Integration of Innovative Technologies in the Digital Strategy of Platforms based on Systems Thinking

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Abstract: This paper explores the strategic integration of innovative technologies within platforms grounded in systems thinking principles. Systems thinking provides a holistic approach to understanding complex interactions, while agile methodologies promote adaptability and responsiveness. As prominent

technology enterprises continue moulding the digital landscape through cloud gaming, subscription models, and integrated ecosystems, the prominence of systems thinking becomes evident as a guiding principle. By gaining a holistic comprehension of the interlinked dynamics within digital systems, technology companies can deftly maneuver through intricacies, foster innovation efficiently, and furnish users with seamless and enhanced digital encounters. The paper's contributions lie in its comprehensive exploration of the integration of innovative technologies in platforms based on systems thinking and agile methodologies. It provides a valuable framework for practitioners and researchers seeking to enhance their digital strategies and offers valuable insights into the strategic integration of innovative technologies within platforms rooted in systems thinking and agile principles. The study combines theoretical foundations with practical examples, making it a valuable resource for organizations looking to navigate the complexities of the digital era.

Keywords: systems thinking, innovation, innovative technologies, agile methodologies, digitalisation, platforms

1. Introduction

In order to better adapt to rapidly changing digital environments, organizations can leverage systems thinking and agile methodologies. By adopting a systems thinking approach, organizations can analyse their entire ecosystem and identify interdependencies within their digital environment. This can help them to better understand the impact of changes and make more informed decisions.

Additionally, agile methodologies can help organizations to quickly adapt and respond to changing market conditions. By breaking down projects into smaller, more manageable pieces, organizations can iterate and improve upon their digital products and services in a more efficient manner.

Overall, the combination of systems thinking and agile methodology can help organizations to stay competitive in today's rapidly changing digital landscape. One way to integrate systems thinking into agile methodologies for more effective digital project management is to consider the entire system, including all stakeholders and potential impacts, when making decisions and planning for each sprint. This can help to avoid unintended consequences and ensure that the project is aligned with the overall goals and objectives of the organization. Additionally, using feedback loops and continuous improvement processes can help to identify and address system-level issues as they arise, rather than waiting until they become major problems.

Ultimately, incorporating systems thinking into agile methodologies can help to create more holistic, sustainable solutions that better meet the needs of all stakeholders involved in the project. In terms of digital project management, integrating systems thinking into agile methodologies can lead to more effective outcomes. By taking a holistic view of the project and considering all the interrelated parts, teams can identify potential issues early on and make adjustments as needed. Additionally, this approach can help with communication and collaboration among team members, as everyone has a shared understanding of the overall goals and objectives.

2. Analysis of Recent Research and Publications

Many scientific works are devoted to the problems of the integration of innovative technologies in the digital strategy of platforms based on systems thinking. This is a critical topic of interest for both scholars and practitioners (Sedera et al., 2016; Evans, 2012, p. 1215). Understanding how digital and enterprise systems platforms achieve innovation is essential in today's competitive and technologically advanced environment (Samarasinghe & Wood, 2021). Companies need to reassess their strategic choices regularly and consider both market information and influences from the broader environment to develop a successful strategic orientation (Lane & Boehm, 2019; White, 2015). However, it is important to note that the approach taken to derive contextual solutions

may not always result in holistic and systemic qualities such as sustainability, reliability, and adaptability (Darrin & Devereux, 2017).

The argument in favour of the application of systems thinking in the implementation of innovations and increasing the efficiency of digital technologies is, in particular, the result of the research (Widdicks et al., 2023), the authors of which considered addressing rebound effects in digital innovation and policy. The interdisciplinary studies examine the effectiveness of applying the system thinking model in implementing green transition tasks in the information and communication technology sector. The use of a system approach is possible when ensuring the functioning of complex water use systems (Noerhayati et al., 2024) as well as through the use of elements of the 'plan-do-check-act' cycle (PDCA) (Mahnashi et al., 2023) when implementing Industry 4.0. A systems thinking model was proposed to guide cement companies in maximizing key performance indicators through a combination of physical and digital worlds and strategic change perception.

The cooperation between organizations in the use of new digital technologies, such as artificial intelligence (AI), big data analytics, the Internet of Things (IoT), and blockchain technology, is based on the systems approach and systems thinking. In a study conducted by Schöggl, Stumpf, and Baumgartner, the authors used a deductive approach and structural equation modelling with the partial least squares method (PLS-SEM) to analyse empirical data from 112 Austrian manufacturing companies. The authors of another research (Schaffers et al., 2011) suggested that inter-organizational cooperation has a positive impact on the application of sustainable development and CE practices, while the local use of new digital technologies does not produce this positive impact. Based on these valid results, it is recommended to use flexible methodologies like Agile Software Engineering and Agile Project Management to implement digital strategies and promote innovations in various fields.

An illustration of successful examples of the implementation of these approaches is presented in the works by Kuika Watat studied the effective use of medical information systems by organizing feedback from the main users of the platform in the field of healthcare, while Byrne & Sæbø (2022), based on the use of the five-stage approach of Arksey and O'Malley developed by Levac et al., and by Peters with the involvement of data from three databases (PubMed, Web of Science and Embase), identified problems and prospects for further use of the DHIS2 software platform to support regular patient health management. The study by Pieroni, Scarpato, Di Nunzio, Fallucchi, Raso, is devoted to the peculiarities of the promotion of innovative solutions using information and communication technologies (ICT) in the field of development of intelligent systems to support the functioning of city infrastructure, where the emphasis is placed on the principles and results of energy saving when applying blockchain technology. Zanella et al. (2012) provided an overview of the underlying technologies, protocols, and architecture for urban IoT, and illustrated best practices for IoT applications. It should be emphasised that pilot projects of 'smart cities' should be formed in an exchange environment, as described in detail by Schaffers et al. (2011) through the mechanism of creation of urban and regional innovation ecosystems with the aim of sustainable partnership and cooperation strategy between the main stakeholders.

The widespread use of digital platforms and corporate systems in various industries and the service sector also lead to the involvement of all interested parties: customers, future employees in the processes of improvement and research of key digital systems (Torbaghan et al., 2023). Therefore, the studies (Li et al., 2023) and (Zhang & Yu, 2024) emphasised the expediency of creating a new system of business talent education for the digital economy and new requirements for consumer development.

The application of agile methodologies, such as Agile Software Engineering and Agile Project Management, has also been shown to promote innovation in engineering fields (Kasych et al., 2019; Pillutla & Mandaleeka, 2015). Furthermore, the construction industry has embraced innovative digital technologies, including virtual reality (VR)/augmented reality (AR), blockchain, 3D printing, building information modeling (BIM), and off-site manufacturing, to enhance construction processes and gain economic, environmental, and social benefits (Yakovenko et al., 2022) These examples highlight the importance of innovative technologies in driving digital strategies and promoting innovation in various domains.

The purpose of the article was to explore the significance of system thinking in the digital environment, with examples that illustrate its importance, and to analyse the incorporating innovative technologies into the digital strategy of platforms based on systems thinking and agile methodologies, and also how one can enhance their efficiency, agility, and overall effectiveness.

Research methods used to study the incorporation of cutting-edge technologies into the digital strategy of platforms through a systems thinking approach include analysing real-world examples of gaming platforms that have successfully integrated innovative technologies into their digital strategies. Additionally, comparative analysis of different platforms and their approaches to integrating innovative technologies were conducted to identify commonalities and differences, drawing insights into best practices and potential pitfalls.

3. Presentation of the Main Research Material

By applying systems thinking to the integration of innovative technologies into the digital strategy, one can create a more holistic and adaptive approach that considers the interconnectedness of the platform's components in order to achieve the long-term objectives effectively. When it comes to implementing systems thinking and agile in the digital economy, there are a few common challenges that tend to arise, and one of the biggest is ensuring that everyone involved in the process is on the same page and understands the goals and objectives of the project. This can be particularly difficult when working with cross-functional teams that may have different priorities and perspectives.

Another challenge is managing the complexity and uncertainty that comes with working in a rapidly changing digital landscape as it requires a flexible and adaptable approach that can quickly adjust to new developments and emerging trends.

Team dynamics play a crucial role in the successful implementation of systems thinking and agile in the digital economy. When team members are able to work together cohesively and collaboratively, they are better equipped to identify and solve problems quickly and efficiently. Effective communication and a shared sense of purpose are also essential components of successful team dynamics, as they allow team members to stay aligned and focused on achieving their goals. In addition, a strong sense of trust and mutual respect among team members can help to create a positive and supportive working environment that encourages innovation and creativity. Ultimately, team dynamics are key to building a culture of continuous improvement and adaptability, which are essential for success in today's fast-paced and rapidly changing digital economy.

When successfully implementing systems thinking and agile in the digital economy, team dynamics play a crucial role. A team with good dynamics can work together efficiently and effectively, which is essential for implementing these complex methodologies. Team members should be able to communicate openly and honestly, listen to each other's ideas, and work collaboratively towards a common goal, it is also important to have a diverse team with different perspectives and skillsets. By building a strong team and fostering positive dynamics, organizations can set themselves up for success in the digital economy.

Finally, there is the challenge of balancing the need for speed and agility with the need for quality and consistency. This requires careful planning, effective communication, and a willingness to make adjustments and course corrections as needed.

Overall, implementing systems thinking and agile in the digital economy requires a careful balance of technical expertise, strategic thinking, and effective collaboration. With the right approach and mindset, however, it is possible to overcome these challenges and achieve success in the digital marketplace.

When implementing systems thinking and agile in the digital economy, there are several common challenges that businesses may face. One of the biggest obstacles is simply adapting to the fast-paced and ever-changing nature of the digital world. Keeping up with new technologies and trends while maintaining a systems thinking approach can be a difficult balance to strike.

Another challenge is ensuring that everyone on the team is on the same page and working towards the same goals. Clear communication and collaboration are key, but these can be difficult to achieve when working remotely or across different time zones.

Finally, one should remember that systems thinking and agile are not one-size-fits-all solutions. Each business and industry is unique, and it is important to tailor these methodologies to fit the specific needs and goals.

In general, successfully implementing systems thinking and agile in the digital economy requires a combination of flexibility, communication, and strategic thinking which may not always be easy, but the rewards are well worth the effort.

There are many companies that have successfully utilised systems thinking and agile in the digital economy. One example is Amazon, which uses agile methodologies to continuously improve its e-commerce platform and logistics operations. Another is Netflix, which uses systems thinking to optimise its streaming platform and personalise its content recommendations for users. Additionally, Google uses systems thinking and agile practices to develop and improve its search engine algorithms and other digital products. These companies demonstrate the benefits of incorporating systems thinking and agile methodologies in the digital economy, enabling them to stay competitive and innovative in a constantly evolving industry.

By using these approaches, these companies have been able to adapt quickly to changing market conditions and customer needs, making them more competitive and successful in their industries, and by taking a holistic view of their operations and focusing on collaboration and continuous improvement, they are able to achieve greater efficiency and innovation in their work. As the digital economy continues to evolve, it is likely that more companies will need to adopt similar methods to remain competitive.

For the purposes of analysis, the authors turned to gaming platforms. Gaming has come a long way since its inception as a niche interest, and is now poised to become the highest-grossing media sector, surpassing both TV and digital video. The gaming industry has become a vital component of our culture, entertainment, and technological advancement, making it one of the most illustrative examples of systems thinking, providing a unique avenue for people to connect and engage with one another. This has led to a plethora of new technologies and innovations, such as Augmented Reality (AR) and Virtual Reality (VR), which are poised to shape the future of gaming.

This new wave of technology promises to bring gaming experiences to new heights of immersion, and the industry itself confirms the importance of systems thinking in technology integration. The gaming industry is a dynamic and rapidly evolving sector, and game studios have been quick to embrace new business models to remain competitive. One such model that has gained significant traction in recent years is the freemium model, which provides users with the ability to download and play games for free, while offering in-app purchases to enhance the gaming experience. All this contributed to changes in the industry throughout 2019-2020 (Figure 1).

However, the success of freemium games is not solely dependent on any single element but rather on a holistic understanding of the entire gaming ecosystem. What allowed Activision Blizzard to become a leader was the combination of the freemium model and the fundamentals of system thinking (Stein & Schmidt, 2018). In other words, system thinking, which involves understanding how individual components interact within a larger system, becomes crucial in navigating the complexities of the freemium model. Game developers must consider various interdependent factors such as user engagement, monetisation strategies, and community building to create a sustainable and thriving ecosystem.
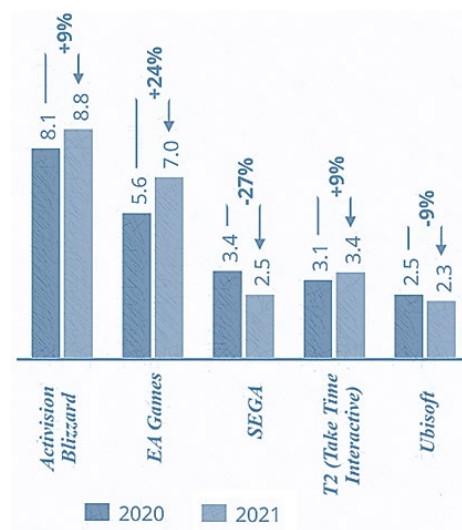
Figure 1. Game developers by revenue in billions US dollars

Source: (McKenzie et al., 2021).

Developers must analyse user behaviour, preferences and spending patterns to tailor in-app purchases that enhance the gaming experience without compromising its integrity. By understanding player interactions, developers can identify key touchpoints where users are most likely to invest in premium content. This involves not only understanding gameplay mechanics but also integrating social and competitive elements that foster a sense of community among players.

The freemium model brings scalability to the revenue stream of Activision Blizzard, supported by the in-game marketplace that facilitates the sale of personalised characters.

Monetisation strategies must align with the overall system. Developers have to consider not only the pricing of in-app purchases but also the timing and frequency of these offerings. Striking the right balance ensures that players feel compelled to make purchases without feeling pressured or overwhelmed.

Community building is an integral part of the freemium model's success. Developers ought to foster a vibrant and engaged player community to create a self-sustaining ecosystem where user-generated content, word-of-mouth marketing, and social interactions contribute to the overall success of the game. By viewing the community as an interconnected network rather than a passive audience, developers can create a thriving ecosystem that benefits all players.

Moreover, systems thinking is an ongoing process. Game studios must remain agile, utilising player feedback, analytics, and market trends to make informed decisions that keep the ecosystem robust and dynamic. By continuously monitoring and adapting to changes, game developers can stay ahead of the competition and create games that stand the test of time.

In this way, the adoption of the freemium business model by game studios demonstrates a strategic response to the evolving gaming industry. However, the success of this model depends on the application of system thinking – an approach that considers the holistic interplay of various elements within the gaming ecosystem. By understanding and optimising the intricate relations between user engagement, monetisation strategies, and community building, game developers can navigate the freemium revolution and establish a lasting presence in the competitive world of gaming.

In recent times, major technology companies have ventured into the ever-evolving digital landscape, creating cloud gaming and subscription services to capture the attention of cross-platform and

multiplayer gamers. This trend not only highlights a shift in technological advancements, but also emphasises the need for a comprehensive understanding of the complex systems at play in the digital world. Thus, 'systems thinking' has emerged as a crucial concept, guiding tech companies to navigate the intricate interplay between technology, user behavior, and market dynamics.

Amazon, a leading tech giant with a comprehensive range of services, exemplifies systems thinking in its approach. The seamless integration of Amazon Web Services (AWS), Amazon Prime, and Twitch creates a holistic ecosystem that leverages user data and preferences across platforms, thereby offering a more personalised experience. Systems thinking enables Amazon to optimise its services based on user behaviour, creating a unified digital atmosphere.

Google, known for its data-centric approach, exemplifies systems thinking through its interconnected suite of products, including search algorithms, personalised ads, and cloud services. Google's systems thinking revolves around leveraging vast datasets to refine its services continuously, thereby delivering more relevant content to users and advertisers alike.

Apple, renowned for its seamless integration of hardware and software, epitomises systems thinking through its ecosystem, including iPhones, iPads, Macs, and services such as iCloud and Apple Music. The seamless integration of hardware and software ensures a consistent user experience across devices, thereby enhancing customer loyalty and satisfaction.

Netflix, operating in the digital streaming realm, uses systems thinking to enhance user engagement through its content recommendation engine. The recommendation engine analyses user viewing habits, ratings, and preferences to suggest personalised content. Netflix's dynamic system adapts to evolving user tastes by continually refining its recommendation algorithms, thereby keeping subscribers engaged.

Facebook's expansive social ecosystem, including Facebook, Instagram, WhatsApp, and Oculus, also uses a systems thinking approach to create a comprehensive network that caters to various aspects of users' social interactions. Facebook adapts its features and services based on user behaviour to enhance the interconnected nature of its systems thinking.

In the digital world, the systems thinking approach is critical for several reasons. Firstly, the digital landscape is characterised by interconnected systems and technologies, and systems thinking enables tech companies to understand the complex relations between these components. Secondly, by considering the entire user experience across different digital touchpoints, systems thinking allows companies to design products and services that smoothly integrate into users' lives, fostering satisfaction and loyalty. Thirdly, in a rapidly evolving digital landscape, the ability to adapt and innovate is crucial. Systems thinking facilitates a proactive approach to change by understanding the broader implications of technological advancements and market dynamics.

Gaining insight into the essence of modern approaches to the digital economy and the differences between platform business and traditional business allows for distinguishing three main interpretations of the definition of 'smart technology' (Evans, 2012; Gurumuthy et al., 2020; Jacobides et al., 2018; Lane & Boehm, 2019):

1) SMART technology (Specific, Measurable, Achievable, Relevant, Time bound) as a project management tool for defining goals and setting tasks;
2) smart technologies as an interactive complex that allows creating, editing and distributing multimedia materials;
3) smart technologies as a complex of information systems and technologies designed to optimize management based on the principles of openness, availability and relevance of information.

Examples of integration of smart technologies into the most common digital strategies of platforms (multi-channel, ecosystem driver or modular) are given in Table 1.

Table 1. Examples of integration of smart technologies into digital strategies of platforms

Type of digital strategy platform	Characteristic	Integration of smart technologies
Multi-channel	Customer orientation and paying attention to consumer scenarios of using the product/service; experience to solve life events; integrated value chain; high operational efficiency	SMART-TV and Netflix
Ecosystem driver	Own interactive platform, presented products/services of third-party manufacturers; disposal of all consumer data; coordination of customer needs with suppliers; availability of the freemium model	Active use of smartphones, 'smart home' systems
Modular	Provides Plug-and-Play products/services; the very strategy to adapt to any ecosystem; product/service innovation is limited	SMART management technology

Source: (Deloitte, 2015, 2017, 2018; Schaffers et al., 2011).

An omnichannel digital strategy provides access to products through multiple channels, including physical and digital channels, giving them a wider choice and seamless experience.

This strategy was successfully used by Netflix. A few years ago, many users began to abandon television in favour of personal computers and/or laptops, but the arrival of SMART-TVs on the market made it possible to combine these two devices.

As a result, there are TVs with access to TV channels and connections that everyone uses on computers, including Netflix. In addition, the fields of application of this technology can be education, business, entertainment, and professional activity. An ecosystem driver strategy means the ability to interact with other providers that offer additional services. The platform ecosystem can be more or less open, for example Google has an open platform, while Apple's is more closed. With the advent of smartphones, this strategy has demonstrated its effectiveness, as they have ceased to serve only as a means of communication (see Figure 2).
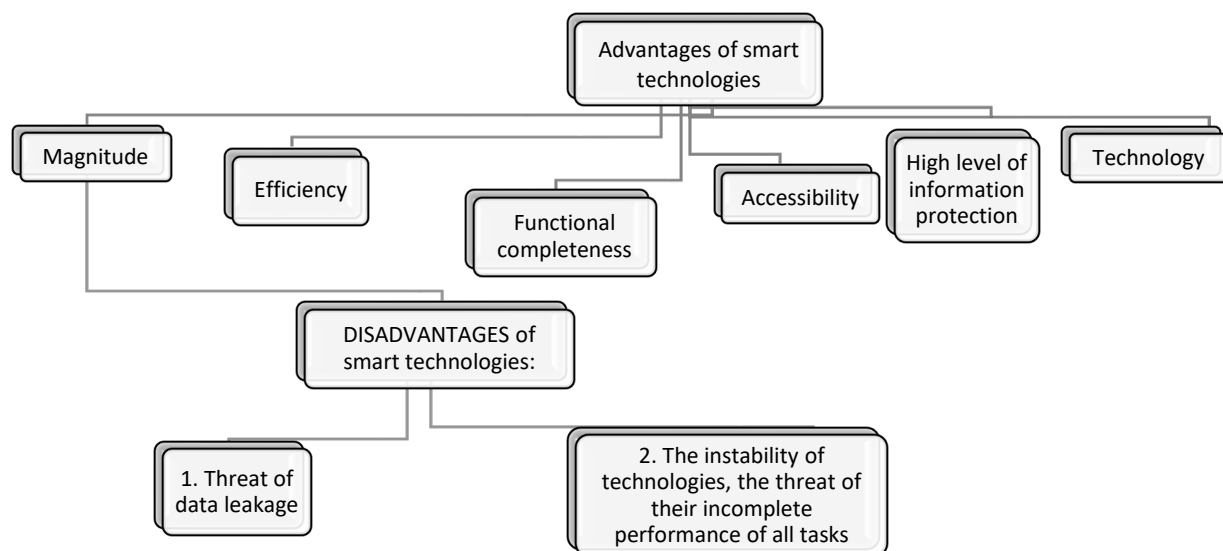

Figure 2. Advantages and disadvantages of smart technologies

Source: (Evans, 2012; Gurumuthy et al., 2020).

Today, smartphones provide many functions that were not widely used a few years ago (Internet banking, augmented reality applications). Taking into account the international experience, the implementation of this strategy has also begun in Ukraine, e.g. the "Diia" app which makes it possible to receive administrative services remotely.

Another example of the integration of smart technologies within this strategy, widespread both globally and partly also in Ukraine, can be considered the 'smart home' system that is controlled from a smartphone and can perform many tasks (e.g. heating regulation, automatic turning on/off of lights; theis system can also monitor the usage of electricity at home and gas leaks, if any).

Modular strategies are less popular, however, such as PayPal providing plug-and-play products or services that can be adapted to different ecosystems. This strategy involves achieving leadership positions in the industry, which is critical to scaling and achieving success. Solving the above-mentioned problematic issues is possible in the case of the use of trust elements of platforms (Figure 3) and a well--thought-out transformational transition algorithm.
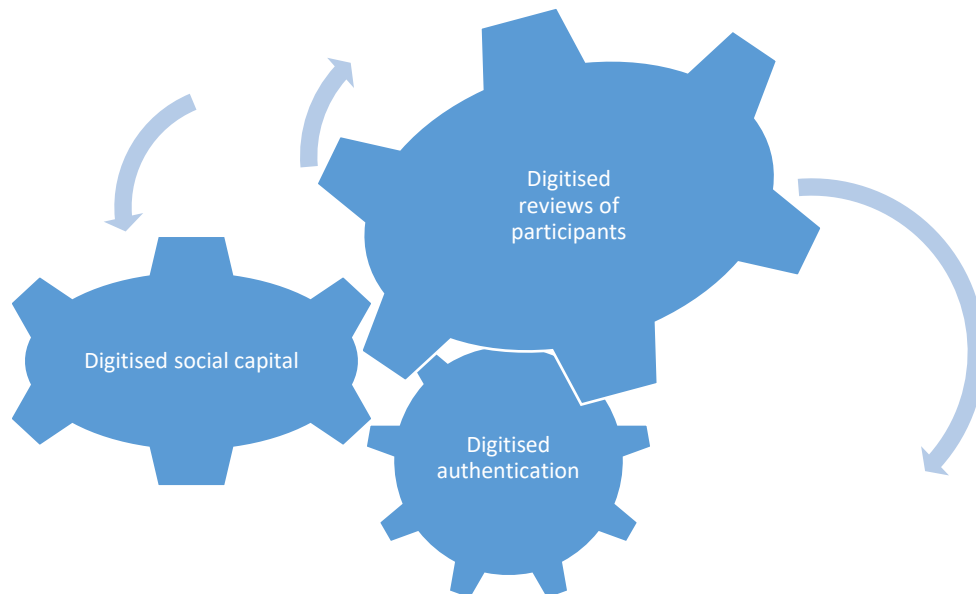

Figure 3. Trust elements of digital platforms

Source: (Deloitte, 2017; Stein & Schmidt, 2018).

The first element, namely the digitised feedback of participants as a synonym of the expert evaluation system, directly or indirectly affects the Internet reputation. An important differentiating factor for reviews on today's commerce-oriented platforms is that, unlike an open review platform, each review typically comes from a real user and a verified transaction.

The second element, digitised social capital, testifies to the fact that social platforms contain digitised representations of the physical world, that is, even in the conditions of the digital economy, the high value of real social capital is a powerful sign of the platform's authenticity and reliability.

The potential of digital social capital as a driver of trust is particularly significant in the context of primarily business-to-consumer interactions, and will expand over time as platform models embrace industrial and professional exchange.

The third element, digitised authentication, means that many consumer platforms rely on the digital availability of a range of real-world authentication systems, thus ensuring an adequate level of cyber security.

At the same time, as companies move from a historically narrow to an increasingly wide range of products, services or experiences, it becomes obvious that there is the need to find partners who can offer their services where the integrator does not work (hypothesis of the 'inverted firm').

It is implied that the top management of enterprises decides what their participation in ecosystems can be. Creating own platform requires special skills, a strong market position, etc.

4. Discussion and Conclusion

Integrating innovative technologies into the digital strategy of platforms, especially when applying a systems thinking approach, is crucial for staying competitive and responsive to evolving market demands. Systems thinking involves understanding how various components within an organization or platform interact and influence each other to achieve a holistic view of the system.

The questions of how to ensure the ethical use of innovative technologies in digital strategy and how systems thinking can increase the effectiveness of the implementation of innovative technologies not only in the conditions of the platform economy, which this article is devoted to, remain debatable and promising for further research.

However, as long as major tech companies continue to shape the digital future with cloud gaming, subscriptions, and integrated ecosystems, systems thinking emerges as a guiding principle. By comprehensively understanding the interconnected nature of digital systems, tech companies can navigate complexities, innovate effectively, and provide users with seamless and enriching digital experiences.

Incorporating these innovative technologies within a digital strategy based on systems thinking and agile methodologies can enable platforms to adapt to evolving market needs, improve user experience, and drive continuous improvement in a rapidly changing digital landscape.

When applied to digital strategy, this approach helps platforms make informed decisions about technology integration to achieve their long-term goals. Thus, nowadays, when the trade and production sectors of the economies of many countries are going through a crisis, a new economy with an orientation towards new technologies and digitalisation makes economic growth possible.

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Integracja innowacyjnych technologii w cyfrowej strategii platform opartej na myśleniu systemowym

Streszczenie: W artykule zbadano strategiczną integrację innowacyjnych technologii w ramach platform opartych na zasadach myślenia systemowego. Myślenie systemowe zapewnia holistyczne podejście do zrozumienia złożonych interakcji, podczas gdy zwinne metodologie promują zdolność adaptacji i szybkość reakcji. W miarę jak czołowe przedsiębiorstwa technologiczne w dalszym ciągu kształtują cyfrowy krajobraz poprzez gry w chmurze, modele subskrypcji i zintegrowane ekosystemy, znaczenie myślenia systemowego staje się oczywiste jako zasada wiodąca. Zdobywając całościowe zrozumienie powiązanej dynamiki w systemach cyfrowych, firmy technologiczne mogą zręcznie manewrować wśród zawiłości, skutecznie wspierać innowacje i zapewniać użytkownikom płynne i ulepszone spotkania cyfrowe. Wkład artykułu polega na wszechstronnym badaniu integracji innowacyjnych technologii na platformach w oparciu o myślenie systemowe i zwinne metodologie. Zapewnia istotne ramy dla praktyków i badaczy pragnących ulepszyć swoje strategie cyfrowe oraz oferuje cenne spostrzeżenia na temat strategicznej integracji innowacyjnych technologii w ramach platform zakorzenionych w myśleniu systemowym i zasadach zwinności. Badanie łączy podstawy teoretyczne z praktycznymi przykładami, dzięki czemu stanowi ważne źródło informacji dla organizacji chcących poruszać się po zawiłościach ery cyfrowej.

Słowa kluczowe: myślenie systemowe, innowacja, innowacyjne technologie, metodyki zwinne, cyfryzacja, platformy