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**EFFECT OF INNOVATION ON MANAGEMENT
SYSTEMS IN BANKING SERVICES**

**WPŁYW INNOWACJI NA SYSTEMY ZARZĄDZANIA
W USŁUGACH BANKOWYCH**

Abstract: The technological development affecting the functioning of the banking and financial sector is a major challenge for the management of a complex system such as a bank. The challenges associated with it concern the broad spectrum of the bank's activities both in the product area and in the organization management. The aim of the work is to pre-

¹ Poglądy wyrażone w artykule są poglądami osobistymi autorki i nie wyrażają oficjalnego stanowiska instytucji, w której jest zatrudniona.

sent selected examples of challenges, especially in the context of the practical functioning of a complex system, as well as to present the impact of innovation on management systems in banking services.

Keywords: Complex systems, banking services, financial system, innovations, management

Streszczenie: Duże wyzwanie dla zarządzania systemem złożonym, jakim jest bank, stanowi postęp technologiczny, wpływający na funkcjonowanie sektora bankowego i szerzej – finansowego. Związane z tym wyzwania dotyczą szerokiego spektrum działalności banku zarówno w obszarze produktowym, jak i zarządzania organizacją. Celem opracowania jest przedstawienie wybranych przykładów wyzwań, szczególnie w kontekście praktycznego funkcjonowania systemu złożonego, a także przedstawienie wpływu innowacji na systemy zarządzania w usługach bankowych.

Słowa kluczowe: Systemy złożone, usługi bankowe, system finansowy, innowacje, zarządzanie

Introduction

The bank is a complex system, which is based on the implementation of specific projects and constant monitoring of the environment, including the satisfaction of consumer needs, as well as responding to changes. A characteristic feature of the bank management process is the complexity of the financial system structures, the obligation to apply normative provisions (both EU² and national³ regulations), prudential standards (e.g. recommendations⁴ of the Polish Financial Supervision Authority, which have been issued several dozen to date) and harmonizing activities with them. In addition, this system is characterized by the ability to adapt to changes and needs of the environment, the use of internal regulations and procedures (formal and legal dimension), undertaking creative activities (structural and organizational dimension) and satisfying the needs of customers⁵ (product and service dimension).

² E.g.: Directive (EU) 2015/2366 of the European Parliament and of the Council of 25 November 2015 on payment services in the internal market, amending Directives 2002/65 / EC, 2009/110 / EC, 2013/36 / EU and Regulation (EU) No 1093/2010 and repealing Directive 2007/64 / EC (Text with EEA relevance) Journal of Laws L 337 of 23.12.2015.

³ The above Directive (also referred to as PSD2) was implemented into the Polish legal order in the form of: the Act of 10 May 2018 amending the Act on payment services and some other acts "Journal of Laws of 2018", item 1075.

⁴ https://www.knf.gov.pl/dla_rynku/regulacje_i_praktyka/rekomendacje_i_wytyczne/rekomendacje_dla_bankow?articleId=8522&p_id=18 [access: 3.05.2019].

⁵ M. Zygiel, *Skuteczne zarządzanie bankiem*, „Zarządzanie. Teoria i Praktyka” 2013, No. 2, p. 36, after: D. Strahl, *Modele zarządzania bankiem*, Wydawnictwo Akademii Ekonomicznej Oskara Langego we Wrocławiu, Wrocław 1997.

1. The concept of complex system and innovation

For a proper understanding of the concept of a complex system, one should refer to the definition formulated by J. Rokita: „We understand a complex system as a whole consisting of a larger number of parts that are in various interactions of energy, material, information, intangibility, including emotions and ethics. Such a system is in constant interaction with its surroundings and its parts, and these are in constant interaction with their local surroundings, between themselves and the system of which they are parts”⁶. In its operations, the bank should ensure efficient use of resources, potential and efficiency of its operations as well as certainty and stability of its position. Due to the profile of their activity, banks should be guided by an ethical system of values, defining the relations that should exist between the institution and the environment: internal ethical codes⁷, the general banking ethical code established at the Polish Bank Association⁸, as well as codes of good practice towards entities exposed to risk financial and digital exclusion of customers.⁹

The bank's forward-looking activities should also include short- and long-term strategies:

1. strategies regarding the bank's operations, which are also the basis for creating detailed corporate social responsibility (CSR¹⁰) strategies;
2. control systems (of both institutions and employees) and early alarming (in particular regarding data security and funds allocated);
3. information systems collecting and processing data and systems creating knowledge bases for employees.

Banks are also equipped with human resources teams that monitor current employment in banks and deal with recruitment and continuous improvement of qualifications.

There is no doubt that significant changes result from new management concepts (e.g. Complex Adaptive System – CAS, „lean management”, TQM, human resources management, outsourcing, controlling, innovative business models, global strategy, learning organization, chaos theory, value for shareholders etc.)¹¹. Using

⁶ J. Rokita, A. Dziubińska, *Systemy złożone w zarządzaniu*, Wyd. Uniwersytetu Ekonomicznego w Katowicach, Katowice 2016, p. 15.

⁷ E.g. the Code of Ethics of the Bank Millennium Group, after: https://www.bankmillennium.pl/static-content/PL/Kodeks_etyczny_Grupy_Banku_Millennium_1928748.pdf [access: 1.05.2019].

⁸ *Kodeks Etyki Bankowej (Zasady Dobrej Praktyki Bankowej)*, Związek Banków Polskich, Warszawa, April 2013, after: https://zbp.pl/public/repozytorium/dla_konsumentow/rekomendacje/KEB_final_WZ.pdf [access: 29.03.2019].

⁹ Concerning e.g. disabled people. In 2011 a working group was created at the Association of Polish Banks to service people with disabilities, and an internal document entitled „*Good practices for the service of people with disabilities by banks*” (currently the third edition is in force), which is to show banks how to support service for clients with disabilities.

¹⁰ <https://www.raportroczny.ingbank.pl/> [access: 1.05.2019].

¹¹ O. Polinkevych, *Polskie doświadczenie rozwoju przedsiębiorstw przez Kaizen*, РОЗДІЛ III. Економіка та управління підприємствами. 4, 2017, p. 73

the most modern concepts is to lead companies to market success and build a competitive advantage¹². Undoubtedly, the efficient operation of the organization's structures affects the efficiency of its functioning, and thus – generated profits¹³.

It is quite often assumed that innovation is part of building a competitive advantage, positive company stand out, and also proves efficiency and following modern solutions. Innovation is seen as an element of super-organization. However, as W. Dyduch points out: „Innovation alone, i.e. an idea based on a new, valuable and useful idea, does not create value. On the contrary, sometimes the preparation of an idea requires high financial outlays and commitment of resources. Only commercialization of innovation can have an impact on efficiency¹⁴.” It is difficult to disagree with this view, especially in the context of current trends in the financial market. Many banks, in a way, inherit an outdated management infrastructure, which may reduce the possibilities of competitive banks in relation to innovative FinTechs¹⁵. For such complex systems as banks, thorough changes are definitely more difficult than in the case of enterprises specialized in new technologies in advance.

It should be noted that not only the size of the entity has the ultimate impact on innovation and entrepreneurship, but the method of management, type of entity, sector of activity and industry, as well as the structure of the market are important¹⁶.

The management of modern organizations can be a stimulus for information activities that cause instability in a given market area. Of course, technologies are then allocated at a much faster pace and increase competitiveness. This is also associated with threats in the form of the collapse of companies that are not at this level of technological advancement.

It is interesting that banks are losing competition with many innovative technology companies. This is due to the fact that current changes in the financial services market are a breakthrough phenomenon, completely new, referred to as the post-digital revolution¹⁷.

¹² W. Janasz, *Strategie organizacji innowacyjnych*, „Studia i Prace Wydziału Nauk Ekonomicznych i Zarządzania” 2011, No. 21, p. 47.

¹³ K. Firlej, *Modele systemów zarządzania – model Levitta i Wattermana w ujęciu holistycznym*, https://www.researchgate.net/publication/280318698_Model_e_systemow_zarzadzania_-_model_Levitt'a_i_Wattermana_w_ujeciu_holistycznym [access: 2.05.2019].

¹⁴ W. Dyduch, *Innowacyjność strategiczna przedsiębiorstw w XXI w.*, „Zeszyty Naukowe Uniwersytetu Ekonomicznego w Katowicach. Studia Ekonomiczne” 2015, p. 19-20.

¹⁵ S. Kasiewicz, *PSD2. Krytyczny przystanek na drodze do nowej ery bankowości*, Oficyna Wydawnicza SGH, Szkoła Główna Handlowa w Warszawie, Warszawa 2018, p. 126.

¹⁶ W. Janasz, *Strategie organizacji innowacyjnych...*, p. 47.

¹⁷ P. Daugherty, M. Carrel-Billiard, *The Post-Digital Era is Upon Us Are You Ready For What's Next?*, Accenture Technology Vision 2019, https://www.accenture.com/_acnmedia/PDF-94/Accenture-TechVision-2019-Tech-Trends-Report.pdf#zoom=50 [access: 27.03.2019].

2. Innovations on the financial market

Certainly technological progress and ever-increasing access to information and knowledge is one of the reasons underlying the emergence of innovation. It is also a challenge in the management of complex systems. Currently implemented technologies in financial institutions should be tailored to the possibilities of assimilation by the agent¹⁸.

The continuous innovation process affects entities on the financial services market that constantly improve the quality of their products, modernizing them and accumulating new knowledge. There are four examples of innovation types:

- in the area of products,
- in the area of processes,
- organizational innovations,
- marketing innovations¹⁹.

The opening of banks (organizations in general) to the environment underlies the theory of complexity. At the same time, you can refer to agency theory – it is employees (agents) who should develop their knowledge. The agents' knowledge and constant improvement of their competences can cause structural changes and shaping skills, which in turn can be modeled through evolutionary and co-evolutionary models, taking into account the whole complexity of the system²⁰.

According to F. Grabowski and D. Dejaniak, our entire environment can be divided into natural and artificial systems. A unique place in the natural system is assigned to people and animals that are complex, because they have the ability to think, have intelligence and self-organization potential that maximizes their behavior. Artificial systems derive from natural systems. According to the authors, it is not possible to match artificial systems with natural ones, however, observing current trends, it can be concluded that they may soon be very similar, especially when it comes to algorithms, Artificial Intelligence (AI) and a complex system called the Internet of Things (Internet of Things: IOT).

AI itself equipped with machine learning, or machine learning, is constantly improving so as not to make mistakes and become more and more perfect. In research in this area, the model is the human mind²¹. An example of innovation can be SlicePay, Fintech from India, which verifies creditworthiness based on modern solutions, e.g. examines photos from events, holidays, etc. published on social media, calculating

¹⁸ A. Dziubińska, *Tworzenie innowacyjnego modelu we współczesnym przedsiębiorstwie*, „Zeszyty Naukowe Politechniki Śląskiej. Organizacja i Zarządzanie” 2015, No. 83, p. 120.

¹⁹ *Podręcznik Oslo. Zasady gromadzenia i interpretacji danych dotyczących innowacji*. Wydanie trzecie, OECD, p. 19, <http://home.agh.edu.pl/~kkulak/lib/exe/fetch.php?media=user:konrad:vary:oslo-manual.pdf> [access: 2.05.2019].

²⁰ R. Rokita, A. Dziubińska, *Systemy złożone w zarządzaniu...*, p. 42.

²¹ Ibidem, p. 170.

on this basis possible spending patterns, risk propensity and luxury. The company replaces the previously known methods of testing creditworthiness, but also interferes with the privacy and freedom of the borrower, which raises ethical doubts²².

IOT, which aims to connect things via the Internet²³, is not an independent technology, but a compilation of complementary technologies, among which management, identification, communication, and information and data processing²⁴ can be distinguished. An example of the IOT application may be one of Canadian banks, which to encourage potential candidates to apply for a job prepared a technological incentive in the form of an application that uses special sensors. Thanks to this solution, every new employee equipped with a telephone can connect to company devices and know how to move around the office²⁵. The dynamic development of financial services is largely based on algorithms and artificial intelligence, which begin to decide in place of a person to match the product to the customer's needs, study creditworthiness (regarding financial products), and even recruitment of financial system employees. Increasingly, there is a fear of turning off the human factor and replacing it in organizations with machines and computers. And although man is considered an integral part of the complex system, ensuring the intended, planned activities of the whole separated from the environment²⁶, the financial market solutions known to us are undergoing a real evolution.

One of the examples of banks that use innovation to recruit employees are PKO BP and Bank Zachodni WBK (currently Santander Bank)²⁷, which, together with the startup Emplocity, use chatbot based on artificial intelligence during initial interviews (also via Messenger) and profiling candidates²⁸.

In addition to the AI machine learning options mentioned above and using it in the form of chatbots or for testing creditworthiness, there are other possibilities of its operation, e.g. for language recognition and use, creative activities, problem solving, decision making, document and contract verification (support of Compliance bank-

²² F. Grabowski, D. Dejaniak, *Ekonomia w kontekście systemów złożonych*, „Nierówności Społeczne a Wzrost Gospodarczy” 2011, No. 18, p. 22.

²³ N. Szozda, *Znaczenie internetu rzeczy w planowaniu przepływów produktów i informacji w łańcuchu dostaw*, „Studia Ekonomiczne. Zeszyty Naukowe Uniwersytetu Ekonomicznego w Katowicach” 2017, No. 315, p. 120.

²⁴ A. Magruk, *Analiza niepewności w złożonych dynamicznych systemach – przypadek internetu rzeczy*, „Technologie Informacyjne. Przegląd Organizacji” 2016, No. 1, p. 53.

²⁵ <https://forsal.pl/artykuly/1109240,internet-rzeczy-juz-zmienia-biznes-oto-najlepsze-przyklady.html> [access: 5.05.2019].

²⁶ M. Dacko, J. Nowakowska-Grunt, *Systemy złożone – wyzwanie dla zarządzania logistycznego. Koncepcje i strategie logistyczne*, „Logistyka” 2014, No. 6, p. 16, za: https://www.logistyka.net.pl/bank-wiedzy/logistyka/item/download/79720_f91ed4ea3bec66ba93b269eb01213fc8 [access: 3.05.2019].

²⁷ <https://businessinsider.com.pl/firmy/zarzadzanie/bz-wbk-rekrutacja-przez-messenger-wspolpraca-z-emplocity/nxy6qr6> [access: 27.05.2019].

²⁸ <https://media.pkobp.pl/komunikaty-prasowe/informacje-o-banku/pko-bank-polski-wykorzystuje-sztuczna-inteligencja-w-rekrutacji/> [access: 2.05.2019].

ing departments through AI - RegTech)²⁹. Importantly, there are already AI elements that may relate to the management processes themselves. One can distinguish here:

- technologies based on inference and fuzzy logic;
- expert systems;
- automatically translated texts;
- learning by AI (machine learnig) - AI based on complex algorithms can constantly learn, learn new words, expand memory and knowledge, and make decisions; this aspect is of great importance for organization management, because some processes and decisions in the financial industry (and not only) can be automated (primarily schematic, repetitive processes);
- data mining and conversion³⁰.

In modern organizations, known and previously used management models may not fully fulfill their role. Intelligent organization concepts are increasingly being used. It should be noted, however, that IT systems supporting company management, aimed at achieving assumed goals and improving results, should be implemented in an enterprise only after creating appropriate conditions for it. In addition, these systems should be based on preparation, commitment, awareness as well as constant improvement of the knowledge of the organization's employees so that they can practically adapt to them. The ethical aspect, whose behavior is important in the context of excluding or limiting the human factor in a number of processes, is also not to be overlooked.

Summary

Management in financial institutions shows features of a complex system, both in FinTechs and banks. There is, however, no single management model that is used in these types of institutions. It should be noted, however, that the use of new technologies and the dynamic development of financial services and innovation affect changes in systems.

The use of artificial intelligence can change the system, excluding the human factor from some departments, it can also support employees (an example of a Canadian bank). There are also many opportunities to expand research into systems directly in institutions. It should be noted that research in the subject of AI and IOT has its origin in the human mind. Following his example, attempts are made to create ideal systems and products.

Innovations accelerate processes related to recruitment of employees and support for new employees in getting to know the company. Innovations can also offer

²⁹ M. Wyskwarski, *Metody sztucznej inteligencji w organizacji inteligentnej*, „Zeszyty Naukowe Politechniki Śląskiej. Seria: Organizacja i Zarządzanie Journal” 86/2015, p. 162.

³⁰ T. Gospodarek, *Aspekty złożoności i filozofii nauki w zarządzaniu*, Wydawnictwo Wałbrzyskiej Wyższej Szkoły Zarządzania i Przedsiębiorczości, Wałbrzych 2012, p. 117-118.

constant access to training and assistance. The above examples show the inevitable changes whose implementation is becoming increasingly apparent. Some employees will be tempted by the perspective of a modern company, but there remains a group for which new technologies pose a huge challenge, which can cause digital exclusion.

Innovations in management and the use of AI in the company's operations also allow building a competitive advantage and positively standing out on the market, while companies that reject or will implement AI too slowly, according to the *Assumptions for the AI strategy in Poland, the Action Plan of the Ministry of Digitization*³¹ may completely lose their competitive advantage. A revolution is therefore inevitable, especially since the state itself encourages the active development of enterprises in this area.

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³¹ *Założenia do strategii AI w Polsce. Plan działań Ministerstwa Cyfryzacji*, Ministerstwo Cyfryzacji, Warszawa 9 listopada 2018, praca zbiorowa – AI team of the Ministry of Digitization under the direction of R. Kroplewski and external experts, p. 20.

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