixed effects model. The RE model is given as:

Developed Economies $$Y_D = B_0 + B_{1i} X_D + B_{2i} W_D + \varepsilon_D \quad (4)$$

Emerging Economies $$Y_{EE} = B_0 + B_{1i} X_{EE} + B_{2i} W_{EE} + \varepsilon_{EE} \quad (5)$$

Developing Economies $$Y_{DE} = B_0 + B_{1i} X_{DE} + B_{2i} W_{DE} + \varepsilon_{DE} \quad (6),$$

where $\varepsilon_{\square} = (B_{0i} - \varepsilon) + \mu_{\square}$ and $B_0$ are the average individual effects in the model $X_D$, $X_{EE}$, $X_{DE}$, $W_D$, $W_{EE}$, $W_{DE}$ are the values of regressors.

The traditional method of assessing whether FE or RE are suitable is the Wu-Hausman test.

GMM is a semi-parametric estimation method that allows for parametric estimation in a model that does not need to be fully specified (Wansbeek, 2017). In estimating the model, the study will use GNI as the dependent variable to measure economic development. The study anticipates that the level of economic development in developed, emerging, and developing countries depends on previous levels of economic development taking into consideration the inertia that is associ-

ated with changes in the regional markets' variables. Consequently, the study will include the lag of GNI in the estimation equation to account for the persistence of time series properties. The study will include the lag of GNI in the estimation equation to account for the persistence of time series properties. Therefore, this study will use the Generalized Method of Moments that is specified as:

For Developed Economies $$y_D = \alpha y_{t-1} + x'_D \beta_i + \varepsilon_D \quad (7)$$

For Emerging Economies $$y_{EE} = \alpha y_{t-1} + x'_{EE} \beta_i + \varepsilon_{EE} \quad (8)$$

For Developing Economies $$y_{DE} = \alpha y_{t-1} + x'_{DE} \beta_i + \varepsilon_{DE} \quad (9),$$

where $y_t$ represents the level of economic development in a country, $x'_t$ is a matrix of all regressors, which in this case include the number of fixed telephone lines per 100 people, number of cellular phone users per 100 people, and the number of internet users per 100 people. On the other hand, $\beta_i$ represents regression parameters that will be estimated within the model, while $\varepsilon_t$ is the error term of regression and it captures all other determinants of economic development that are not captured within the model.

Application of the GMM method of estimation requires that there be moment equations and that the equations be at least as many as the number of parameters that need to be estimated in a model (Wansbeek, 2017). The estimation technique combines economic data with the information in population moment conditions to obtain statistical estimates of unknown population parameters. As such, it provides a universal method for estimating relationships between variables under consideration and it is popular in quantitative research because of its flexibility which is compatible with both linear and nonlinear models. During estimation, a dynamic panel data model is used. The GMM approach is an estimation technique and a model that deals with endogeneity. It is a process for getting estimates of the parameters of a probability distribution through seeking possible values of populations from samples. In empirical research, the GMM estimator is used to address endogenous factors. The resulting output will give the regression coefficients of the various regressors and their significance levels which will be used to determine their respective statistical significance for socioeconomic development.

## 4. Conclusion

*Analysis of FE, RE and GMM Models*

Panel data regression models: Fixed Effects (FE), Random Effects (RE) and GMM are all applicable for conducting regression on panel data. The advantage of

panel data models over other models is that a panel data model allows analysis of large sample sizes and observation dynamics of change. Beside advantages, panel data models have disadvantages like problems with estimation and inferences.

Among several techniques of estimation, Fixed Effects (FE) and Random Effects (RE) models are the two most commonly applied estimators among the rest of the models of estimation. In Fixed Effect (FE) model, the intercept can be different among individual records (cross sectional data units). Considering different individual data units having different intercepts we can apply dummy variables as least-squares dummy variables (LSDV). The disadvantage of (LSDV) is that it uses up large number degrees of freedom when the number of cross-sectional data records is large.

The Random Effects (RE) model allows the constant term to vary across individuals but assumes that this constant is drawn as a random draw from a common pooled distribution. This assumption creates some similarity between the constant terms, which does not exist in the fixed effects model. RE model is appropriate for estimation when exogeneity assumptions are fulfilled. The main advantage of RE vs FE is that RE can include time invariant regressors. The Random Effect model permits consistent estimation of parameter coefficients. The FE model can not identify the effects of the time invariant regressors.

The GMM estimation technique is used because it is robust and does not restrict variables outside of those limits posed by the model in question (Hall, 2010; Zsohar, 2012). These restrictions are population moment conditions (Hall, 2010; Zsohar, 2012). The other advantage of using the GMM technique in quantitative research is that it does not require *a priori* information on the distribution of the data as is the case with other estimation methods such as the Maximum Likelihood Estimation (MLE) technique which require full specification of the model prior to estimation (Hall, 2005; Wansbeek, 2017). Therefore, the population parameters are unknown for the case of GMM. This is so because the estimation technique only requires specified moment conditions that are obtained from an underlying model. As a result, the estimation technique provides a computationally convenient method for conducting inferences without requiring specification of the associated likelihood function. Additionally, the GMM estimation technique provides a more straightforward way of testing the specification of a proposed model from a group of models that are characterised with more moment conditions than model parameters. However, the maximum likelihood estimation technique gives estimators that are both consistent, asymptotically normal, and efficient when there is full model specification and no specification error as compared to estimators obtained when using the GMM technique (Wansbeek, 2017).

Overall, the GMM estimators may be less efficient compared to MLE estimators but are more robust against misspecification. When using GMM estimation technique the idea is to replace the population average with the sample mean and the population parameter with the sample estimator, and then proceed to solve the resulting system of equations (Wansbeek, 2017).

## Bibliography


1. Acemoglu, D. (2009). *Introduction to Modern Economic Growth* [Ebook]. Retrieved from https://www.theigc.org/wp-content/uploads/2016/06/acemoglu-2007.pdf
2. Adeleye, B. N., Adedoyin, F., & Nathaniel, S. (2021). The criticality of ICT-trade nexus on economic and inclusive growth. *Information Technology for Development*, *27*(2), 293-313.
3. Alderete, M. (2017). Examining the ICT access effect on socioeconomic development: the moderating role of ICT use and skills. *Information Technology for Development*, *23*(1), 42-58. doi: 10.1080/02681102.2016.1238807
4. Allen, M. (2017). Relationships Between Variables. The SAGE Encyclopedia of Communication Research Methods. doi: 10.4135/9781483381411.n491
5. Andrianaivo, M., & Kpodar, K. (2011). ICT, financial inclusion, and growth: Evidence from African countries. *International Monetary Fund*. https://www.jstor.org/stable/4129475?seq=1
6. Bahrini, R., & Qaffas, A. A. (2019). Impact of information and communication technology on economic growth: Evidence from developing countries. *Economies*, *7*(1), 21.Zhao, R. (2019). Technology and economic growth: From Robert Solow to Paul Romer. *Human Behavior and Emerging Technologies*, *1*(1), 62-65. doi: 10.1002/hbe2.116
7. Cheng, C. Y., Chien, M. S., & Lee, C. C. (2021). ICT diffusion, financial development, and economic growth: An international cross-country analysis. *Economic Modelling*, *94*, 662-67
8. Creswell, J. W. (2014). *Qualitative, quantitative, and mixed methods approaches*. Sage.
9. Farooqi, Z., Makhdum, M., & Yaseen, M. (2020). Impact of Information and Communication Technology (ICT) Investment on different Components of Human Development in Developing Countries. *International Review of Management and Business Research*, *9*(4), 108-129. doi: 10.30543/9-4(2020)-11
10. Greene, W. (2018). *Econometric analysis* (7th ed.). Boston: Prentice Hall.
11. Hall, A. (2010). What is Generalized Method of Moments. University of Manchester. https://www.google.com/search?q=Hall%2C+A.+(2010).+What+is+Generalized+Method+of+Moments&oq=Hall%2C+A.+(2010).+What+is+Generalized+Method+of+Moments&aqs=chrome.69i57.5559380j0j0&sourceid=chrome&ie=UTF-8
12. Hall, A. R. (2005). *Generalized method of moments*. OUP Oxford.
13. Imasheva, I. Y., & Kramin, T. V. (2019). Impact of broadband internet on the economic growth of the Russian regions. Proceedings of the First International Volga Region Conference on Economics, Humanities, and Sports (pp. 26-28).

14. Jakimowicz, A. (2020). The role of entropy in the development of economics. *Entropy*, *22*(4), 452
15. Jones, C., & Vollrath, D. (2013). *Introduction to Economic Growth*. New York: W.W. Norton & Company.
16. Kamel, S., Rateb, D., & El-Tawil, M. (2009). The impact of ICT investments on economic development in Egypt. *The Electronic Journal on Information Systems in Developing Countries*, *36*(1), 1-21.
17. Karlsson, E., & Liljevern, J. (2017). ICT Investment and the Effect on Economic Growth [Ebook]. Retrieved from https://www.divaportal.org/smash/get/diva2:1110483/FULLTEXT01.pdf
18. Khaldi, K. (2017). Quantitative, Qualitative or Mixed Research: Which Research Paradigm to Use? *Journal of Educational and Social Research*, *7*(2), 15-24. https://doi.org/10.5901/jesr.2017.v7n2p15
19. Lee, S.-O., Hong, A., & Hwang, J. (2017). ICT diffusion as a determinant of human progress. *Information Technology for Development*, *27*(4), 687-705.
20. Majeed, M. T., & Ayub, T. (2018). Information and communication technology (ICT) and economic growth nexus: A comparative global analysis. *Pakistan Journal of Commerce and Social Sciences (PJCSS)*, *12*(2), 443-476. Markets, 453–491. doi:10.1007/978-3-319-53469-5_15
21. Osundina, O. (2018). The Relationship Between Information and Communication Technology, Financial Development, Electricity consumption and Economic Growth
22. Palvia, P., Baqir, N., & Nemati, H. (2018). ICT for socio-economic development: A citizens' perspective. *Information &Amp; Management*, *55*(2), 160-176. https://doi.org/10.1016/j.im.2017.05.003
23. Palvia, P., Baqir, N., & Nemati, H. (2018). ICT for socio-economic development: A citizens' perspective. *Information & Management*, *55*(2), 160-176.
24. Postuła, M., Chmielewski, W., Puczyński, P., & Cieślik, R. (2021). The impact of information and communication technologies (ICT) on energy poverty and unemployment in selected European Union countries. *Energies*, *14*(19), 6110.
25. Roztocki, N., Soja, P., & Weistroffer, H. (2019). The role of information and communication technologies in socioeconomic development: towards a multi-dimensional framework. *Information Technology for Development*, *25*(2), 171-183. doi: 10.1080/02681102.2019.1596654
26. Toader, E., Firtescu, B. N., Roman, A., & Anton, S. G. (2018). Impact of information and communication technology infrastructure on economic growth: An empirical assessment for the EU countries. *Sustainability*, *10*(3750), 1-22. https://www.mdpi.com/2071-1050/10/10/3750
27. Wansbeek, T. J. (2017). Generalized Method of Moments. Advanced Methods for Modeling
28. Zsohar, P. (2012). Short Introduction to the Generalized Method of Moments∗. *Hungarian Statistical Review*, https://www.ksh.hu/statszemle_archive/2012/2012_K16/2012_K16_150.pdf.

Chapter 7

# Cultural Perspective in Leaders' Actions and Subordinates' Reactions in a Crisis. What Can We Learn From COVID-19?

Grażyna Aniszewska-Banaś

## 1. Introduction

The crisis is a situation that threatens the basic structures and/or values of a social system, which in a context of uncertainty creates the need for crucial decisions. It refers to a simplified well-known version of reality and fails when that reality becomes unpredictable, incomprehensible and inconsistent with assumptions made. This generates negative outcomes, and reduces time for decision making. Inaction or inadequate action can further exacerbate the situation (Boin et al., 2016, Mitroff, 1994, Rosenthal et al., 1989).

Leaders need to control the events as much as possible, to deal with lack of rationality, emotions, questioning of imposed actions, resulting from stress and disintegration. They accomplish it through providing a cognition (Jong, 2017, Pennebaker & Lay, 2002). Consistency of leaders' actions and the level of their perceived restrictiveness impact the reactions of subordinates.

The pandemic of COVID-19 is a crisis provoking huge consequences at all levels. As global, it provides great ground for analyzing various phenomena (Adikaram et al., 2021, Fuller et al., 2020, Macnamara, 2021, Pattyn et al., 2020). The aim of this paper is a to provide broader perspective in understanding the crisis through the lenses of the leaders and subordinates behaviors in a cultural context during the pandemic. Especially the first phase of the crisis, when the stress and shock are enormous are part of the analysis. Three dimensions have been chosen to explain leaders' actions and subordinates' reactions. They are all common to most popular cultural models, as literature review suggests (globeproject.com, 2022, de Mooij, 2013, 2017). To the greatest extent, they relate to attitudes toward uncertainty and are responsible for a sense of security, which is, as indicated above, crucial in the initial response to a crisis. These are:

- individualism-collectivism (C) - due to the priority of needs and loyalty toward the group;
- uncertainty avoidance (UA) – i.e. the extent to which a society, organization, or group relies on social norms, rules, and procedures to alleviate unpredictability of events – due to the turbulent nature of the pandemic and the associated sense of threat;
- power distance (PD) – i.e. the extent to which the community accepts and endorses authority, power differences, and status privileges – as it determines the role of leaders and acceptance for discipline.

This paper takes definitions of dimensions from the GLOBE project since its research questions refer to the society, not to personal preferences as in Hofstede's model (Brewer & Venaik, 2011, 2012, globeproject.com, 2022, de Mooij, 2013, 2017, Venaik & Brewer, 2008, 2010).

GLOBE divides Individualism-Collectivism dimension into institutional (C1) and in-group (C2) ones. C1 refers to the degree to which institutional practices encourage and reward collective distribution of resources and collective action. C2 describes the degree to which individuals express pride, loyalty, and cohesiveness in their organizations or families (Chhokar et al, 2007). In this paper only the C1 dimension is taken into account as more relevant to the topic.

Each GLOBE dimension is analyzed on two levels: values, and practices. Practices show the real social rules' orientation. Values capture people's belief about how things should be. This makes GLOBE more relevant to analysis of groups and communities, not individual feelings or beliefs. Moreover, GLOBE offers culture clusters in which nuanced qualitative analysis is possible.

## 2. Method

The sample consists of 2 countries from each of ten GLOBE clusters (those with the highest and the lowest incidents rate per 100 thousand inhabitants on April 1st, 2020 by ICM University of Warsaw database – see appendix 7.1). At that moment the pandemic had already covered all the world, but its duration was so short that societies were still shocked. The knowledge has been negligible, existing patterns inadequate and reactions intuitive. The analysis covered also the next 6 months when leaders and communities could get accustomed to the situation. The taming of the threat causes a desire to return to the past, as the crisis is no longer scary (Thompson, 2015).

The analysis is based on secondary official sources from the respective countries accumulated by Wikipedia. The following leaders' activities were described and analyzed: 1) actions undertaken, 2) scale of restrictions, including

orders vs. recommendations approach, 3) actions to protect leaders, e.g. blame seeking. They were supplemented by a description of subordinates' behaviors: 4) disobedience, e.g. protests, 5) solidarity grassroots activities vs. scapegoating. The analysis was made with respect to GLOBE dimensions (see appendix 7.2).

## 3. Results

In first stage of the pandemic all countries closed their borders, introduced restrictions in reaction to the threat, took measures to support their economies, and then started to loosen the restrictions. The brief presentation of activities is focused mainly on the differences between countries. Since it is indicated that greater differentiation of GLOBE cultural clusters occurs along the East-West axis (Browaeys, Price, 2008), the results of the analysis are shown in four groups of representative countries: Western cultures (i.e. Latin Europe and America, Anglo-Saxons, Germanic and Nordic Europe) with the highest and the lowest incidence rates, and Eastern cultures (Eastern Europe, Middle East, South and Confucian Asia, Sub-Saharan Africa) with the highest and the lowest incidence rates.

### 3.1. Western Cultures With the Highest Rates (Brazil, Germany, Italy, Sweden, USA)

USA and European countries' reactions were lagged and not very restrictive at first. Restrictions were imposed in some regions only or depended on local authorities (e.g. Germany, USA, Italy). Recommendations prevailed over orders. All actions were taken in accordance with the countries' laws. However it meant that in Germany authorities gained more power, while in Sweden they did not have tool to restrict social mobility.

In Germany and Sweden an important element were information campaigns and regular press conferences. All four countries mentioned above attached great importance to experts' opinions.

Sweden's approach requires additional comment. Its astonishing strategy is rooted in Swedish legislation. The government has to make decisions consistent with experts' recommendations and the parliament's approval. The Constitution protects the freedom of movement thus, when government asked for more power all parties voted against. However, Sweden was prepared for covid with the plan developed during the H5N1 outbreak.

Brazil also decided about restrictions. However, its president did not follow the rules in the public space and criticized the protests. There was no widespread testing. In June the government closed the official website on covid statistics. Media groups started to prepare daily reports on their own. The court forced the government to

republish the data. The favelas, in response to insufficient government measures, focused on self-organization and mutual assistance in coping with the crisis.

In all countries some protests and disobedience took place. However, in the USA and Europe there was a reaction to diminishing rights of citizens. In Brazil – to the violation of lockdown rules by the authorities.

### 3.2. Western Cultures With the Lowest Rates (Finland, Israel, Netherlands, New Zealand, Venezuela)

In Finland, Israel and New Zealand restrictions appeared pretty quickly. Relevant legislation was enacted. Care was taken to communicate with the public. Governments were more consistent in their actions than in countries from previous group.

Then restrictions were lifted. In September the measures were tightened again in Finland, Israel and Netherlands. In New Zealand no new cases were reported.

Netherlands were more reluctant in their reactions. Severity of the situation was finally evidenced by the Prime Minister's address to the nation. Realizing the threat caused panic buying of food. Meanwhile, the grassroots initiative to support people involved in fighting the pandemic emerged.

In Israel, the Knesset approved contact tracing which caused protests and accusation of receiving additional power by government under the pretext of dealing with covid. Despite religious restrictions Jewish and Arab communities ignored them. The Knesset also decided about financial assistance for citizens as well as about a 10% pay reduction for all its members and ministers.

Israel and New Zealand introduced alert and control systems defining the range of restrictions accordingto the level of infections. Both countries experienced protests.

In Venezuela, the government had to deal with an economic crisis. Riots were caused rather by food and fuel shortages than restrictions of civil rights. A major outbreaks of the virus took place in prisons, due to the poor conditions. Some spoke about the possible murder of people who did notcomply with the restrictions. The government questioned the number of infections and put pressure on doctors on this issue.

### 3.3. Eastern Cultures With the Highest Rates (Iran, Qatar, Russia, Singapore, South Africa)

Some similarities in justification of high infection rates in Iran, Singapore and Qatar can be seen. They were explained by external factors. In Qatar and Singapore – by the rapid spread of virus in the community of migrant workers. Many areas with migrants in Qatar were cut off, many workers lost their jobs and – according to a "Guardian" report – were forced to beg for food. Citizens who

violated restrictions were arrested or shamed on TV. Despite a quick lockdown, masks became mandatory only in May.

In Singapore, only patients of high risk were admitted to hospitals, which allowed reducing bed take-up. Implemented contact tracing provoked protests.

In Iran, a conspiracy theory was announced that the US created a special version of the virus to start a biological war. The economy was not closed as it suffered from US sanctions anyway. Despite its openness, the government asked the IMF for an emergency loan. Information concerning the covid statistics was censored. Those who filmed and distributed news inconsistent with the official line, were arrested. Seventy medics from "Doctors without Borders" were accused of being spies and forced to leave the country.

Measures taken in response to the pandemic in Russia included a constitutional referendum and national celebrations postponing quarantine with facial recognition use, as well as the digital pass system implementation in Moscow to limit citizens movement. The scale of restrictions was adjusted to election dates. At the beginning of September, a Russian vaccine appeared on the market. The reliability of official statistics was questioned.

In South Africa, one of the major measures undertaken in the country was an alcohol ban. The alert system allowed assessing and informing about the risk level in a simple way. Opinion leaders were involved in the information campaign. Cabinet members declared the donation of one third of their salaries for three months to a solidarity fund.

### 3.4. Eastern Cultures With the Lowest Rates (Albania, Egypt, Tanzania, Thailand, Vietnam)

All countries of this group decided to take radical measures from the beginning of the pandemic and remained consistent in doing so. Albania and Vietnam started preparation for the pandemic before the first cases in these countries were noted. In Vietnam, a proactive strategy come from the SARS outbreak experience.

In Albania, a 72-hour curfew was imposed with organized check-points to make sure that people do not violate restriction rules. All subsequent steps were consistent with the legislation prepared earlier. Muslim and Christian communities supported the strategy, deciding to close temples.

In both countries restrictions were lifted gradually and regionally.

A curfew, as well as contact tracing and interprovincial travel ban were imposed in Thailand. As a result in May infection rates fell to near zero.

In Vietnam, the information policy was based on national pride of success in the struggle against the pandemic. System activities were supported by local charity and overseas Vietnamese. Meanwhile, negative reactions to the Chinese (e.g. not welcomed in hotels and restaurants), and anger with disobedience of

those who travelled abroad were reported. Negative statements about Chinese and "dirty Westerners" spreading the virus were also reported in Thailand.

The explanation for low incidence rates in Egypt and Tanzania is not optimistic. Egypt's government rejected the globally accepted PCR tests, and decided to use antibody tests, detecting only an immune response to the virus. The actual number of infections in March 2020 could be even seven times higher than officially reported.

Tanzania stopped reporting case numbers in May 2020. Tests were made only on the border with Kenia. People were discouraged from going to hospitals to avoid overcrowding. The information was censored. All local media were banned from broadcasting foreign content about the covid. There was an official list of accepted sources. People spreading information about the pandemic were arrested. The true numbers of infections and the real death toll were covered up.

## 4. Discussion

Countries successfully coping with a pandemic usually do not deny the existence of the virus. They more likely have a proactive approach. It is related to past experience with epidemics and/or leadership attitude. In these countries, usually three studied culture dimensions are high or relatively high in terms of practices.

Actions aimed to protect leaders took place in cultures where there was inconsistency between PD practices (high) and values (low or medium). Leaders filtered and censored the information, cut testing or used the tests of questionable quality (e.g. Latin America, Middle East, Tanzania). The scale of the crisis was diminished or justified by external factors. In Thailand, Singapore and Vietnam, where this discrepancy also occurs, accusing and scapegoating took place. On the other hand, some solidarity and symbolic actions had place in cultures with high C and low PD values (South Africa, Israel).

As to restrictiveness of actions, high PD practices favor more formalized activities. When they are less consistent with PD values, the protests and dissatisfaction are more overt, e.g. Germany. Imposing restrictions may be of greater concern.

It is difficult to evaluate the impact of C in isolation from other dimensions. All countries studied have relatively high or high C values. In countries where C practices were at a medium level, there was criticism of governments or subordinates' greater expressed sensitivity to social needs (e.g. Israel, Brazil, Germany). However, leaders in these countries were more likely to appeal to economic rationale in their actions.

Low UA practices and/or values suggest a slower leaders' response to a crisis or fewer restrictions. However, previous experience with the epidemic of the

country should be taken into account, as it changed attitudes and accelerated reactions to the pandemic. Higher UA values can make stronger the need for more explicit threat response. Higher PD values seem to give more acceptance for leaders' actions. Consistency with high PD practices gives more chance for successful actions, e.g. the Anglo-Saxon cluster.

Behaviors in Nordic Europe require an additional explanation. Sweden's and Finland's strategies can be explained by institutional collectivism values. In Sweden their level is lower, which can deter from understanding the restrictions. Existing law also imposes an official definition of the problem.

## 5. Conclusions

UA influences leaders' practices: their anticipatory or reactive response to a crisis, as well as attachment to formalization. On the side of subordinates' reactions, it affects the level of tolerance. A need for a more structured life can require simpler explanations, which in turn favors the search for culprits in the crisis. It can also increase the role of instructions.

PD decides about leaders' orders or recommendations approach. Recommendations are supported by a communication policy and education campaigns. The combination of a high level of UA and PD reinforces tendencies towards hierarchy and bureaucracy. However it may provide a greater opportunity for internally consistent actions executed with greater determination. PD can also influence the discipline and rules obedience in subordinates' group.

C decides about social vs. economic approach in leaders' actions. A high C level favors social approach. On the side of subordinates' reactions, it influences the scope of grassroots initiatives and the likelihood of protests – especially in combination with PD.

These relationships are presented in the model (see Figure 7.1). Certain combinations of leaders' and subordinates' behaviors cause clashes and create possible conflicts. It is when the level of a culture dimensions is low. High levels and consistency between values and practices favor the success or peaceful execution of leaders' interests.

The conclusions from the study may constitute hypotheses for in-depth research in organizations, as leadership styles and group behaviors at organizational level are closely linked to the culture dimensions.

The study also provides some implications. The theoretical one is that GLOBE explains well behaviors and actions in crises due to the practices and values distinction. Values are extremely important in challenging situations, offering a unified view of the environment. It creates sense of security, provides guidance of thoughts and actions, and protects community (Gallagher, 2003, Pratt 2000).

As to practical implication, the study shows that cultural dimensions should be considered as potential barriers in implementation of responses to crises, especially when they represent low level on the scale. Leaders' activities should be then particularly consistent, justified and controlled in order to counteract the negative reactions of subordinates.

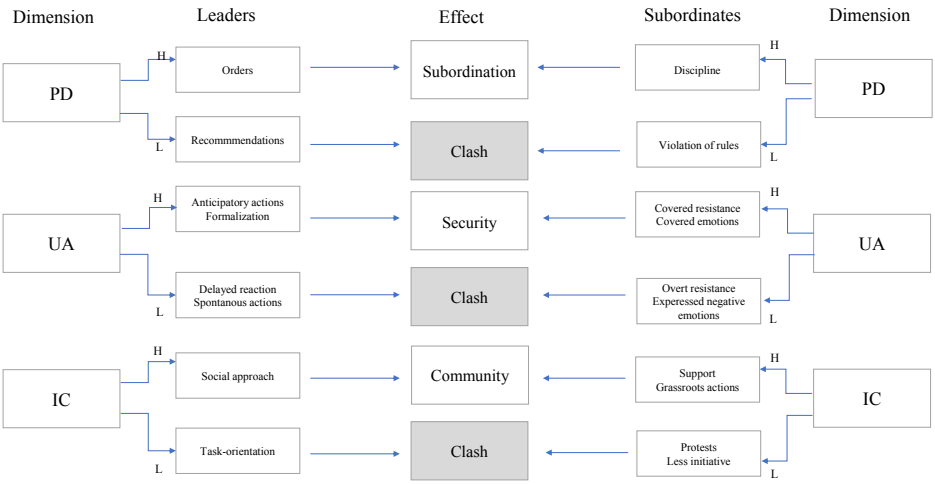


Figure 7.1. The effects of confronting leaders' actions and subordinates' reactions in cultural contexts
Source: own work.

The research has two major limitations. First, some countries were referred to cluster average, as exact data is not included in the GLOBE project. It limits the accuracy of analysis and discussion. Second, the number of infections is naturally lower in small populations, as the virus spreads more slowly. It can be also manipulated by the authorities. Taking this variable makes the sample more random than assumed.

Nevertheless, there is value in interpreting extraordinary situations through the GLOBE lenses and formulating hypotheses for research in organizations.

## Bibliography

1. Adikaram, A. et al. (2021). Navigating the Crises of COVID-19: Human Resource Professionals Battle Again. *South Asian Journal of Human Resources Management*, *8*(2), 192-218.
2. Boin, A., Hart P., Stern E., & Sundelius B. . (2016). *The Politics of Crisis Management: Public Leadership under Pressure*. Cambridge, Cambridge University Press.
3. Brewer, P., & Venaik S. (2011). Individualism—Collectivism in Hofstede and GLOBE. *Journal of International Business Studies*, *42*(3), 436-445.

4. Brewer, P., & Venaik, S. (2012). On the misuse of national cultural dimensions. *International Marketing Review*, *29*(6), 673-683.
5. Browaeys, M.J. & Price, R. (2008). *Understanding Cross-Cultural Management*. Harlow, Prentice Hall
6. Chhokar, J.S., Brodbeck F., & House R., (2007). *Culture and Leadership Across the World: The GLOBE Book of In-Depth Studies of 25 Societies*. New Jersey, Lawrence Erlbaum Associates Publishers.
7. Coombs, W.T. (2015). *Situational theory of crisis: Situational crisis communication theory and corporate reputation*. In: C. Carroll (Ed.), *The Handbook of Communication and Corporate Reputation* (pp.262–278). Malden, Wiley Blackwell.
8. de Mooij, M. (2013). On the misuse and misinterpretation of dimensions of national culture. *International Marketing Review*, *30*(3), 253-261.
9. Fuller, R., Pyle A., Mickel A., & Riolli L. ( 2020). Creating Order Out of Chaos? Development of a Measure of Perceived Effects of Communication on the Crisis Organizing Process. *International Journal of Business Communication*, *59*(2), 174–192.
10. Gallagher, R. (2003). *The soul of the company*. Dearborn Trade Publishing.
11. https://covid-19.icm.edu.pl.
12. https://en.wikipedia.org.wiki/COVID-19_pandemic_by_country_and_teritory, as well as sources on COVID-19 in studied countries cited by wikipedia.
13. https://globeproject.com
14. Jong W. (2017). Meaning making by public leaders in times of crisis: An assessment. *Public Relations Review*, *43*(5), 1025–1035.
15. Macnamara, J. (2021). New insights into crisis communication from an inside emic perspective during COVID-19. *Public Relations Inquiry*, *10*(2), 237–262.
16. Mitroff, I. (1994). Crisis management and environmentalism: a natural fit. *California Management Review*, *36*(2), 101-113.
17. Pattyn, V., Matthys J., & Van Hecke S. ., (2020). High-stakes crisis management in the Low Countries: Comparing government responses to COVID-19. *International Review of Administrative Sciences*. *87*(3), 593-611.
18. Pennebaker, J.W. & Lay, T.C.(2002). Language use and personality during crises: analyses of Mayor Rudolph Giuliani's press conferences. *Journal of Research in Personality*, *36*(3), 271-282.
19. Pepper, M. J., London T., Dishman L., & Lewis J. (2010). Leading schools during crisis: What school administrators must know. Rowman&Littlefield Education.
20. Pratt, M. (2000). Building an ideological fortress: the role of spirituality, encapsulation and sensemaking. Studies in Cultures, *Organisations and Societies*, *6*(1), 35-69.
21. Rosenthal, U., Charles M., & Hart P., (1989). Coping with crises. Springfield, Charles C. Thomas Publisher.
22. Thompson, R.F. (2015). *Habituation*. In: J.D. Wright (Ed.), *International Encyclopedia of the Social Behavioral Sciences*. London, Elsevier, 480-483.
23. Venaik, S. & Brewer, P.A. (2008). *Contradictions in national culture: Hofstede vs GLOBE*. In J. Cantwell, & T. Kiyak (Eds), Proceedings of the 50th Annual Meeting of the Academy of International Business (AIB), Milan, June 20-July 3, UQ Business School, St Lucia, Queensland, 274-274.
24. Venaik, S. & Brewer, P.A. (2010). Avoiding uncertainty in Hofstede and GLOBE. *Journal of International Business Studies*, *41*(8), 1294-1315.

Appendix 7.1. Countries by number of cases per 100,000 population as of April 1st, 2020

| List of countries | Number of cases | List of countries | Number of cases |
|---|---|---|---|
| **Anglo-Saxon** | | **Eastern Europe** | |
| New Zealand | 14,2 | Albania | 8,6 |
| USA | 68,2 | Russia | 1,9 |
| **German Europe** | | **Confucian Asia** | |
| Netherlands | 80 | Singapore | 20 |
| Germany | 94 | Vietnam | 0,2 |
| **Nordic Europe** | | **Southern Asia** | |
| Finland | 26 | Iran | 57,3 |
| Sweden | 53,2 | Thailand | 2,6 |
| **Latin Europe** | | **Middle East** | |
| Israel | 71,3 | Egypt | 0,8 |
| Italy | 184,3 | Qatar | 33,4 |
| **Latin America** | | **Sub-Saharan Africa** | |
| Brazil | 3,2 | South Africa | 2,4 |
| Venezuela | 0,4 | Tanzania | 0,04 |

Source: own work based on https://covid-19.icm.edu.pl

Appendix 7.2. Countries according to GLOBE dimensions (descriptive scale)

| Countries by clusters | Uncertainty Avoidance | | Power Distance | | Institutional Collectivism | |
|---|---|---|---|---|---|---|
| | practices | values | practices | values | practices | values |
| Anglo-Saxon (average) | rel. high | rel. high | rel. high | low | rel. high | rel. high |
| New Zealand | rel. high | rel. high | rel. high | medium | rel. high | rel. high |
| USA | rel. high | medium | rel. high | rel. low | rel. high | rel. high |
| German Europe (average) | rel. high | rel. low | rel. high | low | medium | rel. high |
| Netherlands | rel. high | medium | rel. high | rel. low | rel. high | rel. high |
| Germany | high | medium | high | rel. low | medium | rel. high |
| Nordic Europe (average) | high | medium | rel. high | rel. low | rel. high | rel. high |
| Finland | high | medium | rel. high | rel. low | rel. high | rel. high |
| Sweden | high | medium | rel. high | rel. low | high | medium |
| Latin Europe (average) | rel. high | rel. high | high | rel. low | medium | rel. high |
| Israel | medium | rel. high | high | rel. low | medium | rel. high |
| Italy | medium | rel. high | high | rel. low | medium | high |
| Latin America (average) | rel. high | medium | high | rel. low | medium | high |
| Brazil | medium | rel. high | high | rel. low | medium | high |
| Venezuela | medium | high | high | rel. low | medium | high |
| Eastern Europe (average) | medium | rel. high | high | rel. low | rel. high | rel. high |
| Albania | rel. high | high | rel. high | medium | rel. high | rel. high |
| Russia | rel. low | medium | high | rel. low | rel. high | rel. low |
| Confucian Asia (average) | rel. high | rel. high | high | rel. low | rel. high | rel. high |
| Singapore | high | rel. high | rel. high | medium | rel. high | rel. high |
| Vietnam | no data | no data | no data | no data | no data | no data |
| Southern Asia (average) | high | rel. high | high | rel. low | rel. high | high |
| Iran | medium | high | high | rel. low | high | rel. high |
| Thailand | medium | high | high | rel. low | rel. high | high |
| Middle East (average) | medium | rel. high | high | rel. low | rel. high | high |
| Egypt | rel. high | high | rel. high | medium | rel. high | rel. high |
| Qatar | medium | rel. high | rel. high | medium | rel. high | high |
| Sub-Saharan Africa (average) | rel. high | medium | high | rel. low | rel. high | rel. high |
| South Africa (black/white sample) | rel. high | rel. high | rel. high \| high | medium \| rel. low | rel. high | rel. high |
| Tanzania | no data | no data | no data | no data | no data | no data |

Source: own work based on: https://globeproject.com

# PART II TRENDS AND CONCEPTS OF CONTEMPORARY MANAGEMENT IN THE DIGITAL AGE

Chapter 8

# Eco-Consumption as a Consumer Trend as Understood by Young Consumers

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## 1. Introduction

The consumer trend means that there is a development tendency in the behavior of the consumer, which is the result of the influence of systematic factors (Altkorn & Kramer, 1998). Consumer behavior, in the classic definition, is characterized as activities related to the search, purchase, use and evaluation of goods and services that have the ability to meet the needs (Perenco & Rosa, 2011). Currently, the market offers a wide variety of goods and services, which is why learning about the factors influencing consumer choices on the market is very important nowadays (Sobczyk, 2008).

The consumer decision-making process on the market is influenced by a number of factors. In the literature they are described as conditions, determinants of consumer behavior. Many of them occur simultaneously, and their combination determines a specific way of consumer behavior in the market. These determinants are classified according to a number of criteria, including the criterion of the scale of impact (microeconomic, mesoeconomic and macroeconomic factors), criterion of connection with the economic sphere (economic and non-economic factors, including biological, demographic, social, cultural, psychological), criterion of connection with an individual (internal and external factors) (Gardocka-Jałowiec, 2015). The functioning of the contemporary consumer is also influenced by the environment which shapes new behavioral manifestations in him. These include boredom with the market offer, the search for non-consumer sensations or fatigue with excessive consumerism. In addition, new trends among consumers should be noted: healthy lifestyle, changes in the family model, an increase in the number of divorces, the connectivity trend, i.e. the need to belong to a group, e.g. an ecological organization, or growing indivi-

dualism – looking for products that are closely tailored to the consumer's needs (Zalejewski & Faszczewska, 2012).

Additionally, consumers receive alarming news every day about food poisoning, excessive logging, genetically modified food, overfishing and global warming. These are just a few of the aspects that humans have to face today, hence more and more people are involved in making decisions that would contribute to reducing the negative impact of humans on the environment. Consumers are increasingly choosing products or services that will have a positive impact on the natural environment. Among the observed new trends on the consumer market are the so-called sustainable consumption and the greening of consumption (Ham et al., 2022; Matel, 2016).

## 2. Eco-Trends and Young Consumers' Behavior

### 2.1. Sustainable Consumption vs. Eco-Consumption

When defining sustainable consumption, most researchers refer to the definition adopted at a Norwegian symposium (Oslo Roundtable on Sustainable Production and Consumption, 1994), which says that we deal with sustainable consumption when we consume material goods and services sufficiently to meet basic needs and achieve a higher quality of life, minimizing consumption of natural resources, environmentally harmful materials, created at all stages of production, without limiting the rights of future generations to such consumption. An important aspect is the consumption of goods and services that have a minimal impact on the consumption of natural resources. Thanks to this, future generations will also be able to use them. Many authors equate sustainable consumption with greening of consumption.

The greening of consumption manifests itself in:

- savings, that is, the use of consumer goods in a rational way;
- limiting the production and consumption of such goods that require the use of scarce and non-renewable resources, while creating hazardous post-consumer waste;
- buying and consuming goods that leave a small amount of post-consumer waste;
- consuming ecological goods that do not contain artificial protein, leather, imitation wood or glass;
- consuming goods that come from proven sources; they do not come from inhumane animal husbandry or from slave labour.

All consumer choices are conditioned by a system of values and principles that depend on the socio-economic system in which they function. This

also applies to the phenomenon of eco-consumption. Various types of eco-consumer classification can be found in the literature. One of them, developed in 1990 by the Roper Organization, divides consumers according to their attitude to environmental problems. The extreme groups are: True-blue Greens - consumers sensitive to matters related to environmental protection, with a strongly shaped pro-ecological awareness, and Grousers and Basic Browns - consumers not showing interest in environmental protection and not taking pro-ecological behaviour (Klimczyk-Bryk, 2000). The first of them undertake ecological activities due to their health and awareness of the state of the environment, others value the tradition of food production and its taste properties. According to biodieticians, organic food is to treat and prevent possible diseases, while bio-innovators, caring for the environment, seek new taste sensations. Klimczyk-Bryk (2000) distinguished: consumers who demonstrate common sense who, when buying organic food, are guided by reliable information about it, consumers who are oriented towards themselves, who are guided by concern for their health, and ecological fanatics who give up their consumption of traditional food in favour of organic food only. Based on the research by Zaremba (1997), the following segments of eco-consumers are distinguished: black, which is characterized by a lack of environmental knowledge and awareness, gray characterized by a low level of environmental knowledge and environmental awareness, green – consumers with extensive knowledge and constantly deepened environmental awareness, and bright-green, which is characteristic of a consumer postulating a return to nature. Other studies show the division of eco-consumers into: bio-activists, bio-traditionalists, bio-nutritionists and bio-innovators (Daguet, 1995).

It should be emphasized that eco-consumption is related to other activities that together aim at improving the quality of life of the society in the current socio-economic conditions. Increasingly aware of such relations, the consumer expects that producers will play a greater role in solving social problems and involvement in the development of local communities. More than half of the respondents participating in the research of the French-Polish Chamber of Commerce (CRS Report, 2018) avoid buying products from companies that have a negative impact on the society or the environment. Sznajder (2008) emphasizes the essence of the role of the consumer in caring for the environment in the entire life cycle of a food product, by maintaining responsible consumption, which determines the sustainable behaviour of the supply side.

The currently developing trend of eco-consumption may result from both ecological reasons, such as a high level of ecological awareness, care for the state of the environment, and others, which include the fashion for ecological behavior or demonstrative common sense.

### 2.2. The Role of Young Consumers in Shaping Consumer Trends

Young consumers are special market participants, because they feel different needs, perceive the world, understand messages addressed to them, have different value systems and ways of behaving. Their full participation in the market is limited by many barriers, first of all legal conditions, age, social influences, means of consumption realization, level of market education, understanding the mechanisms of market functioning or access to information. Even though they often do not run their own households yet, they represent significant purchasing and decision-making power because they have more and more financial resources, which they manage according to their own needs and have a significant impact on purchasing decisions made in the family. They assume various roles – from passive participants of purchases, through initiators, informers, advisers and decision makers (Adamczyk, 2014).

According to Babb (2018) the current generations break down as:

- 1928-1945: The Silent Generation (ages 74-91)
- 1946-1964: Baby Boomers (ages 55-73)
- 1965-1980: Generation X (ages 39-54)
- 1981-1996: Millennials (ages 23-38)
- 1997 and beyond: Generation Z (ages 22 and under).

Generations have also been categorized by the advances in technology when they are coming of age, as well as the social issues and global crises that shaped their formative years. The generation of young people born after 2000, due to the fact that they were born in the age of global warming, is often named: "the climate change" generation". This undoubtedly affects their behaviour on the market. They are aware of changes taking place in the environment and that these changes are mainly caused by human activity. This awareness is often reflected in their choices – they are more environmentally conscious and willing to pay more for eco-friendly products (Ad Age, 2020). Acquisition and consumption of organic products made without the use of artificial fertilizers and using methods that respect the natural environment are of significant importance in the trend of eco-consumption (Lemanowicz & Szwacka-Mokrzycka, 2019).

Many studies indicate that Polish consumers are characterized by a rather low environmental awareness, although this awareness has been increasing in recent years (Dąbrowska et al., 2016). Research by Bartosik-Purgat (2011) proves that young Europeans do not belong to the group of eco-consumers who pay special attention to the environmental friendliness of the purchased products. The reason for such a state of affairs may be financial factors (Grzybowska-Brzezińska, 2012; Escher, Petrykowska, 2014) or the place of residence (Kułyk & Michałowska, 2018). On the other hand, most studies on ecological or environmen-

tal awareness show that young consumers believe that the quality of the natural environment is important to them and the environment requires protection. They exhibited also more favorable opinions, attitudes, purchase intentions, or other behaviors related to green consumption. (Ham et al., 2022, Kużniar et al., 2021). Therefore, the aim of this study was to find an answer to the question why Polish young consumers undertake ecological activities, if they take them at all. Are their market choices really the result of their pro-ecological attitudes and awareness?

## 3. Methodology

The diagnostic survey method was used in a selected group of young consumers - undergraduate students of Gdynia Maritime University and University of Gdansk. The study was conducted via the Internet using the CAWI (Computer Assisted Web Interview) technique. The questions included in the survey (20) concerned, inter alia, the level of respondents' knowledge about the state of the environment in Poland and the methods of its protection, responsibility for the state of the environment, their attitude to the fight against contemporary environmental problems and the actions they take themselves to protect the environment. Some of the questions also focused on the purchase of organic products.

Three hundred questionnaires were distributed and two hundred and sixty questionnaires were returned and found usable. The gender composition of the respondents was 65% female and 35% male. All the respondents were between 20 and 30 years of age. Independent samples T-test did not indicate any significant gender difference in the results.

## 4. Results and Discussion

The first questions in the survey concerned the attitude of young consumers to environmental protection. The respondents were asked whether they had encountered the concepts of ecology, ecological activities, and environmental protection before. Only 2% of the respondents stated that it is difficult for them to answer this question. The remaining 98% of the survey participants indicated that they had heard about concepts related to ecology. This study confirmed the earlier assumption that information and dissemination are conducive to the present times. Respondents are aware of the importance of terms related to ecology. The respondents were also asked about their attitude to activities for environmental protection. The vast majority of respondents answered that the fight

with contemporary problems of environmental protection is important for them (36%) and very important (34%). 22% of the respondents are indifferent to taking activities for environmental protection, and a definite minority (2% and 6%) consider it completely unimportant and unimportant. Respondents were also asked to whom, in their opinion, the improvement of the quality of the natural environment should belong. The vast majority (91%) believe that every citizen, regardless of age and origin, should contribute to the improvement of the quality of the natural environment. Half of the respondents also stated that support for improving environmental conditions should be provided by the country's authorities (50%) and business owners (48%).

In the next question, the respondents had to assess the state of the natural environment in Poland. The table below presents the respondents' answers to this question.

Table 8.1. The state of the natural environment in Poland in the opinion of the respondents

| The state of the natural environment | Answers [%] |
|---|---|
| Very bad | 3 |
| Bad | 19 |
| Average | 59 |
| Good | 13 |
| Very good | 4 |
| I don't have idea | 2 |

Source: own work.

Most of the respondents – 59% described the condition of the natural environment in Poland as average, while over 20% of respondents considered it bad and very bad. Therefore, another question was asked whether the respondents contribute to the protection of nature in Poland, since they believe that its condition is average or bad. The vast majority of respondents, 77%, confirmed that they contribute to environmental protection. Only 9% of the respondents answered that they did not do it, while 14% could not say whether or not they did it. It can therefore be concluded that most of the respondents are aware of the condition of the natural environment in Poland and therefore try to positively influence its improvement.

Comparing these results to a report on the research on the ecological awareness of Poles (Bołtromiuk, 2008), it can be said that the respondents show similar features to the general population of Poles. The conclusions of the above mentioned report were as follows: according to Poles, the local authority is responsible for the condition of the natural environment. The number of people for

whom taking action for the sake of nature becomes very important and valuable is growing significantly. For most Poles, ecological values are important. The respondents are most often motivated to take pro-ecological actions by concern for the future generation and their own and their relatives' health. The number of people who consider environmental pollution as a serious problem for Poland has decreased.

The respondents were also asked about the reasons for taking action to protect the environment. Most of the respondents said that environmental protection is simply important to them (64%). 33% considered that they were taking such action because they were imitating other people. Surprisingly, 28% said it was possible to achieve financial benefits. It might seem that until recently there was a perception among consumers that ecological actions are expensive, which is why the majority of the population do not take them. 16% chose the answer that they imitate other people, 15% believe that pro-ecological activities are in fashion.

Actions for environmental protection, which the respondents declare, are included in Table 8.2.

Table 8.2. Respondents' actions to improve the condition of the natural environment

| Actions to improve the condition of the natural environment | Answers [%] |
|---|---|
| Segregation of waste | 87 |
| Using reusable products | 61 |
| Saving water | 52 |
| Choosing a means of public transport or a bicycle | 0 |
| Saving electricity | 24 |
| Buying eco-products | 24 |
| Other actions | 4 |
| None of above | 4 |

Source: own work.

Most of the respondents declared that they segregate waste, save water and use reusable products.

Respondents were also asked about the purchase of organic products. Most of them (60%) confirmed that they buy such products, however less than 1/4 of them treat the purchase of this type of product as a pro-ecological activity. They also indicated the factors that guide them when choosing products consumed for the environment. They could indicate individual features such as: product labeling, product composition, functionality, price and quality on a scale from 1 to 5, where 1 means that this factor is taken into account the least and 5 the most. (Table 8.3).

Table 8.3. Assessment of the impact of individual characteristics on the purchase of an organic product

| Characteristic | Answers [%] | | | | |
|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 |
| Product labeling | 16.6 | 8.33 | 41.66 | 23.33 | 18.33 |
| Product composition | 5.00 | 5.00 | 30.00 | 28.33 | 36.66 |
| Functionality | 6.66 | 1.66 | 28.33 | 40.00 | 25.00 |
| Price | 3.33 | 10 | 36.66 | 21.66 | 30.00 |
| Quality | 6.66 | 1.66 | 16.66 | 23.33 | 56.66 |

Source: own work.

When choosing organic products, consumers are mostly guided by its quality. This answer was chosen by over 56% of the respondents. Another important feature is the composition of the product, with more than 40% believing that the functionality of the purchased product is slightly less, but equally important. According to the respondents, neither the price nor the labeling is an important or unimportant factor (36.66% and 41.66%). The last questions concerned organic products. Respondents were asked if they agreed that it was right to use environmentally friendly products. As many as 81% answered yes. 12% of the respondents did not define their opinion, while only 7% completely disagreed with the assumption. They were also asked if environmentally friendly products were as effective as ordinary products. 39% of people agreed with this opinion and 16% agreed completely. As many as 31% of the respondents neither confirmed nor denied the correctness of the statement and 8% of respondents do not agree with the thesis. Respondents were also asked whether organic products had an appropriate price-quality ratio. Only 16% of the respondents agree with this opinion. As many as 45% of the people do not have an opinion on this subject, and 25% of the respondents do not agree with the above assumption. Consumers are aware that they have to pay more for high-quality products.

Our results indicate that the majority of young consumers exhibit behaviors typical of eco-consumption. Most of them said that they segregate waste, use reusable products and save water and energy and also buy eco-friendly products. Zalega (2019) received similar results in his research. He stated that pro-environmental consumer behaviors of the surveyed young people primarily include: saving electricity, gas, and water, sorting waste, throwing out used batteries into special containers, purchasing products in recyclable packaging, using reusable or biodegradable bags while shopping, and avoiding products tested on animals.

Respondents were also asked about eco-consumption itself. Factors that limit the pace of the development of the ecological trend are very important, so the respondents were asked to indicate these factors. Most of the respondents

believe that the most important factors are the high prices of organic products (79%), consumers' unawareness (70%) and their reluctance to take pro-ecological actions (55%). 28% of the respondents stated that there is contradictory content in the media, and 16% additionally classify the information presented in the media as intrusive promotions. Only 1 person replied that none of the factors mentioned limited the pace of the development of the ecological trend. When analyzing the contemporary eco-trend, it should be examined whether its development can be influenced by famous people. More than half of the respondents (54%) believe that famous people have a positive impact on increasing environmental awareness of the society. 30% also say so, but believe that famous people have little influence on the ecological trend. In turn, 10% of respondents strongly deny it and believe that famous people promote ecological activities only for image purposes. 4% of all respondents stated that famous people promote these activities only for financial purposes, 2% of respondents did not have an opinion on this subject.

## 5. Conclusion

Our research has shown that young people show a great commitment to ecological issues. They showed a significant convergence between consumers' declarations indicating high environmental awareness and readiness to practice pro-ecological behavior, and the actions actually taken. Most of the respondents are consumers involved in pro-ecological activities, using, among others, reusable products, buying ecological products, segregating waste or saving water. The respondents also have a sense of social responsibility for the surrounding environment. They believe that every citizen has an impact on the state of the natural environment. They also see factors that may limit the development of the eco-trend. It could be the beginning of the deepening and strengthening of pro-ecological tendencies in Poland.

## Bibliography

1. Ad Age (2020). Generation Z is willing to pay more for eco-friendly products: Sustainability is becoming more important in consumer choice overall. Retrieved 28.09.2022 from https://adage.com/article/cmostrategy/Generation-z-willing-pay-more-eco-friendly-products/2227101
2. Adamczyk, G. (2014). Wybrane aspekty zachowań młodych konsumentów w nowych realiach rynkowych. *Handel wewnętrzny, 1* (354), 5-16.
3. Altkorn, J.& Kramer, T. (Eds.) (1998). *Leksykon marketingu*. Warszawa, PWE, Warszawa.

4. Babb, L. (2020). The "Climate Change Generation" looks to their future. Manomet. Retrieved 28.09.2022 from Https://www.Manomet.org/publication/the-climate-change-generation-looks-to-their-future/.
5. Bartosik-Purgat, M. (2011). Stosunek młodych konsumentów europejskich do produktów ekologicznych w kształtowaniu strategii marketingowej przedsiębiorstw na rynkach zagranicznych. *ZN UE w Poznaniu*, (180), 7-20.
6. Bołtromiuk, A. (Ed.) (2008). *Polacy w zwierciadle ekologicznym. Raport z badań nad świadomością ekologiczną Polaków w 2008*, https://www.pine.org.pl/
7. Cichocka, I. & Grabinski, T. (2009). Psychograficzno-motywacyjna charakterystyka polskiego konsumenta żywności ekologicznej. *Żywność Nauka Technologia Jakość, 16*(5).
8. Dąbrowska, A., Bylok, F., Janoś-Kresło, M., Kiełczewski, D., & Ozimek, I. (2016). *Kompetencje konsumentów. Innowacyjne zachowania. Zrównoważona konsumpcja*. Warszawa, PWE
9. Daguet, P. (1995), Klient nasz pan – sylwetki konsumentów „bio". in: Sołtysiak U. (edt)Rolnictwo ekologiczne od producenta do konsumenta, Warszawa, Stowarzyszenie EKOLAND.
10. Escher, I. & Petrykowska, J. (2014), Zachowania młodych polskich konsumentów na rynku żywności ekologicznej. *ZN Uniwersytetu Szczecińskiego. Problemy Zarządzania, Finansów i Marketingu, 36*, 23-37.
11. Gardocka-Jałowiec, A. (2015). *Zmiany konsumpcji a kreowanie innowacji*, Białystok, Wydawnictwo Uniwersytetu w Białymstoku.
12. Grzybowska-Brzezińska, M. (2012), Zachowania młodych konsumentów i seniorów na rynku żywności ekologicznej. *Marketing i Zarządzanie, 25*, 211-222.
13. Grzybowska-Brzezińska M., & Grzywińska-Rąpca, M. (2018), Rynek żywności ekologicznej w aspekcie rozwoju zjawiska świadomej konsumpcji. *Handel Wewnętrzny, 2* (373), 168-177.
14. Ham, C.D., Chung, U.C., Kim, W.J, Lee, S.Y.& Oh, S.H. (2022). Greener than Others? Exploring Generational Differences in Green Purchase Intent, *International Journal of Market Research, 64*(3) 376–396, DOI: 10.1177/14707853211034108
15. Klimczyk-Bryk, M. (2000), Trendy ekologiczne a zachowania konsumentów. *ZN AE w Krakowie*, *540*, 93-99.
16. Kułyk, P., & Michałowska, M. (2018), Zachowania konsumentów na rynku żywności ekologicznej w świetle wyników badań empirycznych w województwie lubuskim. *Handel Wewnętrzny, 2* (373), 270-282.
17. Kuźniar,W., Surmacz, T. & Wierzbiński, B. (2021) The Impact of ecological knowledge on young consumers' attitudes and behaviours towards the food market. *Sustainability, 13*, 1984. https://doi.org/10.3390/su13041984
18. Lemanowicz, M.& Szwacka-Mokrzycka, J. (2019). Identification of leading consumer trends on the food market, *Proceedings of the 2019 International Conference "Economic science for rural development"* No 51, Jelgava, LLU ESAF, 9-10 May 2019, 291-297 DOI: 10.22616/ESRD.2019.088
19. Matel, S.A., (2016). Reasons for green consumption from the perspective of consumer behavior, *Zarządzanie. Teoria i Praktyka 16* (2), 55-61.
20. Oslo Roundtable on Sustainable Production and Consumption (1994). Norwegian Ministry of the Environment, Oslo.

21. Perenco J.& Rosa G. (2011). *Zachowania nabywców*. Szczecin, Wyd. Uniwersytet Szczeciński.
22. Raport „CSR w praktyce – barometr Francusko–Polskiej Izby Gospodarczej" http://odpowiedzialnybiznes.pl/aktualno%C5%9Bci/raport–z–3–edycji–badania–csr–w–praktyce–barometr–francusko–polskiej–izby–gospodarczej/, dostęp: 29.09.2022.
23. Sobczyk G. (2008). *Współczesny marketing: Trendy i działania*. Warszawa, PWE, Warszawa.
24. Średnicka-Tober, D., Kazimierczak, R., & Hallmann, E. (2016), Charakterystyka europejskich konsumentów żywności ekologicznej–motywy, działania i implikacje. *Problemy Zarządzania, 1*/(58), t. 2, 100-108.
25. Sznajder, M. (2008), Koncepcja zrównoważonego łańcucha żywnościowego (mleczny łańcuch żywnościowy – studium przypadku), *Journal of Agribusiness and Rural Development, 2* (8), 1–8.
26. Zalega, T. (2015). Innowacje a konsumpcja i zachowania konsumentów. *Marketing i Rynek, 2*, 19
27. Zalega, T. (2019). Sustainable consumption in consumer behaviour of young Polish consumers, *Studia Ekonomiczne. ZN UE w Katowicach, 3,* 82-107.
28. Zalejewski, J. & Faszczewska, K. (2012). The attitudes of Polish consumers towards ecological products. *Economy and Management, 3*.
29. Zaremba, S. (1997), Ekologia produktów a idee zielonego konsumeryzmu. *Mat. I Międzyn. Konf. „Ekologia wyrobów".* AE, Kraków, 53-62
30. Zrałek, J. (2012). Dekonsumpcja jako przejaw proekologicznych zachowań konsumentów. *Handel Wewnętrzny*, t. II, 134-142.

Chapter 9

# Implementation of the Controlling System in Eurobent sp. z o.o

Janusz Nesterak, Michał J. Kowalski, Anna Kołodko

## 1. Introduction

Nowadays, enterprises have to face not only the competitive environment, but also the changing expectations of customers who are sensitive to changes in the prices of products and services. In addition, manufacturers must keep pace with changes across the entire business ecosystem, which are often rapid and complex in nature. Efficient adaptation to dynamically progressing changes seems to be a key factor that will not only help in survival in the business world, but also in further development. An adjustment of the enterprise management system in response to the new conditions of the business environment should become an overriding goal for company managers.

In order to respond to the needs of their recipients flexibly, enterprises introduce modern management tools, with the help of which it will be possible to improve the efficiency and effectiveness of operations, based on solid financial information generated in the business processes.

The solution most often used in companies is management accounting as a source of reliable data or, with a wider scope of application – controlling understood as a cross-functional management instrument that supports managers in decision-making (Vollmuth, 2002, p. 15). Controlling, popularized in the 20th century, eventually developed as a result of changes in the company's environment and the need to adjust the ways of acting and thinking to the market requirements (Nesterak, 2015, p. 35).

Currently, the greatest efficiency in achieving goals can be reached by focusing on undertaking activities in specific processes, where the sequence of actions taken reflects the fulfilment of the client's needs (Nesterak, 2015). Through process management, controlling data is collected from the beginning to the end of the process and links between organizational units. This fosters the creation of

reliable knowledge about the factors influencing growth of the company's value and significantly leads to more flexible operation. In addition, it is possible to recognize strengths and weaknesses in the company's operations.

In this article, the authors present an example of the implementation of a management accounting and reporting system in the production company Eurobent Sp. z o. o. In the implementation of the presented project, an original procedure for the implementation of the management accounting system was used, developed on the basis of analysis of the literature output and the authors' own experience. The proprietary solution for the implementation of the controlling system was possible due to the extensive involvement of the team in the work on the initial analysis and identification of the company's needs.

## 2. Methodology For the Implementation of the Controlling System

The controlling implementation project followed a three-pronged approach. The first was the preparation of a management accounting concept, followed by the development of a pilot implementation based on actual company data, and the third stage was the implementation of procedures related to the recording of business events, cost allocation and managerial reporting. The concept development adopted a course of action consisting of nine essential steps, of which three are concerned with analysis of the current state and six with the design of target solutions (see Figure 9.1).

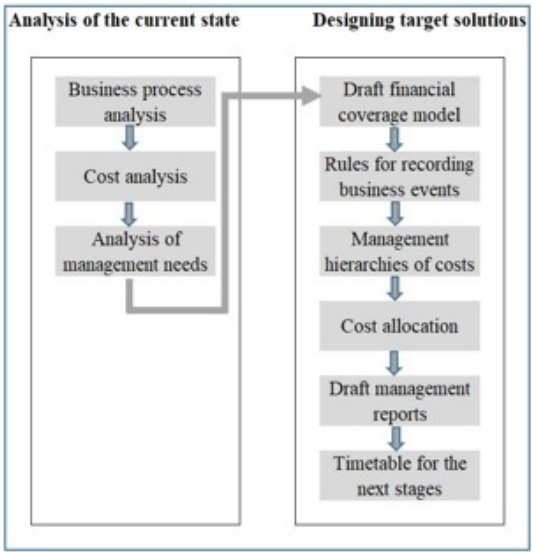


Figure 9.1. Stages of the concept of implementing controlling in Eurobent
Source: (Kołodko, Kowalski 2020).

The preliminary audit work allowed the design of target solutions to begin with. Here, a key step was to design a management layout for the presentation of the financial result, referred to as the financial cover model in the following section. Determining the required financial layouts will allow proceeding to the next step related to the design of target rules for recording business events, proposing modifications to the company chart of accounts, changing forms and techniques of bookkeeping. Subsequently, the data dictionaries for controlling were defined in detail and the rules for maintaining them. Attributes of management information dimensions were defined, management generic cost layouts were defined, and a profit center hierarchy was developed. The next step was to design cost allocation rules. For this purpose, the principles of transferring costs between the previously proposed dimensions of their records and the basis for settlements were indicated, with an indication of data sources. The designed model was not limited to one type of calculation, experience was drawn from many different cost allocation and calculation systems. Next, layouts of key management reports were designed to detail the information visible in the financial coverage model. The final step concerned the development of a timetable for the next stage of the project, i.e. the preparation of a pilot implementation of the concept on actual company data.

## 3. Key Results of the Implementation of Controlling in Eurobent[1]

### 3.1. The System of Recording Business Events

A key element of the controlling system was to ensure an adequate source of input information. In this respect, modifications to the chart of accounts were planned to reflect management needs while meeting the requirements associated with balance sheet law. The designed chart of accounts provided both subject and type records of costs. The chart of accounts adopted as the target plan of accounts consists of three segments. The first segment indicates the type of activity carried out, the second segment the cost center identifying the organizational unit or other cost grouping centers relevant to management e.g. (car, project) and the third segment identifying the type of cost. The third segment represents the last four characters of the generic account identical to the generic records (see Table 9.1).

It was proposed to identify 25 cost locations that meet management needs. Among other things, the possibility of recording the costs of individual production lines, which was lacking in the previous record-keeping system, was made

[1] This part of the chapter presents the main results of the implementation of the controlling system at Eurobent. When presenting sensitive data, including reports, some data has been removed to preserve the confidentiality of the information.

possible, centers for individual organizational units were isolated, but there was also a provision for the separate recording of costs relating to assets (cars) or projects (costs of implementing a new Tiltex product). Twenty-four cost centers were identified and Table 9.2 presents a selection of 10.

Table 9.1. Draft cost accounting principles at Eurobent

| | seg1 | | | prefix | seg2 | | | prefix | seg3 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mark | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
| Mask | 4 | x | x | - | x | x | x | - | x | x | x | x | x |
| Scope of values | 501, 521, 523, 527, 550 | | | - | 001-999 | | | - | 1000-9999 | | | | |
| Example | 5 | 0 \| 1 | | - | 0 | 0 \| 1 | | - | 0 \| 1 \| 0 \| 0 \| 2 | | | | |
| | primary production costs, needling line, consumption of production materials | | | | | | | | | | | | |
| Example | 5 \| 5 \| 0 \| - \| 0 \| 1 \| 8 \| - \| 0 \| 2 \| 0 \| 0 \| 9 | | | | | | | | | | | | |
| | management costs, space maintenance costs, cleaning services | | | | | | | | | | | | |

Source: own elaboration

Table 9.2. The cost centres introduced in Eurobent

| Area | Name area | MPK | MPK_Name |
|---|---|---|---|
| 501 | Costs of primary production | 00 | Consumption of materials |
| 501 | Costs of primary production | 01 | Needling line |
| 501 | Costs of primary production | 02 | Gluing line |
| 521 | Departmental costs | 05 | Production director |
| 521 | Departmental costs | 06 | Laboratory |
| 527 | Selling costs | 11 | Transport services |
| 527 | Selling costs | 12 | Trading commission costs |
| 527 | Selling costs | 13 | Sales service department |
| 550 | Management costs | 18 | Technologist |
| 550 | Management Costs | 19 | Logistics department |

Source: own elaboration

Table 9.3. Selected sample type accounts in Eurobent

| Number | Account name | Number | Account name |
|---|---|---|---|
| 400-001 | Remuneration – employment contracts | 402-012 | Reimbursement for laundry expenses |
| 400-002 | Remuneration – civil law contracts | 402-013 | Car insurance |
| 400-003 | Remuneration of the management board | 402-014 | Telecommunication services |
| 400-004 | Social security – employment contracts | 402-015 | Production materials |
| 401-002 | fuel | 402-018 | Advertising materials for clients |

Source: own elaboration

At the same time, te cost accounting by type has been expanded in order to adapt it to the current needs of the company. Some of the accounts from the

existing generic layout have been omitted, while others have been added to separate, for example, depreciation of production equipment from office equipment, consumption of materials relating to vehicles, production or office activities. In the end, 61 generic accounts were proposed, and Table 9.3 shows 10.

### 3.2. Controlling System Data Dictionaries and Management Reporting Procedure

The key effect of the controlling system was the development of the principles of management reporting and data dictionaries used for this purpose. Data collection and processing rules have been developed in the form of a management reporting procedure. The purpose of the management reporting procedure is to define the principles, scope, deadlines and responsibilities in the preparation of standardized monthly management information for Eurobent. The monthly preparation of management reports follows the following mode:

- preparation of financial data for the current month (Profit and loss account, Single items of bookings, Chart of accounts, Statement of depreciation after fixed assets),
- preparation of business data (e.g. production records, production norms, transport cost statements) and information on data dictionary extensions (e.g. order dictionary (LOT), Client dictionary),
- verification of information about changes in permissions to reports and the correction of the information received,
- mapping posting records to the target chart of accounts,
- preparation of data dictionaries, determination of the completeness of dictionaries and introduction of additions in the event of an extension of the value of data sets,
- assigning attributes to data for the current month,
- preparation of a database of records for a given month in the dimensions of management reporting,
- conducting cost settlement procedures in databases,
- introducing changes in the principles for granting permissions to data,
- preparation of data for reports according to designated permissions,
- making reports available for use.

For the purposes of management reporting, dictionaries have been defined, which have become the basis for management reporting. They contain data dimensions and attributes that are used in management reporting. Attributes are the basis for multidimensional management reporting. Attributes should be defined for each database field that is the basis of the management reporting system. Attribute definition requires the development of an attribute mask, defining and encoding them, creating attribute dictionaries for all field values, and working

out procedures for assigning attributes in case of new values. In total, the company maintains seven main dictionaries in the controlling system containing the dimensions of financial information and their attributes.

The dictionary of generic accounts contains the generic accounts and their attributes, including in particular the generic hierarchy of costs. The management type hierarchy of costs groups the types of costs in management reporting. The hierarchy in management reports replaces the traditional, generic accounting system. This layout better reflects the business logic in any entity cost grouping object. A hierarchy is an attribute of a generic account. Each generic account is assigned one and only one node in the hierarchy. The hierarchy is used only in management reporting, it is not reflected in the accounting system or in the codification of generic ledger accounts. The same management system is used at each level of management reporting. In addition, thanks to the introduction of a management hierarchy of types of costs, it is possible to quickly identify costs of a given type, such as personnel costs, transport costs, IT costs, taking into account all cost elements assigned to a given category. As a result, matrix cost management is possible. Seven generic cost groups were created and Table 9.4 shows an example of three.

Table 9.4. A section of the management costing by type at Eurobent

| | |
|---|---|
| RRK01 Personnel costs | |
| | RRK0101 Remuneration |
| | RRK0102 Social security |
| | RRK0103 Travel, subsistence allowance, mileage allowance |
| | RRK0104 Technical workstations |
| | RRK0105 Personal workstations |
| | RRK0106 Employee benefits |
| | RRK0107 Other costs |
| RRK02 Materials and energy costs | |
| | RRK0201 Materials |
| | RRK0202 Energy |
| RRK06 Surface maintenance costs | |
| | RRK0601 Depreciation |
| | RRK0602 Repairs, spare parts |
| | RRK0603 Lease and maintenance |
| | RRK0604 Insurance of machines, premises |

Source: own elaboration

Table 9.5. Basic dictionaries used for controlling reporting at Eurobent

| Dictionary field | Example of information | Dictionary field | Example of information |
|---|---|---|---|
| Glossary 2: Glossary of cost centres | | Glossary 3: Dictionary of production orders | |
| Area | Data source | Data source | Order List |
| Name area | LOT Polish Airlines | LOT Polish Airlines | 2/1/2022 |
| MPK | Contractor's number | Contractor's Number | 200-2-00326 |
| MPK_Name | CLIENT ID | CLIENT ID | 2 |
| Is MPK leading | Product | Product | EUROBENT 3500 |
| MPK leading | M001 | | |
| PF | PF01 | | |
| Glossary 4: Structure of client dictionaries | | Glossary 5: Product glossary | |
| Contractor's number | 200-2-00372 | Product | BENFELT 3.7 |
| CLIENT_LOT_ID | 193 | Product GP | bentonite mat |
| CLIENT Name | Client's name | Product Line | BENFELT |
| Country | India | Dimension | 3700 |
| Region | Other | GP Dimension | 3550-4000 g/m2 |
| CLIENT_LOT_ID | 193 | Foil | NO |
| Contractor's Number | 200-2-00372 | | |
| Glossary 6: Invoice glossary | | | |
| FV number | FS 82/M-1/03/2022 | | |
| FV2 number | 82/M-1/03/2022 | | |
| LOT Polish Airlines | 39/03/2022 | | |
| Contractor's Number | 200-2-00095 | | |
| Contractor's 2 number | 39 | | |
| Contractor | Oy ViaCon Ab | | |
| M2 | 4080 | | |
| delivery note | WZ 8/M-1/01/2021 | | |

Source: own study

The dictionary of cost centers maintains such information about cost centers as responsible persons, relationships between cost centers and their assignment to the financial coverage model (Table 9.5 - point 2). The dictionary of production orders collects data on orders, including assigning them to the product and the client (table 9.5 - pt. 3). The client dictionary is designed to collect data about clients used for reporting purposes (table 9.5 - pt. 4). The product dictionary collects data on products allowing them to be grouped according to an accepted profit center hierarchy and additional dimensions relevant to management reporting (Table 9.2, point 5). The adopted hierarchy assumes the grouping of products according to the scheme:

↳ Product group ↳ Product ↳ Production orders (LOT) = Client

The invoice dictionary indicates the ways of encoding the client in various systems and its association with sales documents. In addition, the dictionary indicates quantitative data related to the number of square meters of products sold (Table 9.5 - point 6).

### 3.3. Financial Coverage Model

The financial coverage model is the most synthetic report allowing for full insight into the economic picture of the Company. It indicates the key areas of value creation and has the task of presenting the Company's financial results intuitively and consistently with business logic. The financial coverage model is a summary of the principles adopted in the management accounting system. At the same time, it is the starting point for further analyses, going deep into the data, in accordance with the controlling principle of presenting information in a top-down manner. It provides an insight into the management performance of the enterprise, taking into account several perspectives:

- Process perspective, where the layout of financial margins presents costs and results in accordance with the logic of processes. The next levels of financial coverage present information on how the margin is consumed.
- Perspectives of management areas (profit centers) – where it presents results mostly by profit centers of business units, customers, products, markets, geographical areas.
- The generic perspective, where the traditional, accounting-based generic arrangement is replaced by a homogeneous managerial generic cost hierarchy that better reflects the business logic in any cost grouping object, allows a managerial view of generic cost categories across the organization, for example personnel costs, transport costs, IT costs, etc.
- The entity perspective of costs, where the costs of financial margins are analyzed according to where they are incurred, i.e. department, machine nest or auxiliary department.
- The internal service perspective – costs of support areas are billed to management areas. Costs become manageable and profitability analysis complete. The financial coverage model is the basis for defining cost allocations, the aim of which is to allocate as large a volume of costs as possible to the revenue-generating site.

There are 6 levels of building the financial result: PF01 - Revenue and direct costs, PF02 - Production support, PF03 - Transport, PF04 - Cost of sales, PF05 - Operational support and PF06 - Management. The adopted management reporting model is presented in Figure 9.2.


Figure 9.2. A scheme of the financial coverage model at Eurobent
Source: own elaboration

The financial coverage I (PF I) includes sales revenues and direct costs of production. This level of cost presentation includes costs directly related to production, i.e. costs of materials and costs of processing on production lines, costs of production lines group depreciation and maintenance costs of lines and costs of direct production employees employed in the production of mats. The costs are grouped in terms of production lines. At the time of developing the concept two technological lines were involved. Regardless of the line, the consumption of direct materials is recorded on a separate MPK, due to the fact that it is not possible to register materials released for a specific line. In addition, direct costs related to the cost of a process line installed in a related Greek company were isolated. PFI costs are settled on production orders (LOT). Financial coverage II (PF II) covers the direct costs of production support areas. These are the costs of the production department, which directly supervises production, the costs of the production director, the costs of the laboratory for verifying the delivery of raw materials and testing the quality of finished products, the costs of maintenance, the costs of maintaining warehouses and the costs of maintaining production halls. This level of cost grouping also includes the costs of electricity used in production and other indirect production costs, such as consumption of other production materials, depreciation of other production equipment. PFII costs are settled on production orders. Settlements can be carried out in two stages, i.e. costs are first settled on production lines and then on orders or directly on orders based on appropriately selected settlement keys, e.g. number of production orders (LOT), working time on production orders (LOT). Financial coverage III (PF III) covers costs related to transport. These costs are mostly directly related to the order

and relate to the cost of delivery of finished products to the client. Direct costs are applied to production orders in the reporting system. Indirect costs relating to other transport services are subject to settlement / whether they are treated as indirect costs. Financial coverage IV (PF IV) includes costs related to sales, including costs of sales commissions charged to foreign partners conducting commercial activities, promotion and marketing costs. The costs of commercial commissions directly related to orders are allocated to orders, the remaining costs are treated as indirect costs. Financial coverage V (PF V) includes costs relating to operational support areas such as product managers, the costs of the logistics department responsible for preparing production plans and delivery schedules for finished products and production materials, the costs of the sales department dealing with invoicing, customer service, preparation of product sheets and their translations, the costs of new product development. PFIV costs are settled for products in terms of product management costs or treated as indirect costs. Financial coverage VI (PF VI) includes general management costs both in terms of costs of structures related to the management of the company and administered costs. PF VI costs are treated as indirect costs.

### 3.4. Cost Allocation System

The management information system should provide flexibility in the allocation of costs. Allocations of indirect costs are carried out in the management reporting system on dedicated types of accounts visible only on the side of management reporting, neutral for accounting records. Cost allocation is carried out by reducing costs on the sending facility and increasing on the receiving facility. The allocation takes place on the basis of the relevant source data that are the basis for the allocation. In the developed controlling model, 11 cost allocations are implemented and for selected three ones the principles applied are shown in Table 9.6. The table indicates the purpose of the allocation, the defined generic account for making a given cost allocation, the adopted settlement key and the sending facilities from which the cost will be written off and the sending facilities to which the cost will be posted as a result of the allocation.

### 3.5. Database and Controlling Reports

Taking into account the scope of data processed, the number of data sources, the number of recipients of management information – the launch of the managerial reporting system did not require the implementation of a specialized IT system. The managerial reporting system is based on a relational database, permission management and reporting interfaces based on a spreadsheet. Every month, the database is supplied with data from external systems, including the financial

Table 9.6. Selected definitions of introduced cost allocations at Eurobent

<table>
<tr><th colspan="2">1. Settlement of remunerations on MPK</th></tr>
<tr><td>Business objective</td><td>The purpose of the settlement is to settle the general costs of remuneration on MPK</td></tr>
<tr><td>Account</td><td>404-001-00 404-002-00</td></tr>
<tr><td>Ticker</td><td>RozWyn</td></tr>
<tr><td>Carrier</td><td>Business data: Remuneration costs from the HR report</td></tr>
<tr><td>Sending facilities</td><td><table><tr><td>XN4ka</td><td>XMPK</td><td>XLOT</td><td>Contractor's Number</td></tr><tr><td>404-001-00<br>404-002-00</td><td>M005<br>M004<br>M021<br>M020</td><td>NONE</td><td>NONE</td></tr></table></td></tr>
<tr><td>Receiving facilities</td><td><table><tr><td>XN4ka</td><td>XMPK</td><td>XLOT</td><td>Contractor's Number</td></tr><tr><td>404-001-00<br>404-002-00</td><td>MPKs</td><td>NONE</td><td>NONE</td></tr></table></td></tr>
<tr><td>Settlement procedures</td><td>Settlement takes place on the basis of the indicated remuneration in the month</td></tr>
<tr><th colspan="2">2. Settlement of space costs per MPK</th></tr>
<tr><td>Business objective</td><td>The purpose of the settlement is to settle the costs related to the space on MPK</td></tr>
<tr><td>Account</td><td>500-01 Settlement of the space</td></tr>
<tr><td>Ticker</td><td>Development of space</td></tr>
<tr><td>Carrier</td><td>% assignment to MPK based on the space use</td></tr>
<tr><td>Sending facilities</td><td><table><tr><td>XN4ka</td><td>XMPK</td><td>XLOT</td><td>Contractor's Number</td></tr><tr><td>500-01</td><td>M024</td><td>NONE</td><td>NONE</td></tr></table></td></tr>
<tr><td>Receiving facilities</td><td><table><tr><td>XN4ka</td><td>XMPK</td><td>XLOT</td><td>Contractor's Number</td></tr><tr><td>500-01</td><td>MPKs</td><td>NONE</td><td>NONE</td></tr></table></td></tr>
<tr><td>Settlement procedures</td><td>Settlement takes place on the basis of the % assigned to MPK</td></tr>
<tr><th colspan="2">3. Settlement of energy costs on MPK</th></tr>
<tr><td>Business objective</td><td>The purpose of the settlement is to settle the costs of energy on MPK and Production Machines</td></tr>
<tr><td>Account</td><td>500-02 Energy settlement for machines</td></tr>
<tr><td>Ticker</td><td>RozEnergNaMash</td></tr>
<tr><td>Carrier</td><td>% resulting from the working time of machines</td></tr>
<tr><td>Sending facilities</td><td><table><tr><td>XN4ka</td><td>XMPK</td><td>XLOT</td><td>Contractor's Number</td></tr><tr><td>500-02</td><td>M010</td><td>NONE</td><td>NONE</td></tr></table></td></tr>
<tr><td>Receiving facilities</td><td><table><tr><td>XN4ka</td><td>XMPK</td><td>XLOT</td><td>Contractor's Number</td></tr><tr><td>500-02</td><td>M001<br>M002</td><td>NONE</td><td>NONE</td></tr></table></td></tr>
<tr><td>Settlement procedures</td><td>Settlement takes place on the basis of working time L1 and L2</td></tr>
</table>

Source: own elaboration

accounting system and the warehouse system. In addition, other source data are imported into the database, such as working time, records of renovation orders and use of space. In the created database, indirect costs are settled according to the indicated algorithms. The multi-dimensional table allows dynamic spreadsheet reports to be prepared easily. Two types of reports are prepared – reports with a fixed structure based on operations on character strings and reports with a variable structure developed using pivot tables. Access to the data can be individually customized by assigning permissions based on any dimensions of the database.

As a result of implementing the controlling system, the company is provided with a database that contains 50 columns covering dimensions and attributes of revenue and cost information. These columns can be the basis for the analysis of any analysis of the company's results. Table 9.7 presents a section of the database controlling structure and an example database record.

Table 9.7. A section of the database structure for controlling reporting at Eurobent

| Position in the database | Example of database entry |
|---|---|
| Source | FS_LOT |
| XN4ka | 702-PRO |
| XMPK | M999 |
| XLOT | 245/01/2021 |
| XPeriod | 202102 |
| Contractor's Number | 200-2-00124 |
| XKAMOUNT | 51801.54 |
| N5ka | 500 |
| N5kaName | Sales |
| N4kaName | Revenues from the sale of production - export-M1 - 601 - finished products |
| MPKName | Sales |
| RRK1Name | RRK00 Revenues |
| RRK2Name | RRK0001 Revenues from the sales of products |
| MPK leading | M999 |
| MPK leading Name | Sales |

Source: own elaboration

Management information reporting is done using an MS Excel spreadsheet, which is the basis for displaying data from the database created. This way of analyzing the data is sufficient for the needs of the company, does not generate delays and provides full flexibility in any report definition. Every month, the same set of reports with a fixed structure is prepared for each recipient. In addition, users of the system have at their disposal a database from which they can generate information according to their individual needs (see table 9.8).

Table 9.8. Scope of fixed structure reports in Eurobent

| No. | Report name | Report content |
|---|---|---|
| 1. | PF | The fixed structure report presents synthetic management information by financial cover with an indication of the management hierarchy of generic costs, Product Groups, Dimension Groups, Indirect Costs Processes (unallocated). The report can be displayed for selected periods. |
| 2. | PF_Period | The Company Financial Coverage Report presents the Company's financial data after financial coverages with generic analytics by management hierarchy. The data is presented on a monthly basis. |
| 3. | Client | The report presents the results of a given client by PF model for the selected period, including Product Groups and their Dimension Groups. The report can be displayed for selected periods. |
| 4. | Product | The report presents the performance of a given Product Group by Country. The report can be displayed for selected periods. |

Source: own elaboration

A sample layout of reports with a variable structure (freely defined by users) from the designed database is presented in figure 9.3. This figure shows a report on the selected product with a detailed client perspective. The report groups revenues and costs for the selected product by country. A report with a market outlook can, of course, be called up for any product group or the entire company. It allows profitability to be analyzed by countries of customers of company's products.

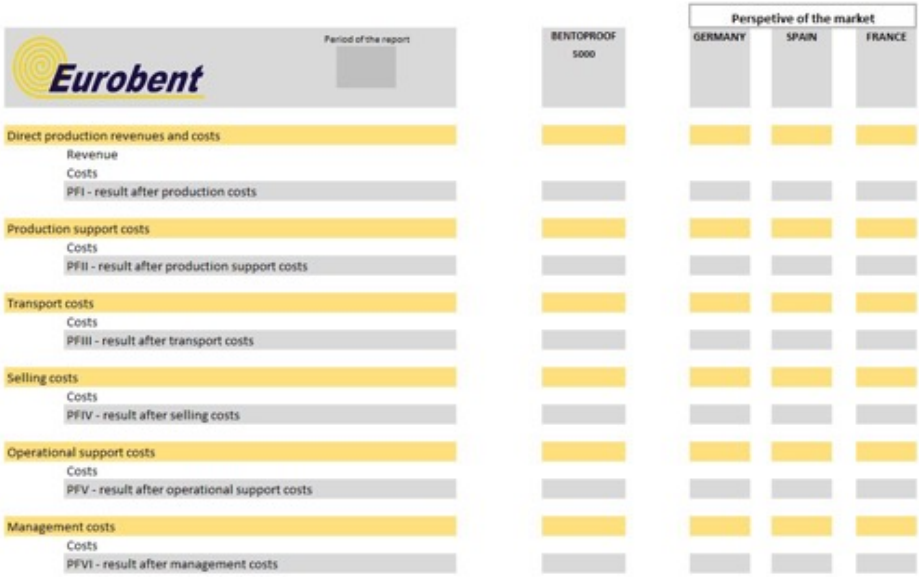


Figure 9.3. Example of a structured variable report - product report in Eurobent

Source: Own elaboration

Controlling as a delivery system of quick and appropriate information for the production company Eurobent z o.o. was developed for the Company in 2019, and then it was implemented and improved at all levels for the next year. This process is still happening today as the implemented solution turned out to be very effective and useful. It continues to support the process of good management by monitoring the current state of the company, capturing gaps, tracking trends and making the right decisions, adequate to the current situation.

The key factor of success turned out to be a well-prepared concept, underpinned by detailed analysis of the company's information needs. High commitment at this stage allowed obtaining answers to numerous questions about future results. Thanks to the systemic approach, the implementation of management accounting and management reporting was smoothly linked to the business aspects of the company and its processes. Multidimensional data obtained from the controlling system support managers in making decisions and provide a quick picture of the current situation of the company on a daily basis. The IT tool, developed in Excel, is highly flexible, practical, does not generate high costs and can be modified at any time. As Nesterak (2015, p. 121) points out, the implementation of management controlling is a long-term process, therefore the presented controlling concept in the Eurobent manufacturing company will continue to be developed. In addition, another positive effect was achieved, consisting in the knowledge not only on how to prepare the organization for changes in management systems, accountability and performance control in the near future, but also how to verify the mechanisms of procedures, which will be reflected in the target systems.

## 4. Conclusion

Controlling as a delivery system of quick and appropriate information for the production company Eurobent z o.o. was developed for the Company in 2019, and then it was implemented and improved at all levels over the next year. This process is still happening today as the implemented solution turned out to be very effective and useful. It continues to support the process of good management by monitoring the current state of the company, capturing gaps, tracking trends and making the right decisions, adequate to the current situation.

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## Bibliography


1. Czubakowska, K. Gabrusewicz, W. & Nowak, E. (2014). *Rachunkowość zarządcza. Metody i zastosowania*. Warszawa, PWE.
2. Friedl, B. (2019). *Praxishandbuch Kostenmanagement. München*, UVK Verlag München.
3. Kołodko, A. & Kowalski, M. J.. (2020). *Wdrożenie rachunkowości zarządczej w przedsiębiorstwie produkcyjnym – studium przypadku*, W: *Praktyczne problemy zarządzania*. 51-72). Wybrane prace słuchaczy 40. i 41. Edycji PASB Executive MBA, red. B. Mielczarek, A. Dobrowolska, Wrocław, Oficyna Wydawnicza Politechniki Wrocławskiej.
4. Nesterak, J. (2013). *Controlling and Performance Management as a Business Management Concepts*, W: ed. Mazaraki A. *Strategy of Enterprises In The Waiting Period Of The Crisis: Economic, Social And Legal Aspects*. 247-257. XI International Scientific Symposium, [May 15-16, 2013, Kyiv]. Kyiv: Kyiv National University of Trade and Economics.
5. Nesterak, J. (2015). *Controlling zarządczy: projektowanie i wdrażanie*. Warszawa, Oficyna Wolters and Kluwer Business.
6. Vollmuth, H.J. (1996). *Controlling, planowanie, kontrola, zarządzanie*. Warszawa, Agencja Wydawnicza Placet.
7. Vollmuth, H.J. (2001). *Führungsinstrument Controlling von A-Z*, 6. Auflage. Planneg, WRS Verlag Wirtschaft, Recht und Steuern GmbH & Co.
8. Vollmuth, H.J. (2002). *Vertriebscontrolling.* Wien, Carl Hanser Verlag München.
9. Vollmuth H.J. (2011). *Controllinginstrumete*. Freiburg, Haufe-Lexware GmbH & Co. KG.

Chapter 10

# Cashpooling as a Tool Supporting Netting in a Capital Group[1]

Magdalena Belniak

## 1. Introduction

Undoubtedly, the main factor driving the increase in the geographical range of enterprises' operations is the progressing globalization. Global expansion of enterprises has become an inseparable element of the economic system of states, and international settlements are a natural result of the evolution of commercial transactions. These transactions were initially carried out locally, only to extend their reach to the entire region, then country, and abroad, to finally become global.

Along with the company development, there arises an opportunity to strengthen cooperation with entities operating in different parts of the world. The need to carry out various forms of billing, depending on their specificity, grows as well. Cross-border transactions are chiefly based on mutual receivables and liabilities arising between business partners, and trade can be negotiated in numerous ways. There are multiple methods of international settlements. They differ depending on whether the entity operates independently on the market or belongs to a capital group. One of the solutions currently gaining popularity worldwide is netting – a tool supporting international settlements of enterprises, consisting in mutual offsetting of liabilities and receivables between economic entities (Belniak, 2020). The method is intended chiefly for large enterprises and capital groups which perform numerous international transactions in different currencies. Thanks to this method of settlement, the exchange rate risk of transactions as well as transaction costs are reduced due to the smaller number of actually performed transfers (Kosztowniak et al. 2009).

However, in some cases this tool appears insufficient in the management of international payments. For this reason, many enterprises make a decision on

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implementing cash-pooling, an auxiliary tool for cross-compensation so as to obtain even greater financial benefits and steer away from difficulties.

## 2. Characteristics of Cash Pooling

For the purposes of managing financial liquidity, enterprises employ numerous tools, such as: bank credit, factoring, forfaiting, assignment of receivables, leasing, issuance of short-term securities, insurance of receivables, trade credit, etc. While netting is not regulated in any manner by banking or tax law and law does not specify the number of entities against which such receivables may be offset, in some cases it appears to be not sufficient enough to deal with international payments (Belniak 2020). One of the effective tools used in cash management is cash pooling. An instrument of financial resources management, cash pooling is closely related to cash management (Szumilewicz, 2009). The literature mentions two aspects of cash management: minimizing the level of current cash and maximizing the benefits of having it, as well as allowing the company for expedite moving of cash through the enterprise (Sierpińska & Wędzki, 2002).

The use of cash pooling enables coordinating liquidity management of the system participants, optimization of interest and reduction of the costs of day-to-day financing. Cash pooling is a method of managing financial resources which proves most successful in enterprises with an extensive corporate structure and operating within capital groups. Cash pooling is therefore a means of supporting the management of the company's financial liquidity. A fairly young tool, it has been created chiefly to satisfy large capital groups. The idea behind cash pooling is consolidation of funds from accounts created for individual entities into a single, common, main account of the entire capital group. Thanks to the collection of all funds, it is possible to obtain greater benefits for the company. The main assumption is internal compensation of surplus of entities within the group. In practice, it consists in offsetting with financial surpluses from individual accounts all negative balances on the remaining entity accounts. The greatest advantage of cash pooling is therefore the reduction of the company's lending costs by using financial surpluses, which results in ability of the capital group to strengthen its global position (Borowiec, 2006).

Cash pooling goals inlcude:

- unlimited flow of funds between the capital group entities,
- use of funds remaining on bank accounts,
- reduction of short-term financing costs,
- minimization of costs resulting from financial liquidity management in the enterprise.

In practice, cash pooling is conducted in compensation or consolidation variants. Zero-balancing cash pooling (the consolidation variant of cash pooling amounts to concentration of funds on the account, actual cash pooling) consists in the actual transfer of funds between accounts of the capital group. Flows between the accounts of cash pooling participants are effected through the main account of the group (consolidated account), which at the end of each day are credited with positive balances of participants, whilst negative balances of other system participants are covered. At the beginning of the following day, transfers are made to restore the balance on the accounts of cash pooling participants prior to funds consolidation. An advantage of this solution is that banks charge interest on the global balance on the consolidated account. Notional cash pooling (cash pooling compensation variant which offsets interest, virtual cash pooling) consists in the fact that there is no actual cash flow between participants' accounts, but the main group account is maintained in a virtual manner. Although participants' account balances are positive and negative, there is no actual cash flow between these accounts, but interest is charged on the total group balance.

In addition to the above-mentioned basic variants of cash pooling, more and more popular are cross-border cash pooling agreements, covering bank accounts of entities from various countries, as well as two-way cash pooling and one-way cash pooling (Chorowska-Kasperlik 2015).

## 3. The Mechanism of Cash Pooling as Exemplified by an International Company

The company, which will be used herein as an example, holds all its bank accounts involved in the cash pooling process in a single bank. This is not a prerequisite, however, it significantly simplifies the entire process and reduces the costs of its operation. The diagram below shows how entities transfer their financial surpluses to the main account, whilst the main account finances the entities with a funds deficit. Thus, at the end of the day, the account balances of the entities amount to zero. The main account, however, depending on the balance held at the end of the day, may invest or withdraw funds from investment funds.

The company has the simplest, single-currency type of cash pooling. As a result, transfers between accounts of entities and the main account are economical and registered directly. The enterprise in question uses two types of cash pooling, one in USD and the other in EUR. When managing financial assets in capital groups, all activities related to the regulation of the level of financial liquidity, as well as international settlements between entities should be taken into account. Therefore, one may conclude that there is a relationship between the

method of internal group settlements and the group's liquidity level. The method of settling liabilities and receivables plays a special role here. The longer the receivables flow to the group and the shorter the period of settling liabilities, the lower the level of funds in cash (Michalski, 2010).

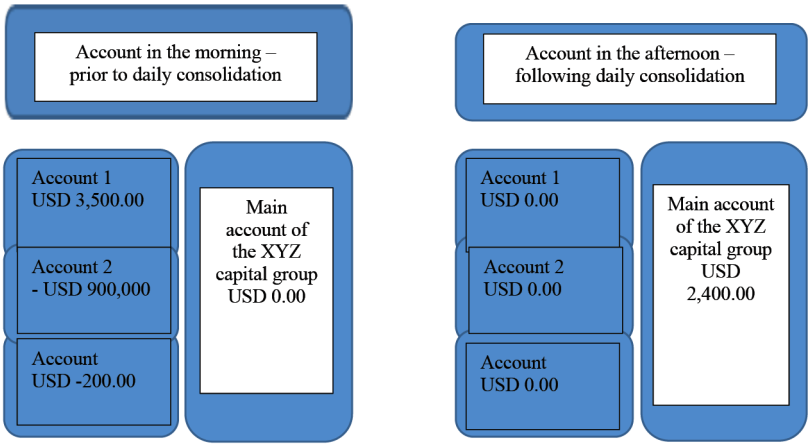


Figure 10.1. Cash pooling operation mechanism in the XYZ capital group
Source: own study based on internal data of the XYZ capital group

Netting and cash pooling are tools supporting management of financial processes in an enterprise. The role of netting is to manage international payments inside and outside the group. Cash pooling, on the other hand, helps to manage in an efficient manner financial resources in the enterprise, which results in improvement of its liquidity. Both these tools improve financial processes and bring savings for the capital group, therefore using them together brings about even better results (Ciężki & Drożdż, 2019).

The figure below shows a simplified example of final settlements in the XYZ company in netting. After obtaining the net position, each entity has information on whether it will receive a payment from the netting center or have to pay its liabilities. Well reflected in the diagram is the fact that some entities have the same accounting currency, in this case these are the Belgian, German and Italian entities. At this point, cash pooling is a perfect solution.

The diagram below shows virtually the same situation as the previous figure, only following the use of cash pooling. Monetary Union entities use the same currency – the Euro. Since the XYZ capital group has many entities in these countries, a cash pooling system has been created. Those entities which are in the black transfer daily capital surplus to the main account, while the entities in the red receive the needed funds from the main account. By combining this type of

capital management with netting, the volume of international transactions between entities and the netting center may be significantly reduced. As shown in the figure above, in the place of three transfers there may be made a single transfer for the net amount of all transfers in the Euro currency. Finally, the netting center will make a single transfer to the Euro cash pool. The above example shows savings in the form of two transfers, but in reality, the number of such transactions is significantly greater, and thus the savings increase.

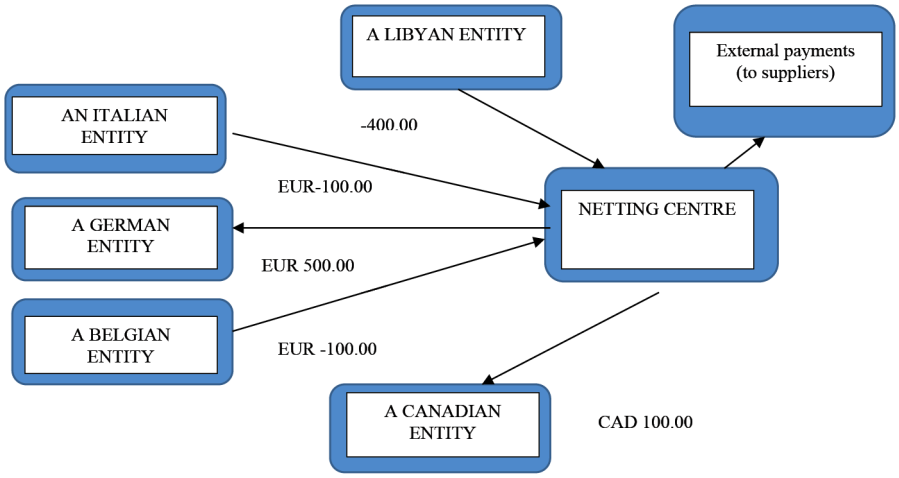


Figure 10.2. Settlements between entities and the netting center in netting
Source: own study based on internal data of the XYZ capital group

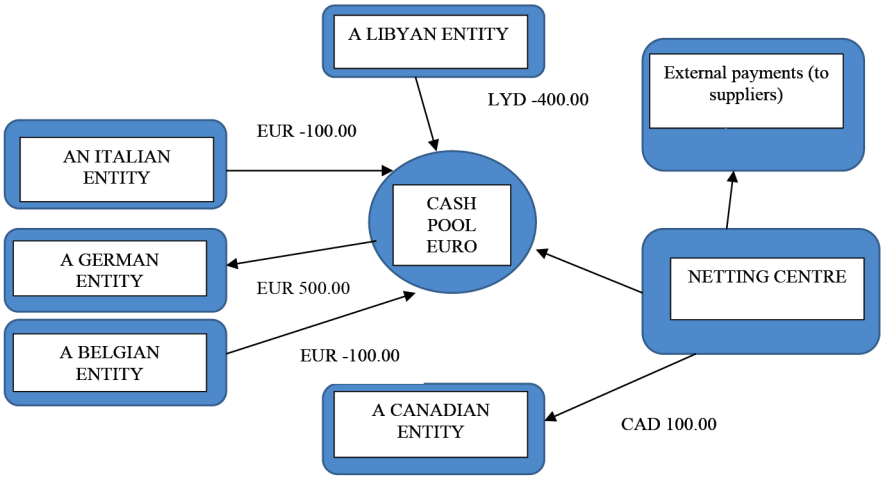


Figure 10.3. Settlements between entities and the netting center in netting with a cash pool account
Source: own study based on internal data of the XYZ capital group

The same solution may be well applied in any other entity. Everything depends on the number of entities owned by the capital group in a given currency. For XYZ, the same is true for entities making settlements in USD. A USD cash pool has been set up and the netting center makes or receives transfers thereto.

## 5. Conclusion

In order to maintain financial liquidity, enterprises employ financial tools such as: credit, leasing, factoring, or overdraft on the current account. The use of the above tools is associated with additional financial costs, significantly higher than the costs generated in cash pooling, and therefore, when compared to the above tools, the cash pooling agreement does present the most interesting solution.

The advantage of the cash pooling agreement is that the surplus of funds from individual accounts of the entities across the group are concentrated and enable compensating for the existing financial shortages in other entities across the same group. Balancing financial shortages with surpluses allows minimizing the costs of crediting activities of the entities in the group, since such financing is effected with the group's own funds. Participation in the cash pooling group enables limiting or reducing interest costs that would otherwise result from incurring liabilities for the purposes of business financing. As part of participation in the cash pooling agreement, there exists internal financing, which is an alternative to external financing. Participation in the cash pooling arrangement also enables the increase of interest income, which has been collected both from own funds of the group participant and from funds of other entities (participants) across the group.

To recapitulate, cash pooling may be claimed to enable effective management of the financial liquidity of system participants, achievement of measurable economic benefits resulting both from the reduction of costs of current financing of operations, as well as from more favorable conditions for allocating temporarily free funds.

## Bibliography

1. Belniak, M. (2020). *Netting as a settlement tool in international enterprises,* In M. Dziura, A. Jaki, T. Rojek (ed.), *Restructuring Management: Models - Changes - Development* (pp. 123-131) Toruń: Towarzystwo Naukowe Organizacji i Kierownictwa. Dom Organizatora, 123-131
2. Borowiec, L. (2006). The role of cash pooling in the effective management of the financial liquidity of a capital group, *Scientific Journal of the University of Szczecin, 765*, 387-401.

3. Chorowska-Kasperlik, E. (2015). Cash Pooling in the Capital Group - Selected Fiscal Aspects, Economic Studies. *Scientific Journal of the University of Economics in Katowice*, 225, 61-73.
4. Ciężki, D., & Drożdż, W., (2019). Using multicurrency cash pooling in the liquidity management of a capital group, *Polityka Energetyczna – Energy Policy Journal*, *22*(3), 120-126.
5. Kosztowniak, A., Misztal, P., Pszczółka, I., Szelągowska, A. (2009). *Finance and international settlements*, Warsaw C.H.Beck Publishing House.Michalski, G. (2010). *Strategic management of financial liquidity in the enterprise*, Warsaw, CeDeWu Publishing House.
6. Sierpińska, M. & Wędzki, D. (2002). *Managing financial liquidity in the enterprise*, Warsaw, Wydawnictwo Naukowe PWN.
7. Szumielewicz, W. (2009). Cash management in capital groups. Diagnosing, shaping, assessment, Warsaw, Difin.

Chapter 11

# Design Thinking and Boosting Creativity in Education – Solutions for the Clothing Industry

Monika Malinowska-Olszowy

## 1. Introduction

The aim of the below analysis is to present an innovative approach to problem solving by using design thinking methodology. This method originates from the University of Stanford in the United States. It was created by David M. Kelly, professor of engineering and founder of IDEO, which shows how to successfully bring innovative solutions to the market using Design Thinking. Initially, the method was used to transfer creative ideas to Silicon Valley businesses. Because of the benefits achieved by the method, Design Thinking can be implemented not only at the level of creation, but also for strategic and business consulting. This allows supporting various companies in areas such as organization, change management, innovation, relations, sale, marketing and communication. Due to its universality, it is capable of being adopted for all industries, regardless of sector or size. Design Thinking can be employed not only for product creation, but also for services and processes design. (Malinowska-Olszowy, 2017, p. 113-120)

The Design Thinking process implemented in the Polish company Oh! Zuza will be evaluated. The company is a slow fashion clothing producer, whose designs are available in 25 counties worldwide. Oh! Zuza offers female clothing made of high-quality materials obtained from credible, mostly European, suppliers. The target group are women looking for meticulously designed lifelong products. (https://ohzuza.com/, 2021) Analysis of the firm showed that the biggest issue is the amount of wase generated during production. The clothing industry is one of the industries (only after fuel industry) creating the most pollution for the environment. The amount of textile waste in Poland is estimated at around 2.5 million tones. Only half of this is capable of being reused. (http://www.eko-impuls.pl/przemysl-modowy-a-produkcja-odpadow-co-mozemy-zrobic-by-zmniejszyc-ich-ilosc/, 2022) During the clothing production, not only textile waste

is generated, but also other refuse created during various levels of the company functioning (e.g., design). Crucially, one of the issues raised by the analyzed firm is that the plethora of waste could be used again or supplied to different beneficiaries. Finding alternative and optimal solutions would not only facilitate environment protection, but also reduce costs incurred during waste collection and disposal.

The Design Thinking methodology had been used to solve the issue presented above. The method focuses on identifying user's needs. The conducted process is comprised of several stages (i.e., empathize, define, ideate, prototype and test) and was handled by interdisciplinary students from Lodz University of Technology together with a mentor (lecturer) and Oh! Zuza representatives. In order to improve creativity, facilitate work and cooperation between participants, various tools were utilized during the process. Having in mind that Design Thinking is a multidisciplinary problem-solving approach, the proposed tools also stem from a variety of areas such as design, engineering, psychology or sociology. Moreover, the process also utilized the empathy map, interviews, 5why method, brainstorming etc. The crucial task was to appropriately define the problem in order to obtain a credible response which will serve to achieve success.

## 2. Design Thinking as a Method of Creative Problem Solving

In times of increased competition and constant globalization, a plethora of products and services appear on the market. Yet, these products and services often do not fulfil clients' expectations and needs. Companies undertake ongoing efforts to make their products and services more attractive and satisfying for clients. According to the Central Statistical Office only 30% of companies that appear on the market achieve success, regardless of improvement attempts. Such a situation could be associated with considerable costs of business activity or ineffective marketing strategies. However, the primary cause is a lack of a comprehensive business analysis. Entrepreneurial activity is often conducted without a vision but rather emulating business models of competitors which rarely leads to success. Efficient business performance is impeded due to a lack of innovative approach, absence of novel solutions or comprehension of users' needs. Companies in the knowledge-based economy have a chance to gain clients' loyalty and consequently to develop their businesses on a wide scale. However, this is conditioned upon the ability to compete through product and service innovation, design of new solutions adjusted to target groups or even creation of entirely new needs. Understanding clients' needs and offering them solutions which accommodate certain expectations is crucial to achieve business success. The Design Thinking methodology could be implemented to improve chances of such suc-

cess. The methodology is focused on innovation production based on a thorough comprehension of users' needs while also considering strengths of the company. The next section evaluates the Design Thinking methodology and the process of its implementation the aim of which is to create a product/service personalized for the client.

## 3. How Does Design Thinking Work?

Design Thinking is a method focused on creation of new products and services by means of creative design. The method originated at the University of Stanford in the United States. It was founded by David M. Kelly, professor of mechanical engineering. Kelly was also a founder of global design and innovation company IDEO which implements Design Thinking to create new products and services for the market. Initially, the method was utilized purely to transfer creative ideas into the Silicon Valley business community. Due to the success of the applied solutions in California, Design Thinking could also be incorporated into strategic and business consulting for companies. The methodology supports enterprises in the context of organization, change management, innovation, sale, marketing, and communications. (http://designthinking.pl/, 2021) Due to its universality, the method could be applied in any industry, regardless of the type of business, size or geographical area of operation. The concept is useful not only in respect of the product itself, but also for the creation of services and processes. There are various definitions explaining the concept of Design Thinking, however, each of them highlights the relevance of a close cooperation with clients as the only party capable of specifying needs. (Brown, 2009) According to Tim Brown, recognized in modern creative design and IDEO CEO, Design Thinking entrusts tools to parties that are not apprised with the creative process to evaluate real market issues from the wider perspective. Moreover, one of the definitions asserts that the methodology is a disciple of its own, using common sense and design methods to fulfil human needs and business strategy utilizing available technology. (Brown, 2008, p.68) Thomas Lockwood, an author focusing on creative design and a leader regarding integration of design and innovation practices in business, points out that Design Thinking is centered around people and their needs. (Lockwood, 2009) Moreover, David Kelly provides a simple but coherent definition that this methodology encapsulates a natural ability to generate new ideas and test them accordingly (Kelley, Kelley, 2012, p. 135)

The analysis of scholarship and practical experiences prompts a view that Design Thinking is an unconventional way of thinking, looking at the problem

from different perspectives. It is also an ability to utilize information, knowledge, and intuition to create innovative solutions adjusted to the clients' expectations.

Ability to work in an interdisciplinary team is of paramount importance to successfully introduce changes in a business strategy. It is one of the prerequisites to adopt the methodology in the first place. A thorough analysis of an issue, its multifaceted perception, and absolute comprehension of the future consumer's intentions is conditioned upon a consolidation of different areas of knowledge and skills.

Design Thinking is based upon stages of action, during which goals are achieved successively and progress is monitored. Hence, it requires implementation of a structured process. The Stanford model, presented below (Fig. 11.1), is one of the most commonly applied schemes of Design Thinking. (https://www.ideou.com/pages/design-thinking, 2021)

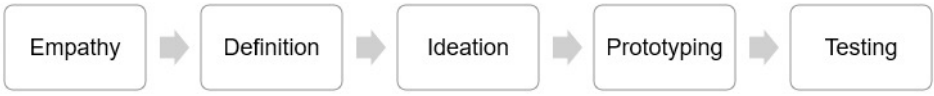


Figure 11.1. Stages of Design Thinking Process

Source: own interpretation based on the Hasso Plattner Institute of Design at Stanford University

The Design Thinking methodology process comprises five stages: (Yayici, 2012)

- mpathize – empathy is usually associated with human behavior, being sensitive to another. Entrepreneurs tend to forget about this. Hence, this first step in the Design Thinking scheme is crucial and influences a success of the whole solution. It is a cognitive factor that is a starting point of the whole work. Empathizing requires an involved team to gain understanding of the user's needs and to identify, sometimes not immediately visible, preferences. This step is based on observation and analysis of the internal and external environment. Observing the client in his own setting usually appears the most beneficial for the project. The goal of empathizing is to obtain important but often unanticipated results that would form the basis of the work that follows.
- Define – accurate description of the situation and extraction of the most relevant issues is possible due to the analysis conducted during the previous step of the Design Thinking scheme. Defining the problem in unambiguous terms requires you to go beyond merely stereotypical perception of the issue. Delineating the target group for which the solution is sought is also crucial. It is done through the creation of a specific persona that mirrors the relevant features, habits, customs, and desires of a target group. Hence, defining is based on a human-centered approach.

- Ideate – building on the previously created definition of the problem, a team generates as many possible solutions as viable. This step should be characterized by a lack of limitations and lack of criticism towards the fellow team members. Decisions on the most appropriate of the generated solutions are reached in a democratic process. Such a created idea will form the basis of the prototype designed in the next step of the Design Thinking process.
- Prototype – the team focuses on presenting a visual solution to the problem in question. It is not advisable to build an overly complicated model, but rather to create a simple vision so that it can be presented as a possible solution to the end user. During this step, it is not yet known whether the proposed solution would be accurate or whether it would be successful on the market. Consequently, the prototype is created using the minimal funding. The aim of this Design Thinking step is to introduce a concept from which errors, insufficiencies could be removed in a straightforward way.
- Test – the last stage of the Design Thinking process is to test the proposed solution to obtain an unequivocal answer whether prospective customers would be interested in the product or service. Testing allows confirming whether the solution would be accepted by consumers and whether it would be viable to be introduced to the market. Crucially, testers should not be random, but rather members of the target group defined in the second stage of the process. Omission of this element results in a failure to achieve success on the market and generates unnecessary costs. Feedback obtained from testers indicates what future steps should be taken to proceed with the proposed solution. Coming back to previous steps of the Design Thinking process is oftentimes necessary to fully fulfil realistic needs of the client. Testing could reveal whether the problem has been accurately defined or whether the generated idea is suitable for consumers. Businesses, by repeating the process, upgrade their solutions until a definite acceptance from the target group is received.

Various tools have been introduced to each step of the Design Thinking process. The aim of these tools is to enhance creativity of team members, facilitate work and improve cooperation between all parties to the project. Design Thinking is a multidisciplinary approach to problem solving and applied tools are extracted from different areas accordingly. They can involve any field from engineering, through psychology to design. They commonly include:

- Empathy map – used to profile users. Empathy maps facilitate understanding consumers for whom the solution is generated, and it is often utilized during the first stage of the Design Thinking process (empathize). Such maps improve teamwork during interviews or observation and provide an

opportunity to prepare an accurate outline of the relevant persona. The empathy map is divided into specific groups, where a team member could introduce his observations i.e., thoughts and feelings of the client, perception, explicit statements as well as client's fears and joys. All areas complement each other, giving the researcher a complete set of empathy regarding the relevant group of people. (Helman, Rosienkiewicz, 2016, p.62-72)

- 5 why method – facilitates identification of the root of the problem that the team is working on. Asking 'why' several times allows thorough exploration of the topic, defining the point of its origin and looking at the issue from various perspectives. Asking questions also clarifies the problem and identifying its core is less complicated and easier to eliminate. (http://quality-management.pl/5why/, 2022)
- Brainstorming – this heuristic method is used for the purposes of creative problem solving. Brainstorming is especially appropriate while looking for the specific solution among many possibilities. In the Design Thinking process, it is used to generate ideas by the team. Team members are taught to listen. Brainstorming can inspire and encourage creativity. It is most often used during the third stage of Design Thinking (generate).
- 6 hats method - developed by the creator of lateral thinking, Dr Edward de Bono. Each of the six-hats presented to the team is of a different color and signifies a different state of mind. The method facilitates looking at the problem from various perspectives. The red hat represents emotion, white represents objectivity, black represents pessimism, yellow represents optimism and green represents opportunity. The 6 hats method aims to obtain as many different opinions as possible regarding the researched topic. (De Bono, 2016).

The above list of tools used in the Design Thinking process is by no means finite and these are just the tools that are most common. New tools that will facilitate problem solving are being constantly created. Throughout the Design Thinking process, facilitators also apply other elements that have already became part of the process and which are designed to stimulate creativity, motivate, and build better relationships within the team. These elements do not directly affect task performance, but they do contribute to better and more efficient work.

Considering many opportunities for innovation building, it can be concluded that Design Thinking is a good way to improve products and services and introduce them to the market when characterized by the quality expected by clients. Involving clients in the design process facilitates the generation and evaluation of solutions and, most importantly, allows you to create a satisfactory design. It allows you to verify whether the initial, declared by consumers

properties that the product should have, is reflected in their actual interest by purchasing it right after it is introduced to the market. The probability of successful acceptance of a new product increases significantly if the primary goal of its introduction is to satisfy the consumer's needs. Understanding these needs is possible when the consumer can have insight at the design stage into co-creating a new product, through direct participation in planning, implementation of subsequent stages and commercialization of the product. (Czajkowska, Kowalska & Piotrowski, 2013, p.31)

There are many examples of companies that successfully apply the Design Thinking methodology on the market, but they are united by one basic principle – the product is designed in accordance with the dreams and expectations of the end user, which is the most important aspect in building the quality of products and services.

## 4. Design Thinking Approach as an Innovative Didactic Method for a Real Problem in the Clothing Industry References

The current functioning of higher education is associated with dynamic developments of the knowledge-based economy. To respond to the growing difficulties faced by universities, these institutions must search for new educational methods. The effectiveness of these novel methods does not only positively improve a university's public image but also directly affects job opportunities for graduates. Education focused on finding optimal solutions for potential users, i.e., Design Thinking, has become a trend in the educational sector. As such, this approach is oriented towards the implementation of projects embedded in reality, tasks stemming from practice.

Under the project „Designing with focus on the user" a 30-hour series of classes was carried out. These classes were conducted simultaneously for two courses at the Faculty of Materials Technology and Textile Design of the Lodz University of Technology, i.e., „Textile and Fashion Industry" and „Design". Overall, 32 students participated in the classes. The base theme was created in cooperation with the Polish clothing company Oh! Zuza and presented to the students. Oh! Zuza is a manufacturer of women's clothing [see website: https://ohzuza.com/]. The company is based in the Polish capital of textile industry - Łódź. It has been on the market for 14 years and has two brands in its portfolio - Oh! Zuza and Vanilla night & day. The materials from which the projects are made are ordered from trusted Polish knitting mills and imported from European Union countries – most often from Italy, France and Portugal. The company uses only high-quality fabrics, knitwear and lace. It mainly uses cotton, viscose,

silk, cupro and linen. The entire production process takes place on site through construction, cutting, sewing, finishing and pressing. In addition, each item of clothing is inspected prior to packing. Brand designs are available in 25 countries around the world.

The analysis of the company's activities showed that the main issue faced by the manufacturer is the amount of waste generated during the production of products. Hence, the first topic to be dealt with by the students was effective and ecological waste management for a clothing company. The Design Thinking process was conducted by multidisciplinary teams of 5-6 people, comprising students from different faculties, a mentor (teacher) and representatives of the clothing company. Over the time span of half a year, students had a chance to benefit from knowledge and experience of Oh! Zuza's employees, working closely with the company. Students analyzed the company's operations at every stage starting with design, through production, to the delivery of the product to the customer. The conducted process resulted in a design of six innovative solutions. The aim of the solutions was to reduce waste generated by Oh! Zuza during production. Each of the six solutions was submitted in the form of a presentation and prototype. These were evaluated by a group of students, mentors and company representatives. Showing the prototype to the primary user aimed to obtain an opinion about the generated 'product'. Consequently, it was possible to evaluate what functioned well and what failed. During this stage, the designed solution can only be tested in the environment it will be used by. However, it is necessary to engage a plethora of participant and technical, administrative, or legal support. During this time, the company had to decide which solution will be the most useful and will bring the most advantages. Selected solutions proposed by student groups are the following:

1. Creating a charitable organization that will design clothes and items for financially disadvantaged people out of waste from the cutting room. The organization will bring together volunteers from all over Poland, who will work together on turning cuttings into eco-friendly patchwork bedspreads, blankets, mattresses and fillings, poufs, etc. Created products will be donated to those the most disadvantaged across Poland. As a result, the company would get rid of the problems of costly waste disposal, and their actions would improve the company's image.
2. Expanding the company's product range by using post-production waste.
    - Large waste – decorative product packaging instead of plastic bags, fabric bags, fabric bags, blankets, rugs, bedding, pillows. These products can be created from several different scraps (patchwork), slippers, toys or their fillings, scarves, shawls, caps, turbans

- Medium waste - decorative sachets, food sachets, toys and their fillings, blindfolds, winter ear bands, terry cloths, reusable cotton balls, closet fragrance sachets, scarves
- Small waste – personalized gift tags with embroidery, name tags, patches, hair bands, garlands, fabric ribbons, scrunchies, fabric jewelry (bracelets, necklaces), shoelaces, belts, bookmarks, cup warmers, pompoms, tassels, ribbons.

3. Mobile application where textile and clothing companies can insert ads containing information such as type and amount of post-production waste they have to give away. Recipients can take them for free from a specific place or order a courier who will pick up and take the waste to a designated place (to companies, people in need of such materials). The application will have a comment section for sharing ideas on the use of the waste and a rating section where it will be possible to give feedback on the company issuing and receiving the waste.

## 5. Conclusion

Design Thinking plays an increasingly significant role in the functioning of modern companies. It is a means to create innovation within firms and an opportunity to gain an advantage among competitors. Using the method allows creating new products, services, innovative solutions, and ground-breaking technologies. The Design Thinking methodology supports unusual problem solutions and improving existing ones. Working in interdisciplinary teams utilizing unconventional approach to create solutions is an answer to satisfy needs of companies and social issues presented by the modern market (Brodnicki, 2015, p. 35-45)

Unfortunately, current university courses in many countries still lack emphasis on graduate competences such as working on projects, team problem solving project work, team problem solving, multidisciplinary and interdisciplinary approach to issues under analysis, proper construction of team and team management, negotiation, and other soft skills. The format of classes in a work environment focused on creativity is the basis for the creation of ideas, expanding creative approaches to problem solving. An important didactic aim is to learn new methods of solving design problems while at the same time „forcing", rare among students, teamwork. Students had the opportunity to gain social competences necessary to engage in teamwork. Such an opportunity was possible through exercises characterized by specific dynamics, and which posed issues such as improper organization and accepting shared responsibility for the result.

## Bibliography


1. Brodnicki K. (2015), Zastosowanie koncepcji design thinking w funkcjonowaniu przedsiębiorstw. *Quarterly Journal*, *15*, 35-45.
2. Brown T. (2008), Design Thinking, *Harvard Business Review*, 18-23
3. Brown T. (2009), *Change by design*, Harper Collins Publishers.
4. Czajkowska K., Kowalska H., & Piotrowski D. (2013), Rola konsumenta w procesie projektowania nowych produktów spożywczych, *Zeszyty Problemowe Postępów Nauk Rolniczych*, *575*, 31.
5. De Bono E. (2016), *Six Thinking Hats*, Penguin Books Ltd.
6. D.school, Retrieved on April 21, 2021, from http://designthinking.pl/.
7. EcoImpuls, Retrieved on April 15, 2022, from http://www.eko-impuls.pl/przemysl-modowy-a-produkcja-odpadow-co-mozemy-zrobic-by-zmniejszyc-ich-ilosc/.
8. Helman J. & Rosienkiewicz M. (2016), Design thinking jako koncepcja pobudzania innowacji, Innowacje w Zarządzaniu i Inżynierii Produkcji, Oficyna Wydawnicza Polskiego Towarzystwa *Zarządzania Produkcją*, *5*, 62-72.
9. Ideo, Retrieved on August 17, 2021, from https://www.ideou.com/pages/design-thinking
10. Kelley T., & Kelley D. (2012), Reclaim Your Creative Confidence, *Harvard Business Review*, *90*, 135.
11. Lockwood T. (2009), *Design Thinking: Integrating Innovation, Customer Experience and Brand Value*, Allworth Press.
12. Malinowska-Olszowy M. (2017), Design Thinking jako metoda kreowania jakości produktów i usług: Aspekty Jakości Produktów, *Towaroznawstwo w Badaniach i Praktyce*, 113-120.
13. Oh'Zuza. Retrieved on May 9, 2021, from https://ohzuza.com/
14. Quality-Management.PL, Retrieved on July 23, 2022, from http://quality-management.pl/5why/.
15. Yayici E. (2016), *Design Thinking Methodology Book*, ArtBisTech.

Chapter 12

# Lean Management Implementation Support Tools in the Enterprise – Own Research

Janusz Nesterak, Angelika-Wodecka-Hyjek, Ewa Bąchor

## 1. Introduction

The lean management approach is characterized by a wide set of methods and techniques, subject to continuous development by borrowing concepts from other areas of practical operation (Dudojć, 2022, p. 30). Lean Management as a concept of an enterprise management has its roots in the Toyota Production System, that has become over time a concept implemented in many production companies operating in various sectors. This study presents the main assumptions of the Lean Management (LM) concept, main characteristics of the support tools for this system as well as presents their perception among practitioners. The LM implementation process requires application of many support tools and is a process that requires various activities at all levels of the organization, undertaken both by the management and consultants supporting its implementation. In fact, there are many business models based on the concept of Lean Management that are widely used by consulting companies. LM is a business management concept developed on the basis of organizational techniques and solutions applied for the first time in the automotive sector at Toyota production plants in Japan. It is based on the principles of an organizational process known as Lean Thinking, which traditionally defines five steps of process improvement, including the improvement of production processes. Consulting companies typically assist their clients in developing customized Lean Management models to be applied practically in an industrial setting, as they can offer a good balance between some complex frameworks and other models dedicated to a hands-on LM approach in a manufacturing enterprise. The authors' own research was conducted study and verify the perception of advantages and benefits as well as difficulties resulting from the practical use of LM tools in enterprises. An electronic questionnaire with the use of email communication was used as a research technique. The conducted

research was run as a pilot and preliminary examination, during which data and information were obtained, that subsequently became the basis for further questions and research work on the issues raised. The questionnaire consisted of 24 questions, divided into 7 sections. The questionnaire itself was conducted among business consultants on LM implementation and top management of companies that decided to implement LM. Questions were related to work experience, general knowledge of the LM concept, knowledge of the tools used in LM, training in LM or personal opinions on the benefits and barriers encountered in LM during the implementation of LM, respectively.

## 2. Lean Management assumptions in an enterprise functioning perfection

Lean Management is a management concept aimed at maximizing value for the customer, while continuously minimizing waste (Hamrol, 2017, p. 192). In response to changing operating conditions, organizations look for a specific balance point of action (Koźmiński, 2004, p. 42). Lean Management is widely promoted in the theoretical framework and practice of management. It is a method that aims at an enterprise's functioning perfection, through continuous elimination of waste, optimization of value creation and flow of value throughout the entire production process, while adopting cost reduction as a principle (Lisiński & Ostrowski, 2006, p. 71). Its goal is to build quality into the manufacturing process. The approach and concept of Lean Management is an area of interest for both practitioners (Taiichi, 1988) and management theorists (Krafcik, 1988; Womack, Jones, & Ross, 1990; Womack, Jones, 1996, 2003, 2007). Achieving the goal of maximizing value for the customer should be the result of the elimination of losses understood as waste occurring in the processes taking place in the enterprise. We can analyze waste from three different points of view:

- Muda - (waste), i.e. waste related to operations in the production process that do not generate added value for the customer; Muda is further divided into 7 types (Taiichi, 2008): waste of overproduction, waste of inventory, waste of defects, waste of waiting, waste of overprocessing, unnecessary transport (waste of transportation), unnecessary movement (waste of motion), unused potential of employees (waste of untapped human potential) (Suzaki, 2010);
- Muri – (overburden), i.e. waste resulting from overload – refering to operations in which there is overload of machines, people, lack of ergonomics of operation;
- Mura – (unevenness) – i.e. waste, generated by irregular operations undertaken in action, flow fluctuation, variable pace of work, lack of standardization.

The LM approach to improve the processes manifests in the application of the „five principles of lean management". Their adherence should take the form of a feedback loop and be repeated continuously (Womack & Jones, 1996, 2003, 2007). They are characterized in Table 12.1.

Table 12.1. Five principles of lean management and their characteristic

| Lean Principle | Lean Enabler for Systems Engineering (top level categories) |
|---|---|
| Value | ■ Follow all practices for the requirements capture and development of the INCOSE[1] handbook process<br>■ Establish the value of the end product or system to the customer<br>■ Frequently involve the customer |
| Map the value stream | ■ Plan the program according to the recommended INCOSE handbook process<br>■ Map the systems engineering and product development value stream and eliminate all non-value adding elements<br>■ Plan for frontloading the program<br>■ Plan to develop only what needs developing<br>■ Plan to prevent potential conflicts with suppliers<br>■ Plan leading indicators and metrics to manage the program |
| Flow | ■ Execute the program according the INCOSE handbook process<br>■ Clarify, derive, prioritize requirements early and often during execution · Front load architectural design and implementation<br>■ Encourage system engineers to accept responsibility for coordination of product development activities<br>■ Use efficient and effective coordination and communication<br>■ Promote smooth systems engineering flow<br>■ Make the program visible to all<br>■ Use lean tools |
| Pull | ■ Tailor for a given program according to the INCOSE handbook process<br>■ Pull tasks and outputs based on need, and reject others as waste |
| Perfection | ■ Pursue continuous improvement according to the INCOSE handbook process<br>■ Strive for excellence of systems engineering processes<br>■ Use lessons learned from past programs<br>■ Develop perfect communication, coordination and collaboration policy across people and processes<br>■ For every program use a chief engineer role to lead and integrate the program from start to finish<br>■ Drive out waste through design standardization, process standardization and skill-set standardization<br>■ Promote all complementary continuous improvement methods to draw best energy and creativity from all employees |

Source: (Oehmen & Rebentisch, 2013, p. 28).

The pursuit of operational process excellence under conditions of variability is the goal of targeted actions based on the methods and techniques necessary to implement LM. The concept of Lean Management is an open catalog of methods and techniques for process improvement (Liker & Meier, 2011; Womack

[1] INCOSE - International Council on Systems Engineering – a non-profit organization dedicated to advancing systems engineering and raising the profile of systems engineer.

& Jones, 1996). The philosophy of implementing a lean manufacturing system can seriously affect the results expected by customers understood as companies that plan to implement LM, especially when the customer does not have reliable knowledge about how the Lean Management system should work and when they lack knowledge of the requirements of such a system. The philosophy of the Lean Manufacturing System approach actually has a direct impact on the implementation phases of the system itself, and thus on the schedule and achievable results. Most consulting companies offer support to clients implementing the LM concept in the presentation of supporting tools. In the process of implementing various methods and concepts, differences in terms of, for example, implementation conditions, the expected schedule for achieving results, the quantity and quality of expenditure needed and expected to achieve results, the level of involvement of higher levels of management, the level of involvement of all required production resources are noticeable. Despite these differences, it is fairly easy to see why many companies are switching their business model to ‚Lean Manufacturing' and ‚Lean Management'. It is determined by the general increase in efficiency and effects of operations in the form of, for example: reduction of defects, shortening of delivery times, improvement of their timeliness, increase of employees' efficiency, reduction of inventories, improvement of quality or reduction of changeover times (Pavnaskar, Gershenson &Jambekar, 2003, p. 3076).

## 3. Selected Methods and Review Techniques Necessary to Implement Lean Management

Lean Management uses several dozen complementary tools that provide assistance at every single stage of the development of an enterprise, individual departments or individual projects (Tapping, 2003, p.12). The most commonly used are: just-in-time, comprehensive quality management (TQM), autonomous defect detection system (jidoka), the method of quick changeover of machines (SMED), the method of quality circles, the technique of arranging machines into object or technological sockets (in other words, group technology), error prevention system (poka yoke), housekeeping system (5S), material flow controlled by suction system (kanban), machine maintenance system (TPM), fault signaling technique (andon), production leveling technique, parallel design method, process mapping technique, value stream mapping technique. In addition, it uses, inter alia, the FMEA method, kaizen philosophy, Lean Six Sigma, Hoshin Kanri method, 5Why method or standardization (Lisiński & Ostrowski, 2006).

Many of the above are used together. It is impossible to indicate the most important or the most effective method or tool. Depending on the problem and the area of disruption, the most appropriate tool should be selected. From the po-

int of view of a wide spectrum of use, the Kaizen philosophy is most often used in the catalog of Lean Management tools. Choosing the right tool will depend mainly on the industry and department in which the lean philosophy is implemented. You need to look at the production process and decide where it is necessary to use specific tools. It is worth using given tools, as long as they bring at least one of the results in the form of increasing the throughput of the production process, i.e. increasing efficiency, reducing production costs and improving the morale of the crew (Czerska, 2014, p. 163). From the perspective of visualization, analyzing and improving processes, Value Stream Mapping is widely used. The FMEA method and the just-in-time technique are the tools that allow for the analysis of the causes and effects of waste. In order to maintain the proper maintenance of machinery and equipment in the enterprise, the TPM system is used today. The use of the FMEA tool is to lead to the highest possible quality by analyzing the causes and effects of waste in the form of failures or defects in the production process. The following is a description of the indicated tools, which can impact the broadest spectrum of the enterprise or be the latest implemented technique.

### 3.1. Kaizen

A tool with a wide range of applications, both in the production and office areas, is the Kaizen philosophy. This term comes from a Japanese word that has a double meaning: improvement, change for the better and the Japanese philosophy of business (conduct), continuous improvement of the management and production process at all its levels. Is based on the technique of "small steps", which brings big effects by introducing small changes. In essence, Kaizen should lead to the achievement of the following goals: shortening the duration of the work process and improving quality, technical adaptation of system components, creating evaluation and reward criteria, and finally cost reduction. The basic principle of implementing lean, and in particular the Kaizen principles, is the involvement in the process of employee improvement at all levels of the organization. It is necessary and highly required to constantly analyze the processes taking place, the implemented rules of conduct, or the applied work standards, thanks to which it is easier to find and eliminate errors and imperfections in the functioning of the entire enterprise. Continuous improvement is precisely the task of senior management. Since Kaizen is based on the principle of small steps, very often the results and effects of implemented improvements can only be seen after some time. This can be daunting at times, especially if the management team is keen on quick wins. There are five basic rules of conduct in kaizen (Kryś, 2016, p. 137-138):

- If there is a problem (anomaly), start by visiting gemba (in production). Don't try to solve the problem from behind the desk, go to the factory floor and watch closely.

- Check gembutsu, i.e. real items, material objects in gemba – broken machines, waste and rejects, returned products. Look for the cause of the failure.
- Apply temporary countermeasures on site.
- Look for the immediate cause of the problem. Don't wait to take action – many of your problems at gemba can be solved right away. Gather all the information and data to help determine the immediate cause of the failure or problem. Many of them can be determined by the five-question method (5WHY).

It is necessary to use a well-thought-out implementation and application of several tools and methods all together naturally depending on the needs, which will be defined in the analysis of the process.

### 3.2. Value Stream Mapping

A very important tool in the work on the development of an organization is Value Stream Mapping (VSM). It is an analysis of the current processes that create value for the customer, the purpose of which is to improve the flow of value in the organization (https://smartlean.pl/vsm). The implementation of the Value Stream Map takes place in three stages:

1. Development of the Current State Map (As Is), which presents the current flow of values in the analyzed processes. The stock levels of materials and products are analyzed as well as work-in-progress states, resulting in a product transition time. Secondly, the flow of information between individual departments is mapped. This step is to clarify the flow of information between the planning department and individual processes. The above actions lead to the receipt of the so-called Lead Time, which shows the processing time of the product in subsequent stages and the time of storage in the warehouse.
2. Development of the Map of the Target (Future or To Be) State, i.e. the target state that we want to achieve in a given process through a detailed analysis of the current state. This allows the identification of current problems and losses for their further elimination. Each solution should be considered, regardless of its level of difficulty or feasibility.
3. Development of an Action Plan, approved by the management, which is to bring the enterprise from the current state to the target state. At this stage, the process of verifying solutions that are possible to be realized and implemented takes place. The aim is to achieve processes consisting mainly of value-adding activities.

Of course, before starting the VSM preparation, it is necessary to collect the appropriate amount of data, i.e. the number of employees in a given process step (full time equivalent – FTE), processing time of the unit (i.e. one complaint), what

percentage of cases are "processed" and forwarded to the next step in the process without any problems (right first time – RFT), i.e. how many parcels are dropped at once (batch size) or information, how many percent of the time an employee or machine is in production mode (up time). Preparation of VSM and process analysis (each product – separate VSM) allows to observe the activities occurring in the process that do not add value to the product (non-value added – NVA), but at the same time allows to indicate activities with added value and measure their duration. Considering that the goal of LM is to deliver value to the end customer by streamlining the ongoing processes, basically none of the implementations can take place without VSM.

### 3.3. FMEA

FMEA is a tool that allows to analyze the causes and effects of waste in the form of failures or defects in the production process. Initially, the analysis was used in the military sector, successively in high-tech industries and then in many sectors of the economy, including services, contributing to the detection of threats that expose the client to, for example, suffering financial losses or inappropriate treatment (Hamrol, 2017, p. 67). ). Thanks to the use of the FMEA method, it is possible to subject the product or process to subsequent analyses, and then to introduce, on the basis of the obtained results, improvement actions aimed at effective elimination of the sources of the defects. Most often, the FMEA analysis concerns a product/structure or a production process (Pałubicki & Kukiełka, 2017, p. 257).

The product's FMEA is primarily aimed at optimizing product reliability. As a result, we obtain information about the strengths and weaknesses of the product. In addition to preventive measures, it allows to specify actions that should be taken when the product leaves our company, e.g. during transport or in the service. Process FMEA is used in the initial phase of designing technological processes, before starting serial production (production planning) and in serial production to improve processes that are unstable or do not provide the required performance. Product FMEA can be used at various stages of product development (Soliński, 2011): product concept, before implementation into production, during product implementation on an industrial scale, production and operation. The process FMEA is conducted to identify factors that may lead to possible disruptions to the manufacturing processes. These factors may be related to processing methods, processing parameters, measuring and control means as well as machines and devices. FMEA prioritizes key resources for defined waste and identifies risk associated with a sub-element of each failure mode for lean application. It gives a chance for a quick and agile reaction to irregularities in the process and product.

### 3.4. Just in Time

The technique comprising complete elimination of waste by providing each production process with all the necessary elements in the required time and quantity is JiT. The JiT principle assumes that "stock is a waste". Inventory is treated as incurring a cost or a waste instead of adding and storing value. According to the JiT, the company should strive to eliminate inventories, as they are a waste. Ideally, the product should be delivered when the company needs it, without any deviation from the agreed date. JiT is the most famous and widespread method of production management, where three conditions for batch delivery for production are set, and it is about (Horzela & Semrau, 2020, p. 42): adding what is needed, adding when it is needed and adding exactly as needed. The JiT concept is characterized by four main assumptions: zero defects, high quality, zero inventory, frequent small refills of individual goods and a short order fulfillment cycle. In JiT, material flow is controlled in accordance with three basic principles (Szymonik, 2012, pp. 90-91):

- decentralized system of the tasks' implementation and ordering control,
- the production process is carried out from the material stream phase upwards, according to the pull principle from the previous production cell,
- in the case of shift and day production, scheduling of final assembly.

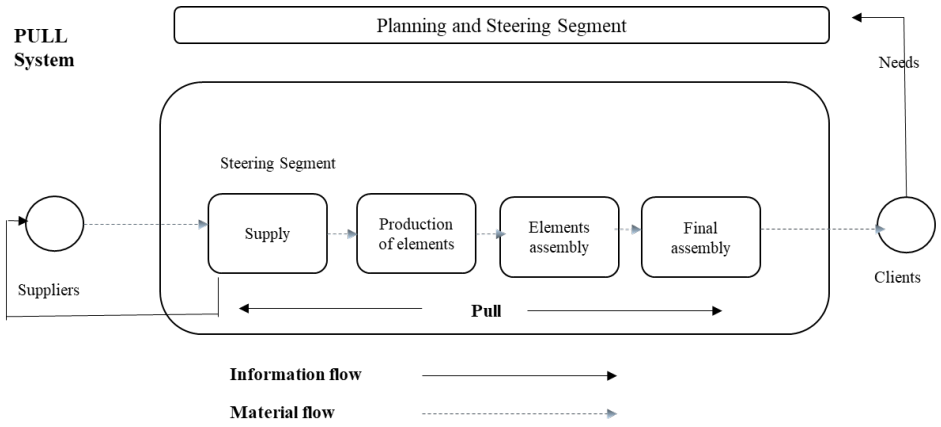


Figure 12.1. Material flow control in the Just in Time system
Source: (Horzela & Semrau, 2020, p.42).

The method that enables efficient operation of the above-mentioned tools and methods is TPM, being a support of efficiently applied and working JIT technique.

### 3.5. TPM

Total Productive Maintenance (TPM), i.e. proper machine maintenance, is a method by which we can maximize productivity and ongoing maintenance of tools and equipment. In TPM, the goal is to minimize losses during production related to breakdowns or malfunction, as well as to maximize the efficiency of production equipment, which is the effectiveness of machines and devices, measured by the OEE (overall equipment efficiency) indicator. The TPM method is divided into three areas (Horzela & Semrau, 2020, p. 46):

- preventive maintenance - it is performed if it is possible to predict the failure,
- autonomous maintenance - meaning that maintenance is performed by a team of workers as part of their work schedule,
- scheduled maintenance - related to heavily operated or high-risk parts that must be regularly replaced or maintained, this type of work must be planned as the tools, parts or equipment must be taken out of service.

Through actions taken in individual pillars of TPM, the highest degree of machine efficiency can be achieved, which is manifested by reaching the level of three zeros: zero failure, zero deficiencies, zero accidents at work. The 8 pillars that make up TPM are shown in Figure 12.2.

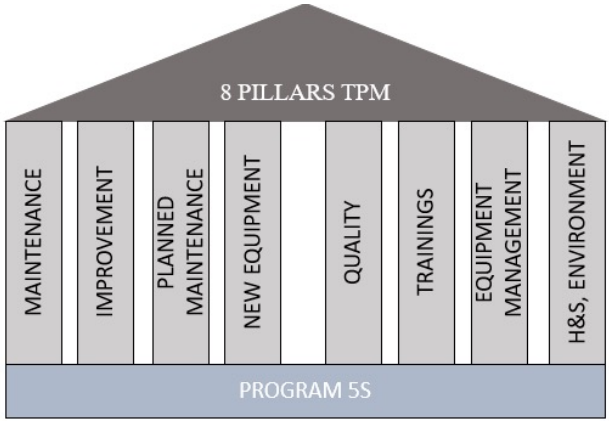


Figure 12.2. TPM Pillars
Source: (Golonka, 2022)

As shown in the figure above, the basis of TPM is the 5S principle. TPM pillars will not have a solid foundation and will not achieve their intended goals without the implemented stable 5S (Furman, 2014, p. 250). This tool is used to create an optimal workplace and its name is an acronym for five Japanese words:

- Seiri – choice - we separate all materials (instructions, tools) from each other at the workplace and remove unnecessary things,
- Seiton – ordering - we designate and label tools and their parts,
- Seiso – cleaning – removing dirt, laying, cleaning, restoring the workplace,
- Seiketsu – standardization - constantly keeping the workplace tidy, clean and tidy (here we go smoothly to the next tool),
- Shitsuke – self-discipline/self-improvement - keeping the improvements introduced in the workplace. To this end, it is imperative that all employees participate in 5S activities and that they become part of their work.

The above indicated pillars of TPM cover the entire enterprise management process. Autonomous UR engages the entire production staff in the effective use and maintenance of machines. It consists in transferring the simplest works and activities related to the technical maintenance of equipment from the maintenance department to the operators. The condition for efficient implementation of the autonomous UAV is a thorough knowledge of the operated machine, knowledge of its operation and the basics of its structure. Improvement is a process within which the Kaizen philosophy is used. Planned maintenance and planning of new machines and devices constitute a standardized process of managing the machine park and the necessary resources, so as to effectively reduce the frequency of failures and reduce the time of failure. Quality assurance is the use of tools and solutions related to the operation of machines, which will allow to maintain the best possible quality of the final product. Another pillar, training, is an indispensable element of the continuous improvement of employees' qualifications, increasing their competences. Managing the machine park is one of the most important components of the company's fixed assets, which requires that the activities undertaken in its scope be directed at effective, economical and stable management of machines throughout their life in the plant, from the design/purchase phase through implementation, use to getting rid of them. The last pillar is the health and safety system, which allows you to maintain a high level safe operation of machines and the work environment.

## 4. Own Research Results

The choice of the Lean Management concept as a way to carry out restructuring and changes in the enterprise must be carefully considered by the company's management. The company's management must be aware of the risks, the enormity of work and the change in the way of thinking among employees of the entire company. The LM concept cannot be used in all enterprises because the conditions in which a given organization operates may not be favorable to it, so the organization will make a mistake and adopt an incorrect development

and change strategy. The decision to choose the lean management concept is best discussed with specialists and industry consultants (Golarz, 2016).

An electronic questionnaire with the use of email communication was used as a research technique. The conducted research was run as a pilot and preliminary examination, during which data and information were obtained that subsequently became the basis for further questions and research works on the issues raised. The questionnaire consisted of 24 questions, divided into 7 sections, in which the questions respectively related to work experience, general knowledge of the LM concept, knowledge of the tools used in LM, training in LM or personal opinions on the benefits and barriers encountered in LM during the implementation of LM. 18 people were selected for the study, and finally answers were received from a total of 8 respondents, of which 4 respondents came from consulting companies, and 4 worked in production plants implementing LM. Respondents in consulting companies worked as CEO and Senior Consultant, Business Unit Director and Multiple Projects Coordinator. Company employee respondents include the CEO, chief operating excellence officer and two plant managers in multinational corporations. Each of the respondents worked professionally with LM issues, and so: four respondents (50%) had contact with LM principles for more than 10 years, three of them for 5 to 10 years (37.5%), and one of them has been involved in Lean for less than 3 years (12.5%). While in the case of respondents working in consulting companies with experience in implementing LM concepts in several enterprises, in the case of respondents who are employees of enterprises, their experience was mostly limited to this one enterprise. The distribution of professional experience of respondents with Lean issues is presented in Figure 12.3.

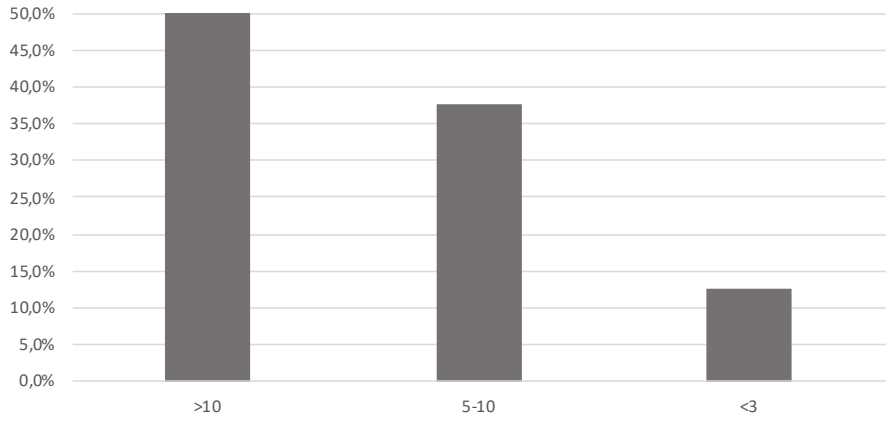


Figure 12.3. Respondents' experience in working with the lean concept
Source: own study based on the responses to the survey

Questions regarding the knowledge of LM tools and the answers obtained reveal an extensive knowledge of these tools among the consultants and the expected lower level of knowledge on the part of the production group of respondents. Moreover, the list of tools known and used by consultants is very extensive, while the list of tools used by the production group is smaller than the list of known tools. A very significant difference can be seen in the definition of the most important tools to be applied: again consultants tend to refer to „high level" tools (implementation of cost-performance analysis, strategic analysis), while the production group is more oriented towards basic problem solving and applied tools. directly in production, such as TPM.

LM tools and methods widely described in the literature do not cover all the existing Lean Management business models that are used by consulting companies. Consulting companies usually help develop custom Lean Management models that can be put into practice in an industrial environment. Table 12.2 presents the obtained indications in the field of tools used by consultants and employees.

Table 12.2. Questions about the tools used during the LM implementation

| Question Respondent | LM uses some „ improvement tools". Can you name these you know? | Name all used LM tools |
|---|---|---|
| CEO, senior consultant | PDCA, 5W1H, 5 WHY, 5S, Kaizen, TPM, visual management, VSM, poka yoke, OPL (one point lesson) checklist, 4M, 5 no defect condition, PPA (process point analysis), one piece flow, OEE, chart spaghetti, a way to educate people, SMED, kanban. | PDCA, 5W1H, 5 WHY, 5S, Kaizen, TPM, visual management, VSM, poka yoke, OPL (one point lesson), checklist, 4M, 5 no defect condition, PPA (process point analysis), one piece flow, OEE, spaghetti chart, way to teach people, SMED, kanban |
| Business Unit Director | All | All |
| Multiple Projects Coordinator | All | All |
| CEO | TPM, 5S, SMED, Kaizen, Problem solving, Daily management, target implementation. It depends on the type of process and production. There is process control, problem solving. Good troubleshooting tools everywhere, 5S, cleaning. High-quality tools or maintenance depending on the process | As above |
| Operational Excellence Director | Kaizen, TPM, 5S, Kaikaku, VSA, standardization, suggestions system | As above + some others |
| Plant Managers | 5S, spaghetti chart, VSM, PFEP, TPM, SMED, quality circles, suggestions system, kaizen | quality circles, SMED, VSM, Kaizen, TPM |

Source: own study based on the responses to the survey

The multitude of tools that can be used during LM implementation may introduce a problem with choosing the right solution. The degree of use of individual tools is shown in Figure 12.4.

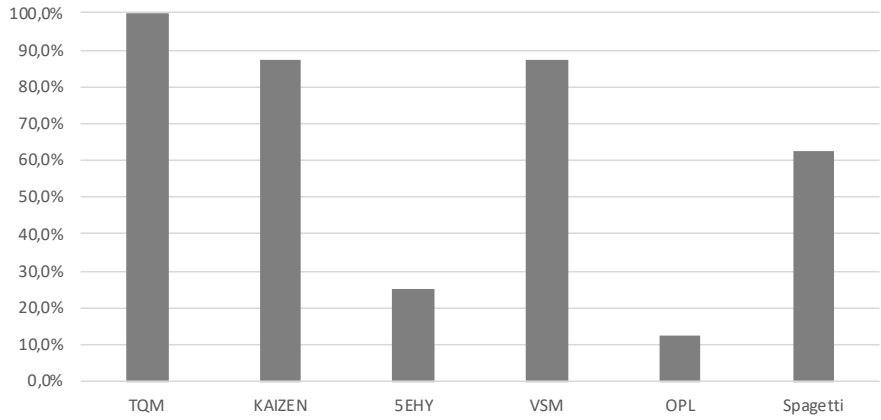


Figure 12.4. LM tools indicated by respondent as used by them
Source: own study based on the responses to the survey

In addition to identifying the tools themselves, the respondents also pointed to the need to properly select them: „target implementation depends on the type of process and production". As a result of the implementation of LM, it is expected that it will bring benefits, therefore the questionnaire asked about the benefits as well as the difficulties that respondents encountered during the implementation, and the obtained indications are included in Table 12.3.

Table 12.3. Benefits and difficulties as a result of LM implementation indicated in the LM survey

| Question Respondent | Name main advantages from LM system implementation | Describe main difficulties you encountered during LM implementation |
|---|---|---|
| CEO, senior consultant | I have experienced amazing results that were never achieved in the previous stage of activity: it is possible to produce (or deliver a service) in a more efficient and effective way, with high quality and optimal level of service, responding to all market/customer requirements in terms of value creation. | The main difficulty stems from "cultural change": LM is not a tool, it's a new way of doing business! (very often the understanding of LM is about a set of tools, not a vision). |
| Business Unit Director | Discovering the possibility of obtaining a lean enterprise and, consequently, transforming LM into a business model and gaining a competitive advantage in the market. | Focus on short-term outcomes without a clear and comprehensive vision. |

table 12.3 cnt'd

| Question Respondent | Name main advantages from LM system implementation | Describe main difficulties you encountered during LM implementation |
|---|---|---|
| Multiple Projects Coordinator | Engaging people in delivering results that reflect the company's goal. It is not a sterile technique that can be used to obtain results, but a form of organizational culture. | The main difficulty is related to past failures that have demotivated people. |
| CEO | Optimization of the company's resources and financial results. Optimization of human resources implementing strategies more effectively and having job satisfaction. | The consistency of the company to promote the same level of attention and commitment in all market conditions. When faced with difficulties, there is a tendency to break down instead of increasing the emphasis on reducing waste. |
| Operational Excellence Director | Process optimization. | Clarification that LMS implementation will generate layoffs and the resources freed will be used as Lean trainers for further improvement, not laid off (trade union problems). |
| Plant Managers | More than economic benefits, it has an impact on culture, method, and structured controls. By gradually introducing the concept, you can then explain the global vision that is made up of individual tool. | Barriers in the initial phase in the first line of management, cultural barriers. Lack of vision, unfamiliarity with the system. |

Source: own study based on the responses to the survey.

Obtained answers reflect the belief that the implementation of LMS is more of a cultural change than a simple list of technical achievements, implementation of new management tools, and the answers focus on: creating value, competitive advantage in the market, employee involvement in changing the corporate and work culture, human resources satisfaction, working methods. Often, what is a benefit on the one hand, on the other presents the greatest difficulty to overcome. The respondents indicated the lack of knowledge and training as a difficulty encountered during the implementation: „barriers in an LM start-up in the first line of management, cultural barriers. Lack of vision, ignorance of the system „mismatch between different levels of the structure of the company (organization), no vision of the top management." Unequivocally, the lack of commitment and determination at all levels of the organization is an indication of the reasons for failure and failure in implementation. All the barriers and difficulties mentioned by the respondents can be confirmed in the literature. Griffin distinguished four reasons for resistance to changes, the understanding of which is the basic element of change management in a company (Griffin, 2005, pp. 398-399):

- uncertainty - employees' anxiety and worry about new requirements; a sense of threat to the security of workplaces and an uncertain future,

- threat to personal interests - some changes may threaten the personal interests of some managers, which may be related to a reduction in their power or influence in the organization,
- different perceptions - people can oppose changes because they perceive a given situation differently than the manager,
- feeling of loss - some of the changes are related to work process modifications that disrupt the existing social connections; social relations are very important in any enterprise; therefore their violation may automatically generate resistance; therefore, changes can threaten factors such as status, power, security and self-confidence.

Moreover, all respondents indicate that the implementation never ends, which is also confirmed by one of the basic theoretical assumptions of LM. The following measures were indicated as remedial measures: resumption of the analysis, according to the Deming circle principle, escalation to the top management of the company, intervention of a sensei[2].

## 5. Conclusion

The wealth of Lean Management techniques allows them to be flexibly adapted to the size of the company, industry or the level of development of the company's current needs. However, success is determined by the identification of the impact of tools, their development and continuous self-improvement of innovative effects with the correct recognition of customer needs (Janiszewski & Siemieniuk, 2012, p. 62). The company must be aware of the consequences and possible effects of choosing a particular approach. The choice of approach should be adapted to the environment in which it operates and scrupulously follow all recommendations and principles assigned to a given approach. Successive implementation of the lean management concept, despite the risk and the enormous amount of work and knowledge, is able to bring the company tangible benefits (Golarz, 2016, p. 68). A properly organized information system on the goals and values of the enterprise as well as the assumptions and effects of the continuous improvement system is one of the factors of the successful functioning of this system (Walentynowicz, 2014, p. 38). This is confirmed by the results of a pilot survey, in which 87.5% of the respondents indicate the need to maintain the continuity of learning and emphasize that the implementation „never ends".

[2] Sensei, master and teacher of Lean knowledge and principles (Sayer & Williams, 2007, p. 98).

## Bibliography


1. Czerska, J. (2014). *Podstawowe narzędzia lean manufacturing lean manufacturing basic toolbox*. Gdańsk: LeanQTeam.
2. Dudojć, D. (2022). Implementacja lean management w organizacji w aspekcie prakseologicznej oceny sprawności działania. Wrocław: *Prace Naukowe Uniwersytetu Ekonomicznego we Wrocławiu*, *66*(1), 30-46 .
3. Golarz, M. (2016). Lean management jako jedno z narzędzi restrukturyzacji przedsiębiorstwa. *Journal of Modern Management Process*, *1*(1), 59-69.
4. Griffin, R.W. (2005). *Podstawy zarządzania organizacjami*. Warszawa: PWN.
5. Golonka, P. (2022). Total Productive Maintenance – Totalne Utrzymanie Ruchu. Access 29 August 2022 from http:// https://leanactionplan.pl/tpm/.
6. Hamrol, A. (2017). *Zarządzanie i inżynieria jakości*. Warszawa: PWN.
7. Horzela, A. & Semrau, J. (2020). Koncepcja lean manufacturing jako narzędzie doskonalenia procesów produkcyjnych. Access 28 August 2022 from http:// researchgate.net.
8. Janiszewski, J. M. & Siemieniuk, K. (2012). Lean management jako koncepcja wspomagająca zarządzanie innowacjami w przedsiębiorstwie. *Studia i Prace Wydziału Nauk Ekonomicznych i Zarządzania*, *30*, 49-64.
9. Koźmiński, A. K. (2004). *Zarządzanie w warunkach niepewności*. Warszawa: PWN.
10. Krafcik, J. F. (1988). Tryumph of the Lean Production System. *Management Review*, *30*(1), 41-51.
11. Kryś, P. (2016). Kaizen w przedsiębiorstwie. *Zeszyty Naukowe Uniwersytetu Przyrodniczo-Humanistycznego w Siedlcach*, *109*, 135-142.
12. Lean Action Plan. (Sierpień,2022). TPM – Metodologia prawidłowego utrzymania maszyn. Access 29 August 2022 from https://www.leanactionplan.pl/tpm/.shtml.
13. Liker, J. K. & Meier, D. P. (2011). *Droga Toyoty Fieldbook. Praktyczny przewodnik wdrażania 4P Toyoty*. Warszawa: MT Biznes.
14. Lisiński, M. & Ostrowski, B. (2006). *Lean management w restrukturyzacji przedsiębiorstwa*. Kraków-Kluczbork: Antykwa.
15. Oehmen, J. & Rebentisch, E. (2013). Waste in Lean Product Development. LAI Paper Series "Lean Product Development for Practitioners". MIT I LAI MIT. Access 30 August 2022 from https://www.researchgate.net/publication/279844585_LAI_Paper_Series_Lean_Product_Development_for_Practitioners_Waste_in_Lean_Product_Development.
16. Pałubicki, S. & Kukiełka, K. (2017). Zarządzanie jakością w wybranym procesie produkcyjnym z zastosowaniem metody FMEA. *Autobusy: technika, eksploatacja, systemy transportowe*, 7-8, 256-261.
17. Pavnaskar, S. J. & Gershenson, J. K. & Jambekar, A. B. (2003). Classification scheme for lean manufacturing tools. *International Journal of Production Research*, *41*(13), 3075-3090.
18. Sayer, N. J. & Williams, B. (2007). *Lean for Dummies*. Publishing Inc.
19. Sayer, N. J. & Williams, B. (2015). *Lean dla bystrzaków*. Gliwice: Helion.
20. Soliński, B. (2011). Metody zarzadzania jakością. Access 29 August 2022 from https:// http://www.zarz.agh.edu.pl/bsolinsk/fmea.html.

21. Smart Lean. (2022). Narzędzia Lean Management. Access 29 August 2022 from https://smartlean.pl/vsm/.
22. Smart Lean. (2022). Narzędzia lean w praktyce. Access 29 August 2022 from https://smartlean.pl/narzedzia-lean-management/.
23. Szymonik, A. (2012). *Logistyka produkcji*, Warszawa: Difin.
24. Taiichi, O. (2008). *System produkcyjny Toyoty. Więcej niż produkcja na dużą skalę*. Wrocław: Wydawnictwo ProdPress.com.
25. Tapping, D. (2003). *The Lean Pocket Guide*. Warszawa: MCS Media.
26. Walentynowicz, P. (2014). *Uwarunkowania skuteczności wdrażania Lean Management w przedsiębiorstwach produkcyjnych w Polsce*. Gdańsk: Wydawnictwo Uniwersytetu Gdańskiego.
27. Womack, J. P. & Jones, D. T. (1996, 2003). *Lean thinking*. New York: Simon & Schuster.
28. Womack, J. P. & Jones, D. T. (2001). *Odchudzanie firm: eliminacja marnotrawstwa kluczem do sukcesu*. Warszawa: CIM.
29. Womack, J. P. & Jones, D. T. (2007). *Zobaczyć całość. Mapowanie rozszerzonych strumieni wartości*. Wrocław: LEIP.
30. Womack, J. P. & Jones, D. T. (2008). *Lean thinking – szczupłe myślenie. Eliminowanie marnotrawstwa i tworzenie wartości w przedsiębiorstwie*. Wrocław: Wydawnictwo ProdPress.com.

Chapter 13

# The Place of the Marketing Department in Corporate Architecture

Marcin Szplit

## 1. Introduction

This paper presents the place and role of the marketing department in the enterprise that is establishing service-oriented architecture. Recent progress towards realizing the connection of software architecture and marketing-centric control is reported in this paper. This study aims to increase understanding of how development processes are tailored to meet the needs of software development and creation of good working enterprise structure.

## 2. State of the Art

As part of company management, IT management in achieving the organization's goals is becoming increasingly visible as an added value while balancing risk against ROI for IT and its processes. IT management is integral to the success of managing a business by providing efficient, effective, and measurable improvements to related business processes.

IT management provides a structure that connects IT processes, IT resources and information with the company's strategy and goals. Moreover, IT management integrates and formalizes good practices in planning and organizing, acquiring, and implementing, delivering, and supporting, and monitoring IT performance to ensure that the company's information technology supports business goals.

IT management allows the company to fully use its information resources, and thus to maximize profits, to take advantage of favorable circumstances and gain a competitive advantage.

Following the architecture definition of ANSI/IEEE Std 1471-2000 Enterprise Architecture can be understood as the formal description of the structure

and functions of the corporation's components, interconnectedness between these components and principles and guidelines regarding design management and the change of these components over time. (Schelp, J., Aier, S., 2009)

Corporation components - component elements of corporations, both at the business, data, application, and technical levels. These can include processes, data structures, applications as well as specific IT solutions (software and hardware).

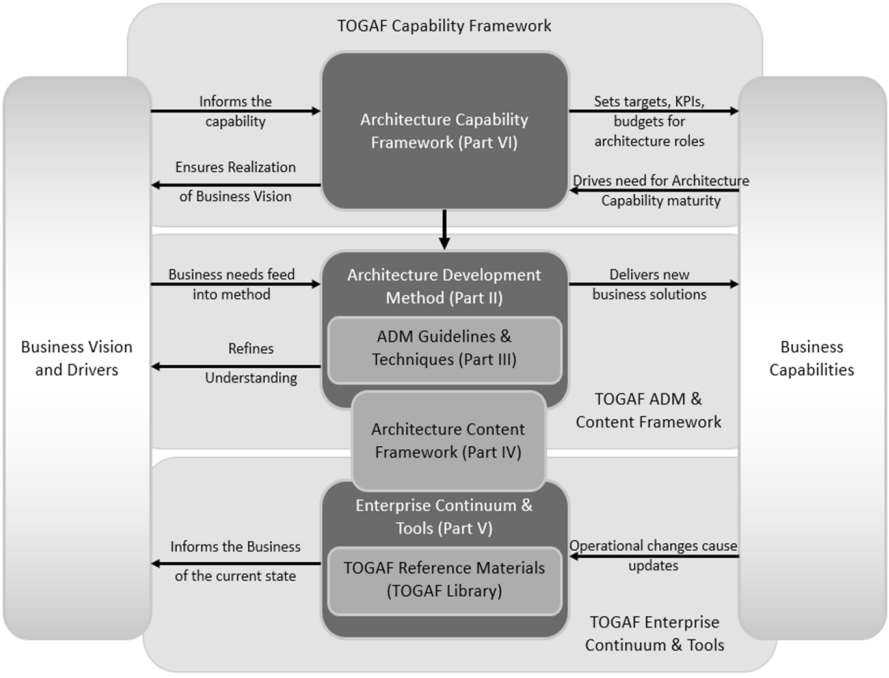


Figure 13.1. A model showing in which activities within TOGAF the corporate architect works, realizing the strategic goals of the company

Source: https://www.opengroup.org

Principles of corporate architecture – a set of basic, permanent principles based on the organization's development strategy and representing the overall needs of the organization in terms of creating its IT solutions.

Enterprise Architecture is positioned between business and IT and must serve both; and it is regarded as a mechanism for contributing to agility, consistency, compliance, efficiency, and sustainability.

Standardization efforts like the TOGAF (Aier, S. & Schelp, J., 2010) offer means establishing Enterprise Architecture processes. TOGAF is a methodology and framework of Enterprise architecture that has been proved and can be

used by various types of organizations whose function is to improve business efficiency (Mueller, T., Schuldt, D., Sewald, B., Morisse, M., & Petrikina, J., 2013). Corresponding efforts e.g., like CobIT [The Open Group: TOGAF (The Open Group Architecture Framework) Version 9, 2009] increase governance maturity and ensure well defined interfaces to related IT management fields — governance, IT strategy, business/IT alignment etc. However, although EA is spreading among practitioners, it still seems to be immature in practice.

A frequently used approach to assessing architectural maturity is the method referring to the EFQM Excellence Model (The EFQM Excellence Model). This model consists of nine components:

1. Leadership – the component defines how the board / management behaves and operates, to inspire and cause cultural change.
2. Policy and strategy – the component determine whether policies and strategies are formulated, verified, and improved.
3. Personnel management – the component defines how the organization releases its full potential of the employed personnel.
4. Resources – the component defines how financial, informational, material resources and the technologies used are effectively used to support policy delivery and organization strategy.
5. Business processes – the component characterizes how critical processes are applied and controlled to ensure the continuous improvement of the organization.
6. Customer satisfaction – the component considers how the customer assesses the quality of the received products and services.
7. Employee satisfaction – the component defines how employees evaluate the benefits from employment in each organization and own contribution to its development.
8. Impact on the environment – the component defines the relationship between the organization and the local community and its impact on the natural environment.
9. Business results – the component considers the extent to which the organization achieves the planned goals.

The EFQM model, adapted to the architectural specifics, covers all the most important areas of its operation and determines what requirements should be met in these areas. Thanks to that, it can serve as a comprehensive self-assessment tool and at the same time a model of excellence, which should be pursued by taking appropriate actions in each of the distinguished areas. Self-evaluation makes the architectural organization aware of its strengths and allows it to identify areas to be improved (Sobczak, A.,2013).

## 3. Enterprise Architecture Success Factors

Four groups of factors could be identified over time: *Contextual factors* describe the general corporate environment. *Structural factors* describe the architectural power and its impact in the companies. *Process characteristics* describe the working mode of architectural influence in the companies. Finally, factors influencing the *architectural leverage over time*.

Table 13.1. Potential Enterprise Architecture factors for Enterprise Architecture implementation success

| Factor group | Individual factor | Description |
|---|---|---|
| Contextual factors | size of company/architecture | size of company; number and size of resulting architecture models used |
| Structure | architectural power | How strong are formal and informal architectural power and the resulting impact? |
| Process | rules and EA processes | What are the instruments to enact architecture within projects? |
| EA over Time | EA marketing | "marketing" measures to raise architecture attention and architecture sensibilization |

Source: own work based on Aier, S., & Schelp, J., (2010). *A Reassessment of Enterprise Architecture Implementation* In: Dan, A., Gittler, A., F., & Toumani, F. (eds) *Service-Oriented Computing*. ICSOC/ServiceWave 2009 Workshops. ServiceWave ICSOC 2009 2009. Lecture Notes in Computer Science, vol 6275. Springer, Berlin, Heidelberg. https://doi.org/10.1007/978-3-642-16132-2_4

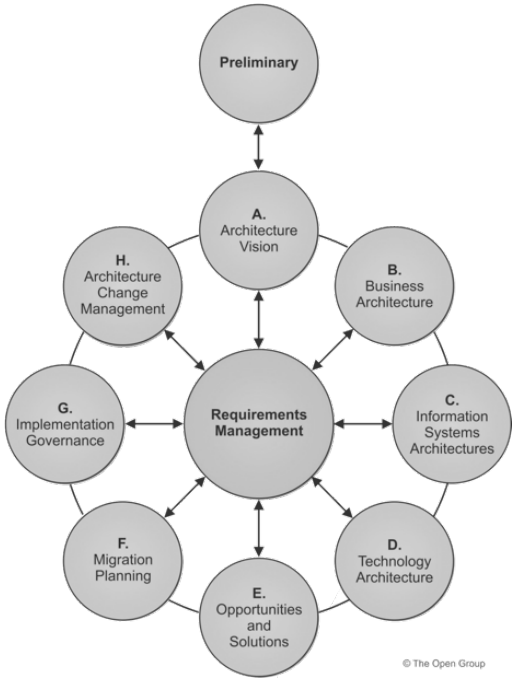


Figure 13.2. Architecture Development Cycle
Source: https://www.opengroup.org

## 4. Marketing Department and Enterprise Architecture

When working together, Enterprise Architects and Marketers can create a powerful customer experience and influence enterprise-wide development roadmaps. However, IT and Business Architects that can adapt to the life of a marketing manager, understand in-depth customer journeys and customer experience, while at the same time master technology, business design and overall enterprise architecture, are rare.

Traditionally, marketing organization think enterprise architecture plans make life difficult. However, structured enterprise architecture planning makes marketing more agile, robust, and scalable in creating better customer experiences.

Compared to marketing managers, enterprise architects have better ability to influence long term enterprise roadmaps. By influencing technology roadmaps and enterprise processes, it is possible to make complex marketing configurations and empower rich customer experiences. For example, IT Architects can have a vital role in the application integration to ERP and Master Data Management (MDM). If data structure of the product item needs to be enhanced, IT Architects can agree this with various departments e.g., sales, customer service and logistics. In this way architecture planning can enable data to flow seamlessly from one system to another. This means that customers can access rich and real time information related to their product of interest.

Updating technology and applications roadmaps normally also means the need to enhance enterprise capabilities. Capabilities can be associated with people and knowledge, or tools and technologies. Even though architecture planning is traditionally focused on applications and on the technical side of IT, there is a new breed of architects that are focused on business processes and business design. These business architects are normally fully empowered to analyze capability development needs and roadmaps.

Business architects can utilize capability frameworks and maps that make it easy to detect critical development needs. This is a work and a process that marketing departments have typically not done. Below is an example of a simplified capability map that empowers marketing to discuss digital transformation capabilities with the top management. With these maps, it is easy share comments and form a harmonious view without political battles. By using various colors, it is easy to highlight what is the current situation but also what are strategically important capabilities to be developed.

There are many historical reasons why marketing and IT Architects are distant from each other. The reasons include job descriptions, development time span, professional personalities, and budgets.

The major reason is that the job roles and descriptions are written in separate departments. If we look at job descriptions, Enterprise Architects are traditionally not focused on customer life cycle journeys, customer behaviors and channels; those aspects in which marketing is considering to be critical for success. Instead, IT Architects have tried to create order from chaos with various applications and processes. They draw structured flowcharts, diagrams, make process descriptions.

*Time span* of looking at development needs are different in marketing and IT. Often, the marketing department wants to implement things immediately while architects try to evaluate best long-term options. Normally marketing manages applications that are easy to upgrade or change e.g., marketing automation. IT manages applications that are only upgraded a few times a year and often require waterfall development methods.

*Marketing budgets* often reside directly under the influence of the sales and marketing organizations. Marketing budgets are more flexible than traditional ones, for example ERP related IT budgets. Therefore, IT architects have not been in daily contact with the marketing organization. The marketing organization needs to jointly define clear role descriptions, provide sufficient mandate, and find right competences to complement each other's capabilities. [Kanerva K. 2018]

Enterprise Architect's role descriptions need to be clear. This is the start of successful cooperation. Marketing management needs to sit down with the IT and business management to jointly plan the role. The role might include technology and solution evaluations, capability developments, roadmaps, integration planning and many others.

Marketing management should study what Enterprise Architecture including IT and Business Architecture means, what are possibilities and typical deliverables. This enables structured discussions between the marketing and IT functions.

## 5. Conclusion

Enterprise Architects need sufficient mandate from top management. This means that they need to feel confident when making suggestions and not having a feeling that someone will overrule the proposal. They should have a mandate to stop and change the IT landscape if the current architecture is not providing optimal business value. Without a real mandate, IT Architects start feeling alone and easily lean towards the rest of the IT organization.

The marketing department should think about existing competences and how an Architect could compliment these competences. In addition to tradition-

al IT Architect competences, those rare Business Architect individuals should be capable to analyze customer needs, explain various implementation alternatives in a simple way but also excel in presenting and communicating with top management.

## Bibliography


1. Aier, S. & Schelp, J., (2010), *A Reassessment of Enterprise Architecture Implementation* In: Dan, A., Gittler, F., Toumani, F. (eds) *Service-Oriented Computing*. ICSOC/ServiceWave 2009 Workshops. ServiceWave ICSOC 2009 2009. Lecture Notes in Computer Science, vol 6275. Springer, Berlin, Heidelberg. https://doi.org/10.1007/978-3-642-16132-2_4
2. Mueller, T., Schuldt, D., Sewald, B., Morisse, M., & Petrikina, J. (2013). *Towards inter-organizational enterprise architecture management-applicability of TOGAF 9.1 for network organizations*. Kidder, T. (1981). *The soul of a new machine*. Boston, MA: Little, Brown & Company.
3. The Open Group: TOGAF (The Open Group Architecture Framework) Version 9 (2009)
4. T. Governance Institute, http://www.isaca.org, Retrieved 15.09.2022
5. Sobczak, A. (2013), *Sposoby oceny dojrzałości praktyki architektonicznej w organizacji*, In *Oblicza architektury korporacyjnej*, https://www.andrzejsobczak.net/sites/default/files/architektura_e-book.pdf


## Conference Proceedings


1. N A Pratama and I D Sumitra 2019 IOP Conf. Ser.: Mater. Sci. Eng. 662 042025
2. Schelp, J. & Aier, S., (2009) SOA and EA – Sustainable Contributions for Increasing Corporate Agility. In: Proceedings of HICSS-42. IEEE Computer Society, Los Alamitos


## Websites


1. T. Governance Institute, http://www.isaca.org
2. https://medium.com/@KimmoKKanerva/https-medium-com-kimmokkanerva-marketing-meets-enterprise-architect-5bd73389b39f Retrieved 16.09.2022

Chapter 14

# Genesis of the Subscription Business Model and Its Acceptance in the Gaming Industry

Aleksandra Ryczko

## 1. Introduction

With consumers preferences constantly changing, businesses strive to find the optimal model for a given context. Recent years have witnessed a rise of popularity of subscription-based model that allows consumers to gain access to a product through a subscription instead of purchasing it (Lee et al., 2016). Fueled by ICT developments and common Internet availability, subscription model shifted consumers' attitudes towards consumption and ownership (Ziobrowska, 2017). It is a key element of the sharing economy (Ritter & Schanz, 2019) based on a concept that access to goods and services is more important than possessing a product. The subscription model expanded to many markets (Andonova et al., 2021), one of them being the video game market. As its worth steadily grows, being projected to reach US$208.60bn in 2022 (Statista, 2022a), new ideas of monetization occur. Consumers of video game subscription services pay a monthly fee to gain access to a vast library of games, with subscriptions being available on virtually any device.

Extensive research has shown that there are no studies describing subscription-based business model in the video game industry even if there are many works that examine subscription model and video games separately. Meanwhile, research in this area is desired as the dynamic growth of the video game industry coincides with the emergence and expansion of new business models. Hence, the aim of this paper is to fill the above mentioned research gap by exploring the genesis and adoption of a subscription business model on the video game market. By examining gamers' perceptions of particular video game subscription services, the model adoption and popularity will be investigated.

The paper is structured as follows. We begin by outlining the subscription-based business model and describing subscriptions on the video game market. In

the next part, we describe methods used in the study. Then, selected outcomes of a consumer survey are presented. Conclusions and practical implications make the last section.

## 2. Literature Review

A subscription-based business model works on the basis of a monthly fee, paid by consumers to gain access to goods or services. The most popular examples include content subscription services, such as music streaming (e.g. Spotify, Apple Music) or video streaming (e.g. Netflix, HBO GO). They provide consumers with real-time access to a library of digital content without transferring ownership of the content (Sim et al., 2022). For consumers it is a convenient, lower-cost and often personalized way to gain access to content they enjoy. From the company's point of view, subscription-based video streaming became a main revenue driver in the home entertainment industry (Yu et al., 2022). The increasing popularity of the subscription has not gone unnoticed by consumer goods manufacturers and retailers, such as Sephora that introduced Play! beauty boxes in USA, or P&G, which started offering Gillette on Demand, a shaving razor subscription (Chen et al., 2018). The model of a subscription-based business became so popular that even meal kits (e.g. HelloFresh), apparel (e.g. Fabletics) or pet supplies (e.g. PetBox) became available on a subscription basis (Andonova et al., 2021).

Adoption of subscription models is strengthened by constant changes in consumer attitudes and lives. Consumers became increasingly present in an online environment, especially during COVID-19 pandemic, when the world suffered a prolonged lockdown that stopped the majority of human activities but made information technologies more important than ever (Mejía-Trejo, 2021). With subscriptions, consumers are able to have a frictionless, convenient shopping experience. When they purchase a subscription, they place an order only once and then receive their products regularly. Moreover, consumers become increasingly conscious as they strive for independence and freedom in selecting the most satisfying options (Akbar & Hoffmann, 2018). They consider alternative ways of getting what they want. Their attitudes towards ownership and access have changed over time. They are aware that ownership brings obligations, responsibilities, and risk, which can all be avoided by just gaining access to a certain product or service (Schaefers et al., 2015). All of these shifts opened a way for the evolution of the sharing economy and access-based economy (Fritze et al., 2020).

Innovations in business models may result in a strong competitive advantage, stronger than innovations in products and processes alone (Tzuo, 2018). In many industries, subscriptions have fundamentally changed the rules or even

created a new kind of businesses (Schuhs et al., 2020), such as music and video streaming. Many businesses realized the potential and adopted the model, so they can stay competitive. This regards even the industries that theoretically do not fit the model. They are able to gain revenue from providing access to their content or products. For example, as consumers' habits shifted and many of them prefer not to own a car, subscriptions that allow reserving vehicles on demand were introduced by e.g. BMW or Volvo (Volvo Cars, 2022; Sixt+, 2022).

Service-like models have been embraced by creative industries – digitalization of music or cinematography has given way to monthly paid fees to gain access to music and film content offered by streaming services (Kowalkowski et al., 2017). As the entertainment industry increasingly turns to subscription service offerings, the subscription-based model has made its way to the gaming market (Dubois & Weststar, 2021). The digital market, where games are purchased and streamed over the Internet, became the go-to way to purchase games (Choi et al., 2018). Since there is no physical product to own in the first place, the difference for consumers between ownership and just having access to games is minimal. Subscriptions on the gaming market offer a library of games users can access for a monthly fee. It benefits consumers as well as game companies – publishers and game creators (Klimas, 2019). Consumers are able to play a variety of video games for a lower price than they would have to pay for separate titles. Publishers gain a steady revenue stream from monthly payments, while game creators get more publicity, which is especially good for small studios, as subscribers are more likely to play a game included in their subscription, even such one that they would normally ignore (Ashraf & Godwin, 2020).

Subscription services are very diverse, offered at different prices by various companies, with multiple games and additional benefits to choose from. They are available on consoles, mobile devices, and personal computers. The best known options for personal computers include Xbox Game Pass for PC, EA Play or Ubisoft+. Even Amazon has its share, as it introduced Prime Gaming subscription. Consoles have their own options as well, such as PlayStation Plus, Xbox Game Pass or Nintendo Switch Online. Information about these services has been taken from their official websites (Xbox Game Pass, 2022; EA Play, 2022; Ubisoft+, 2022; Prime Gaming, 2022; PlayStation, 2022; Nintendo, 2022). Depending on a selected device, consumers have many services to choose from, that offer different games in various price ranges.

## 3. Methods

Both primary and secondary data sources were used in the study. The latter were obtained through thorough literature studies. To find relevant works,

Internet databases such as Scopus, Science Direct, ProQuest, Google Scholar and EBSCO were researched. Keywords used for the search related to video games, subscription-based model and sharing economy. Additionally data about companies offering video game subscriptions were gathered online from the official websites.

As for the primary research, an online survey was selected as a method of data collection. It allowed gathering information about adoption of the subscription-based model on the video game market and popularity of subscription services among gamers. The link to the online survey was shared on social media, Instagram and Reddit, as well as on gaming Discord servers. There were 100 people in the convenience sample. Due to time and money constraints, the sample size was relatively small, but the exploratory nature of the study may prove it sufficient.

The survey was conducted online, mostly among gamers. The questionnaire included questions about respondents' gaming habits and preferences, as well as motivations and ways of using subscription services. Respondents were also asked to evaluate three selected subscription service platforms: Xbox Game Pass, EA Play, and Ubisoft+. Their users were also assessing their satisfaction level.

Based on the survey and literature review, adoption of the subscription-based model in the video game industry was assessed and is presented in the next section. As service-like models are making appearances in various areas, including gaming, the following research question is proposed: What factors influence consumers to purchase a video game subscription service the most?

## 5. Survey Results

The online survey about the popularity of video game subscription services was conducted on the Sphinx Declic platform. There were 100 respondents in total, 90 of whom play video games. When it comes to socio-demographic characteristics, most respondents were male (68%), between the ages of 21 and 26 (49%) and had a higher education (48%). The majority of respondents (53%) stated that their financial situation was good.

First, respondents playing games were asked if they heard about video game subscription service. 94% (N=85) of them answered positively. More than half of them (52%) stated that they use (or used) a gaming subscription service. Those ones (N=43) were questioned about how they pick a platform offering that service, and also to assess the importance of different factors that might influence their choice (Figure 14.1). 65% of them usually select a platform by comparing the games available in each option. Less than half of the subscribers compare prices across the services, while one third uses the trial period. More than a quarter

of the participants follow the choice of their friends and can play the games together. Only 14% of respondents have multiple subscriptions.

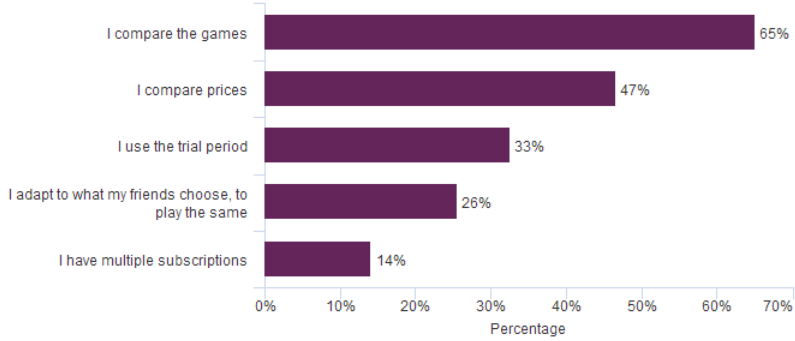


Figure 14.1. Ways of selecting a subscription service* (N=43)

*The numbers do not total to 100% as respondents could select more than one option.
Source: own calculations based on survey data.

Most of the participants declared that they purchase a video game subscription only when they are interested (55%). One third subscribe to a service every month, while only 9% of the respondents decided to purchase an annual package (Figure 14.2).

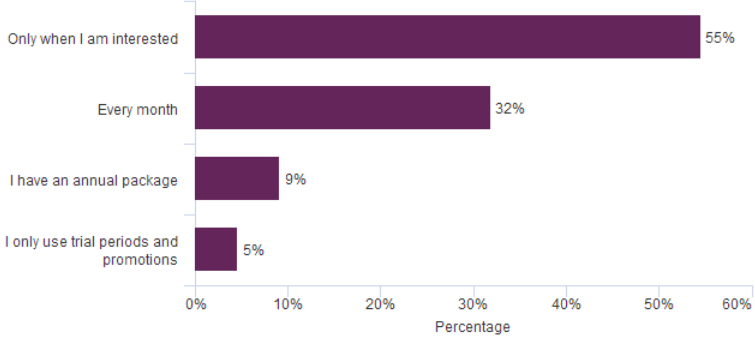


Figure 14.2. Frequency of purchasing a subscription service (N=44)

Source: own calculations based on survey data.

The biggest group of participants (43%) have used a subscription for over a year. Nearly a third of them indicated they have been using their subscription for less than 3 months.

When asked about factors that convinced them to subscribe for the first time, most of the respondents (79%) explained that the most important was availability of specific games that attracted their attention. Nearly two thirds of the re-

spondents signed up for a subscription service because a promotional offer, such as a free trial, was available. More than half use a subscription service due to its low cost (60%) and extensive game selection (58%).

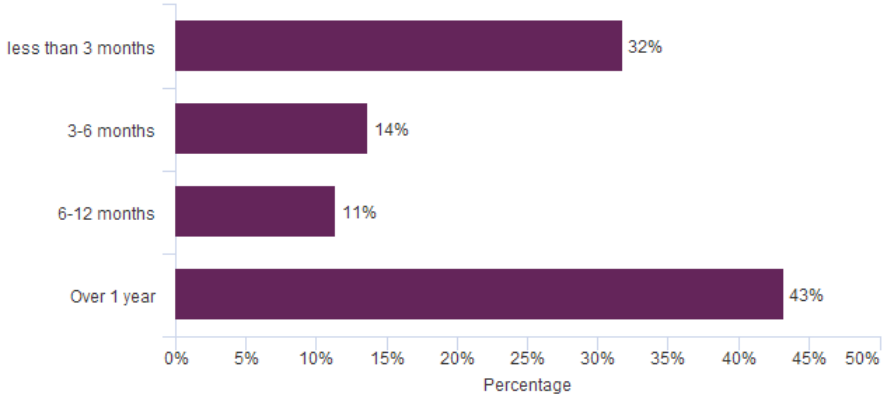


Figure 14.3. For how long consumers were using their gaming subscription (N=44)
Source: own calculations based on survey data.

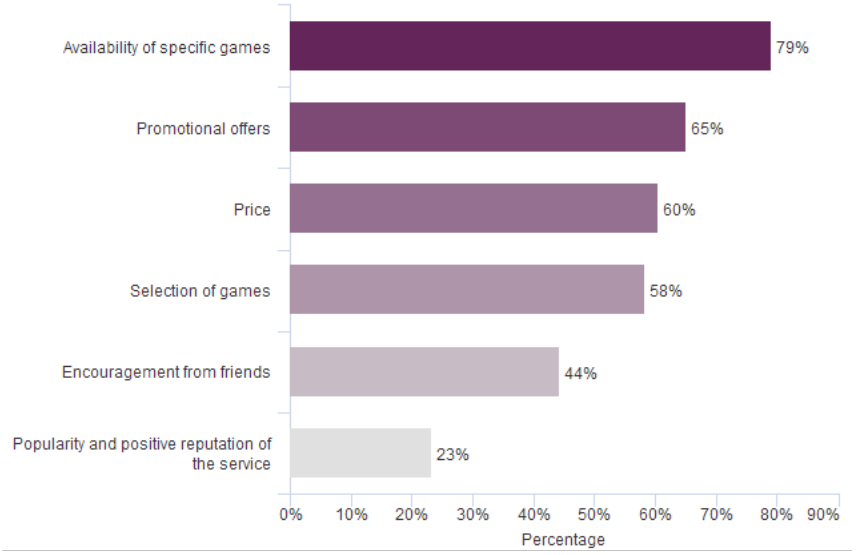


Figure 14.4. Reasons that convinced customers to subscribe to a gaming subscription platform for the first time (N=43)
*The numbers do not total 100% as respondents could select more than one option.
Source: own calculations based on survey data.

When asked about how much money they spend on a subscription monthly, a third of participants declared that they either spend between 5-10 EUR (32%) or between 10-15 EUR (34%). Only 9% of interviewees spend more than 20EUR.

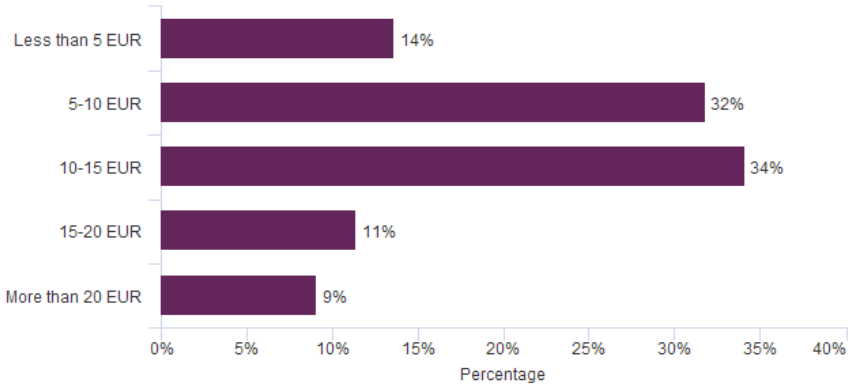


Figure 14.5. How much money consumers spend on video game subscription service monthly (N=44)
Source: own calculations based on survey data.

Questioned about which subscription service do they currently use, more than half of the respondents (59%) stated that they choose to subscribe to Xbox Game Pass. Nearly half of them (49%) currently has subscriptions for devices different than a PC – either consoles or mobile devices. Almost a third of the participants subscribes to Prime Gaming (31%), a fifth to Humble Bundle (Humble Choice; 21%).

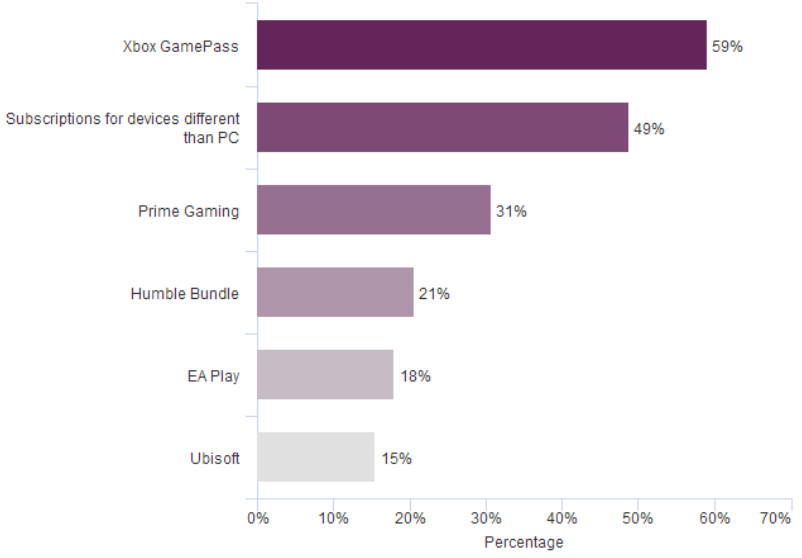


Figure 14.6. Currently used subscription services (N=39)
*The numbers do not total to 100% as respondents could select more than one option.
Source: own calculations based on survey data.

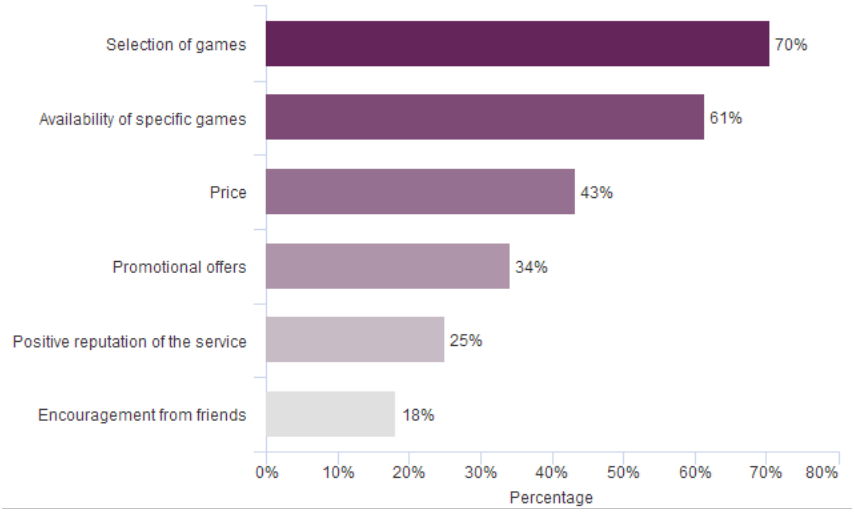


Figure 14.7. Factors that convinced consumers of video game subscription services to choose specific platforms (N=44)

*The numbers do not total to 100% as respondents could select more than one option.
Source: own calculations based on survey data.

Finally, respondents stated which factors convinced them the most to subscribe to services they chose. A vast majority (70%) indicated that the selection of games was the most important. Nearly two thirds of the participants chose a subscription service based on availability of specific games. Price was an important factor to 43% of the interviewees, while one third made their choice based on promotional offers. Less than a fifth (18%) was influenced by friends.

## 7. Discussion

The primary focus of this research was to explore the genesis and adoption of the subscription business model in the gaming industry. The popularity of such services is apparent on the video game market, as a vast majority of gamers that participated in the survey have heard about video game subscription services, and more than half of them used such services. These results alone indicate that the model of subscriptions is well adopted on the video game market and widely accepted by consumers.

The research question asked what factors influence consumers to purchase a gaming subscription service the most. It was discovered that for consumers the most important factors are choice and availability of games, with price not being the crucial factor. Additionally, it was discovered that most of the consumers use

video game subscriptions only when they are interested in specific games. Xbox Game Pass service is the most popular among gamers.

To make the analysis more objective and compensate for weaknesses of the previous approach we additionally present a comparison of selected subscription services (cf. Table 14.1). The choice of subscription services is diverse and available for multiple devices. Majority of subscription services offer access to games that change monthly. The number of Prime Gaming subscribers is not disclosed, but the service is available in Amazon Prime subscription, which offers benefits for Amazon users. Amazon Prime has more than 150m subscribers in the USA alone (Wise, 2022).

Table 14.1. Comparison of most popular video game subscription services

| Subscription service | Device | Lowest monthly price | Number of subscribers | Benefits |
|---|---|---|---|---|
| Xbox Game Pass | PC and Xbox consoles | 9.99EUR | 25mil (Q1 2022) | Access to a library of games, discount on games |
| EA Play | PC, PlayStation and Xbox consoles | 3.99EUR | 13mil (Q3 2021) | Access to a library of games, discount on games, cosmetic bonuses in games, pre-release access to games |
| Humble Choice | PC | 9.99EUR | 12mil | Ownership over different games available monthly, discounts on games |
| PlayStation Plus | PlayStation consoles | 16.99EUR | 47,3mil | Access to a library of games, discount on games, online multiplayer |
| Prime Gaming | PC | 2.30EUR | n/d, 150mil Amazon Prime subscribers | Ownership over different games available monthly, discounts on games, cosmetic bonuses and other benefits in games |
| Nintendo Switch Online | Nintendo Switch console | 3.99EUR | 32mil (Q3 2021) | Access to a library of classic Nintendo games, online multiplayer, cosmetic bonuses in games, trials of games and other exclusive offers |

Source: Own study based on: Humble Bundle (2022), Statista (2022b), PlayStation (2022), Wise (2022), Statista (2022c), Spencer (2022), Statista (2022d).

Based not only on the results of the consumer survey, but also on the number of subscribers for each service, it can be said that video game subscription services are very popular among consumers and the model is well adopted within gaming industry.

To present additional data about how many of the largest video game companies take part in the subscription business model, we selected ten companies on the video game market with the biggest market capitalization as of 5.10.2022 and researched their participation in the subscription business (cf. Table 14.2). As the total market cap of video game companies stands at $2.762T, these companies alone make up for 92,2% of it.

Table 14.2. Comparison of the largest video game companies and their participation in subscription services

| Company name | Market capitalization | Percentage of total market capitalization on the gaming market | Participation in a subscription business model |
|---|---|---|---|
| Microsoft | $1.853 T | 67.09% | Company offers a subscription service |
| Tencent | $338.86 B | 12.27% | Company offers their games within other company's subscription service |
| Sony | $82.42 B | 2.98% | Company offers a subscription service |
| Activision Blizzard | $58.00 B | 2.10% | Company offers their games within other company's subscription service |
| NetEase | $52.61 B | 1.90% | Company offers their games within other company's subscription service |
| Nintendo | $48.54 B | 1.76% | Company offers a subscription service |
| Sea (Garena) | $34.28 B | 1.24% | Company does not offer a subscription or their games within a subscription service |
| Electronic Arts | $34.15 B | 1.24% | Company offers a subscription service |
| Roblox | $22.48 B | 0.81% | Company does not offer a subscription or their games within a subscription service |
| Take 2 Interactive | $19.35 B | 0.70% | Company offers their games within other company's subscription service |

Source: Own study based on: CompaniesMarketCap.com (2022).

Based on the data presented above, 8 out of 10 companies with the largest market capitalization take part in the subscription business model. These eight companies make up 90.4% of total market capitalization on the video game market. This shows that the model is popular not only among consumers, but also companies.

## 8. Conclusions

Findings of the study reveal that consumers accept and willingly purchase video game subscription services. Hence, the results confirm that the model is successful. Video games companies can thrive in the changing market, as addition of the subscription-based business model could be beneficial to them. Factors that influence consumers the most to purchase a video game subscription are the choice and availability of games.

There are certain practical implications of the presented information. At first, almost every video game consumer has heard about a video game subscription service, yet only slightly more than half of them used such a service. It implies that the market is not saturated, and consumers would be more than likely willing to try a new subscription service. Moreover, nearly 80% of consum-

ers need to be interested in a specific product available in a subscription to buy it. This means that companies on the video game market that are willing to add a subscription service to their offer need to include interesting, popular games that consumers are interested in. The price consumers are the most willing to pay ranges between 5 EUR and 15 EUR. Furthermore, services with the highest number of subscribers offer access to games over ownership of the offered titles.

The results of this research are subject to some limitations. The survey used a relatively small sample size of only 100 people. Hence, analyses were descriptive in their nature. In addition, some of the findings are limited to selected subscription services. For future studies, we recommend including a bigger sample size and other methods to assess the adoption of the subscription-based model on the video game market. Additionally, considering recent announcement about shutdown of the Google Stadia cloud gaming subscription service (Harrison, 2022), we suggest answering further questions about video game subscription services – for example, which versions of those services do gamers choose the most.

## Bibliography

1. Akbar, P., & Hoffmann, S. (2018). Under which circumstances do consumers choose a product service system (PSS)? Consumer benefits and costs of sharing in PSS. *Journal of Cleaner Production, 201*, 416–427. https://doi.org/10.1016/j.jclepro.2018.08.010
2. Andonova, Y., Anaza, N. A., & Bennett, D. H. S. (2021). Riding the subscription box wave: Understanding the landscape, challenges, and critical success factors of the subscription box industry. *Business Horizons, 64*(5). https://doi.org/10.1016/j.bushor.2021.02.024
3. Ashraf, Z. & Goodwin, M. (2020). *Growth in the Video Gaming Market: the changing state of play* [Market report]. OC&C. https://www.occstrategy.com/media/2685/growth-in-the-video-gaming-market_the-changing-state-of-play_online.pdf
4. Chen, T., Fenyo, K., Yang, S., & Zhang, J. (2018). *Thinking inside the subscription box: New research on e-commerce consumers* [Market report]. McKinsey & Company. https://www.mckinsey.com/industries/technology-media-and-telecommunications/our-insights/thinking-inside-the-subscription-box-new-research-on-ecommerce-consumers
5. Choi, H. S., Ko, M. S., Medlin, D., & Chen, C. (2018). The effect of intrinsic and extrinsic quality cues of digital video games on sales: An empirical investigation. *Decision Support Systems, 106*, 86–96. https://doi.org/10.1016/j.dss.2017.12.005
6. CompaniesMarketCap.com (2022, October). Largest video game companies by market cap. CompaniesMarketCap.com. https://companiesmarketcap.com/video-games/largest-video-game-companies-by-market-cap/

7. Dubois, L.E., & Weststar, J. (2021). Games-as-a-service: Conflicted identities on the new front-line of video game development. *New Media & Society, 24*(10), 2332–2353. https://doi.org/10.1177/1461444821995815
8. EA Play. (2022, September). EA Play - EA Video Game Membership. EA. https://www.ea.com/en-gb/ea-play
9. Fritze, M. P., Marchand, A., Eisingerich, A. B., & Benkenstein, M. (2020). Access-Based Services as Substitutes for Material Possessions: The Role of Psychological Ownership. *Journal of Service Research, 23*(3), 368–385. https://doi.org/10.1177/1094670520907691
10. Harrison, P. (2022, September 29). A message about Stadia and our long term streaming strategy. The Keyword | Google. Retrieved October 5th, 2022, from https://blog.google/products/stadia/message-on-stadia-streaming-strategy/
11. Humble Bundle. (2022, September). About Humble Bundle. Humble Bundle. https://www.humblebundle.com/about?hmb_source=navbar
12. Klimas, P. (2019). Current revenue (Monetisation) models of video game developers. *Journal of Management and Financial Sciences, 28*, 119-136. https://doi.org/10.33119/jmfs.2017.28.5
13. Kowalkowski, C., Gebauer, H., Kamp, B., & Parry, G. (2017). Servitization and deservitization: Overview, concepts, and definitions. *Industrial Marketing Management, 60*, 4-10. https://doi.org/10.1016/j.indmarman.2016.12.007
14. Lee, S., Kim, H., Kim, J., & Allenby, G. M. (2016). A Model for Mixed Decision Variables: Modeling Subscription versus Ownership of Consumer Goods. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.2642948
15. Mejía-Trejo, J. (2021). COVID-19 ads on Purchase Intention of Online Consumer Behavior as Business Innovation Activity: a contribution to the Uses and Gratification Theory. *Electronic Commerce Research and Applications, 49*, 101086. https://doi.org/10.1016/j.elerap.2021.101086
16. Nintendo. (2022, September). Nintendo Switch Online. Nintendo. https://www.nintendo.com/switch/online-service/
17. PlayStation. (2022, September). PlayStation®Plus | Monthly games, online multiplayer, discounts, and more. PlayStation. from https://www.playstation.com/en-us/ps-plus/
18. Prime Gaming. (2022, September). Prime Gaming. Amazon. https://gaming.amazon.com/home
19. Ritter, M., & Schanz, H. (2019). The sharing economy: A comprehensive business model framework. *Journal of Cleaner Production, 213*, 320–331. https://doi.org/10.1016/j.jclepro.2018.12.154
20. Schaefers, T., Lawson, S. J., & Kukar-Kinney, M. (2015). How the burdens of ownership promote consumer usage of access-based services. *Marketing Letters, 27*(3), 569–577. https://doi.org/10.1007/s11002-015-9366-x
21. Schuhs, G., Gutzlaff, A., Cremer, S., Lammersmann, J., & Liu, Y. (2020). Business Model and Organization – Interdependencies for Customer-Centric Continuous Innovation in Subscription Business. *2020 IEEE International Conference on Industrial Engineering and Engineering Management (IEEM)*, 260-264. https://doi.org/10.1109/ieem45057.2020.9309897

22. Sim, J., Park, J. G., Cho, D., Smith, M. D., & Jung, J. (2022). Bestseller lists and product discovery in the subscription-based market: Evidence from music streaming. *Journal of Economic Behavior & Organization, 194*, 550–567. https://doi.org/10.1016/j.jebo.2021.12.030
23. Sixt+. (2022, September). BMW Car Subscription | SIXT+ - Sixt Car rental. Sixt.com. https://www.sixt.com/plus/bmw-subscription/#/
24. Spencer, P. (2022, January 18). Welcoming the Incredible Teams and Legendary Franchises of Activision Blizzard to Microsoft Gaming. Xbox Wire. Retrieved September 6, 2022, from https://news.xbox.com/en-us/2022/01/18/welcoming-activision-blizzard-to-microsoft-gaming/
25. Statista. (2022a). Video Games Worldwide. Statista. Retrieved September 3, 2022, from https://www.statista.com/outlook/dmo/digital-media/video-games/worldwide#revenue
26. Statista. (2022b). PlayStation Plus Subscribers. Statista. Retrieved September 6, 2022, from https://www.statista.com/statistics/532431/playstation-plus-subscribers-global/
27. Statista. (2022c). Nintendo Switch Online subscribers. Statista. Retrieved September 6, 2022, from https://www.statista.com/statistics/1276229/nintendo-switch-online-subscriber-count-global/
28. Statista. (2022d). EA Play user research. Statista. Retrieved September 6, 2022 from https://www.statista.com/statistics/1202097/ea-play-user-reach/
29. Tzuo, T. (2018). *Subscribed: why the subscription model will be your company's future - and what to do about it.* Penguin Business.
30. Ubisoft+. (2022, September). Ubisoft+ Game Subscription Service. Ubisoft. https://store.ubi.com/eu/ubisoftplus
31. Volvo Cars (2022, September). Volvo Cars. Care by Volvo | What is a car subscription? Volvo Cars. https://www.volvocars.com/us/v/care-by-volvo/information/what-is-a-car-subscription
32. Wise, J. (July 30, 2022). Amazon Prime Statistics 2022: How Many People Use Amazon Prime? EarthWeb. Retrieved September 6, 2022, from https://earthweb.com/amazon-prime-statistics
33. Xbox Game Pass. (2022, September). Join Xbox Game Pass - Discover Your Next Favorite Game. Xbox. https://www.xbox.com/en-US/xbox-game-pass
34. Yu, Y., Chen, H., Peng, C-H., & Chau P. (2022). The causal effect of subscription video streaming on DVD sales: Evidence from a natural experiment. *Decision Support Systems, 157*, 113767. https://doi.org/10.1016/j.dss.2022.113767
35. Ziobrowska, J. (2017). *Sharing economy jako nowy trend konsumencki.* In U. Kalina-Prasznic (Ed.), *Własność w prawie i gospodarce* (pp. 261-269). E-Wydawnictwo. Prawnicza i Ekonomiczna Biblioteka Cyfrowa. Wydział Prawa, Administracji i Ekonomii Uniwersytetu Wrocławskiego.

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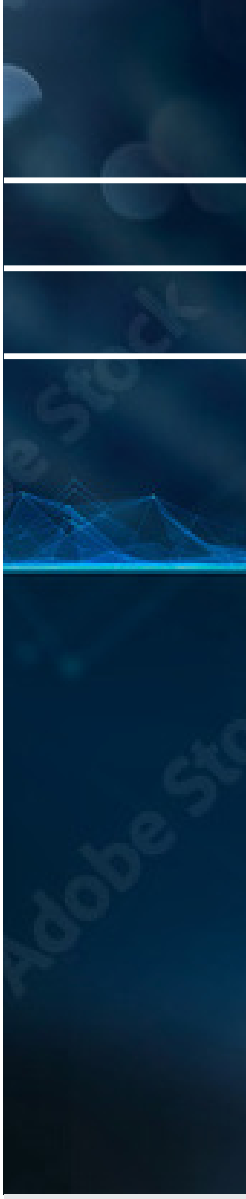

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