

LEVELING UP KNOWLEDGE MANAGEMENT: HARNESSING GAMIFICATION FOR EFFECTIVE KNOWLEDGE ACQUISITION, DISTRIBUTION, DISSEMINATION, AND SHARING

DOSKONALENIE ZARZĄDZANIA WIEDZĄ:
WYKORZYSTANIE GAMIFIKACJI DLA EFEKTYWNEGO POZYSKIWANIA,
UDOSTĘPNIANIA, ROZPOWSZECHNIANIA I DZIELENIA SIĘ WIEDZĄ

<https://doi.org/10.34739/zn.2023.61.21>

Aleksandra Witoszek-Kubicka

Poland, University of Economics in Krakow
witoszea@uek.krakow.pl, ORCID 0000-0001-5304-3379

JEL Classification Codes: M12

Abstract: The paper addresses the issue of motivating employees to engage in behaviors related to knowledge transfer. This challenge is prevalent in numerous contemporary organizations that seek methods and tools to enhance the effectiveness of acquiring, distributing, disseminating, and sharing knowledge. Within the scope of the article, preliminary research was conducted, including a systematic literature review and a case study based on in-depth interviews and documentation analysis. The aim was to address the following questions: P1: What is the impact of a gamification project on knowledge transfer? P2: Does any objective of internal gamification also aim to support knowledge transfer? The results indicate that knowledge transfer is a pivotal element across all objectives of internal gamification, and the gamification elements positively influence the shaping of desired behaviors within its sub-processes. While these findings stem from preliminary research, they unequivocally underscore the significance of the issue and the necessity for further investigations into the implementation of gamification within organizations, particularly in the context of knowledge transfer. Publication financed by the University of Economics in Krakow under the Support program conference activity – WAK – 2023.

Keywords: knowledge transfer, internal gamification, knowledge management

Abstrakt: Opracowanie podejmuje problematykę motywowania pracowników do realizowania zachowań z obszaru transferu wiedzy. Jest to wyzwanie wielu współczesnych organizacji, które szukają metod i narzędzi wpływających na efektywność pozyskiwania, udostępniania, rozpowszechniania i dzielenia się wiedzą. W ramach artykułu przeprowadzono badania wstępne: systematyczny przegląd literatury oraz studium przypadku opierające się na wywiadach pogłębionych i analizie dokumentacji aby odpowiedzieć na postawione pytania: P1: Jaki jest wpływ projektów gamifikacyjnych na transfer wiedzy? P2: Czy każda gamifikacja wewnętrzna ma na celu również wsparcie transferu wiedzy? Wyniki wskazują, że transfer wiedzy jest kluczowym elementem wszystkich celów gamifikacji wewnętrznej, a elementy gier wpływają pozytywnie na kształtowanie pożądaných zachowań w ramach jego subprocesów. Są to jedynie badania wstępne, jednak wskazują one jednoznacznie na istotność problematyki i konieczność dalszych badań dotyczących wdrażania gamifikacji w organizacji w kontekście transferu wiedzy. Publikacja finansowana przez Uniwersytet Ekonomiczny w Krakowie w ramach programu Wsparcie aktywności konferencyjnej – WAK – 2023.

Słowa kluczowe: transfer wiedzy, gamifikacja wewnętrzna, zarządzanie wiedzą

Introduction

Knowledge transfer consists of four complementary subprocesses: knowledge acquisition, distribution, dissemination and sharing. Knowledge acquisition is a process wherein an organization assimilates knowledge from its environment, and employees gather knowledge from internal sources such as colleagues, documentation, databases, books, and journals. Knowledge can also be acquired through the analysis of competitor

products and processes (e.g., benchmarking) as well as from media sources (particularly concerning opportunities and threats). Training sessions, conferences, symposia, and informal interactions with others are also vital knowledge sources. Knowledge distribution is the process through which individuals impart knowledge to their colleagues, offering information (e.g., oral instructions regarding specific operations) or facilitating access to

databases and documentation. Knowledge distribution also encompasses the flow of knowledge from an organization to its environment. Examples include providing information to customers over the phone by advisors, attaching user manuals to products, delivering technical service documentation to service points, exchanging technical documentation with suppliers and recipients of semi-finished goods, as well as licensing agreements. The organization also distributes its knowledge through the sale of products and services and the execution of processes observable by individuals outside the organization. Knowledge dissemination is a more comprehensive form of knowledge distribution, differing in the scope of distribution. Knowledge distribution focuses on specific units, and the knowledge may be safeguarded from unauthorized individuals (e.g., sharing a customer database with selected sales representatives). Knowledge dissemination aims to make knowledge widely accessible. This can involve advertisements, brochures, creating websites containing information about the company and its products, publishing case studies or best practices in textbooks or presentations delivered at conferences. Examples of knowledge dissemination also include open hardware solutions and the market for software development standards. Knowledge sharing is a process in which individuals mutually convey knowledge to each other during communication and collaboration. This encompasses both explicit and tacit personalized knowledge. Throughout this process, people may utilize codified knowledge (such as information from organizational documentation) and grounded knowledge (for instance, through product failure analysis) to support one another (Mikuła, 2006). In some studies, the term “knowledge transfer” is used interchangeably with the term “knowledge diffusion” (Pietruszka-Ortyl, 2020, pp. 165), however, for the purposes of further discussion, we will exclusively use the term “knowledge transfer,” considering diffusion as a broader category that also encompasses the creation of new knowledge and its adaptation, which results from the process of knowledge transfer (Adamczyk, 2017, pp. 6). If knowledge transfer is successful, it leads to the accumulation and assimilation of new knowledge within the organization (Pietruszka-Ortyl, 2020, pp. 164). Transfer is also one of the three key components of knowledge replication, enabling organizations to grow and scale their operations (Łukasik, 2019, pp 10-15). Given the significance of knowledge to organizations, it is imperative to support knowledge transfer and cultivate an atmosphere conducive to collaboration (Moczulska,

Winkler, 2018, pp. 37-44). Currently, it is essential to possess a combination of diversity and advancements in technology to successfully overcome the challenges resulting from the coronavirus pandemic and recent distressing occurrences (Koza, 2022, pp. 45-53). Many organizations, especially larger ones, struggle with effective knowledge transfer, particularly in the context of knowledge sharing. This issue can, in turn, lead to negative consequences within the organization, such as delays in project implementation, conflicts within the supply chain, resource wastage due to redundant efforts on solving the same problem across multiple units or employee burnout (Fazlagić, 2014, pp. 110-114). Knowledge transfer is influenced by various individual and organizational factors. The article addresses one of the most crucial aspects according to the literature – motivation for knowledge transfer. Lack of motivation among employees to engage in activities related to this process, often stemming from the belief in the limited significance and benefits of such actions for the knowledge holder (Swacha, 2015, pp. 150-159). Hence, there is a quest for new methods and tools to support the motivation for knowledge transfer within the organization. The article aims to examine the potential of organizational gamification as a tool supporting knowledge management, based on the relevant literature and a case study of a Polish organization that implemented two distinct gamification solutions. The purpose of the article is to examine the potential of organizational gamification as a tool supporting knowledge management, based on subject literature and preliminary case study research within a Polish organization that implemented two distinct gamification solutions.

Gamification as an innovative tool supporting knowledge transfer – literature review

Knowledge transfer often takes place nowadays through the utilization of Information and Communication Technology (ICT). Authors criticize these systems for their ineffectiveness due to the absence of pleasurable user experiences and engagement (Schacht, Maedche, 2015, pp. 593-614). As indicated by M. Silic and A. Back, the integration of gamification could serve as a response to these challenges, providing enjoyment, eliciting behaviors associated with mutual assistance, and furnishing mechanisms that enhance an employee’s sense of the value of their work. In order to better comprehend this concept, it is worthwhile to delve into the characteristics of the gamification project itself. Gamification is a project with a purpose

beyond entertainment, defined by rules, where activities undertaken within gamification have a direct impact on reality (Witoszek-Kubicka, 2020). The elements of games are implemented in various contexts of personal and professional life, finding application wherever the human factor is present. Following the literature on the subject, one can identify educational, business, social, and personal gamification. Educational gamification aims to enhance learning outcomes across various levels of education or within training programs and courses. Business gamification's purpose is to elevate the achievement of specific business objectives related to internal (internal gamification) and external (external gamification) processes. Social gamification seeks to enhance the quality of life within communities, whether local or global, primarily by fostering particular social attitudes and behaviors (ecologically conscious actions, initiatives related to road safety, etc.). Personal gamification is linked to achieving individual goals, such as following training plans or adopting health-conscious behaviors (Kania, Smolarek, 2017, pp. 60–71). Gamification is most commonly classified as a persuasive technology, and as it was said, the actions undertaken within its framework have direct consequences in the real world. However, structurally, the design of such solutions is rooted in the field of game design and adheres to similar principles. In the literature, one can identify game design models which, as it turns out, also serve as the foundation for creating gamification solutions. One of the widely employed approaches is designing based on the MDA framework, consisting of the mechanics, dynamics, and aesthetics of the game (Hunicke, Leblanc, Zubek, 2004, pp. 2). Mechanics can be understood as a set of tools, functional elements of the game that players encounter during gameplay, such as points that determine their level. Dynamics encompass the actions undertaken individually or collaboratively by the user in interaction with mechanics, such as earning points for the team by completing specific activities. Aesthetics, therefore, refers to how the mechanics and dynamics of the game influence the emotions experienced by the player, for instance, the joy derived from achieving a higher level through attaining a designated number of points (Zichermann, Cunningham, 2012, pp. 80-93). The integration of these elements is intended to lead to the success of the solution, namely, motivating its participants to engage in desired behaviors and exhibit specific attitudes. The rationale for the assertion that gamification serves as a motivating factor for behavior change is underpinned by two theoretical frameworks: Self-Determination Theory

(SDT) (Passalacqua, Sénécal, Frédette, Nacke, Pellerin, Léger, 2020, pp. 1-5) and the concept of flow (Csikszentmihalyi, 2005, pp. 134-150). The foundation of the self-determination theory comprises three innate needs: competence, relatedness (belonging) and autonomy. The need for competence pertains to development, mastery, understanding of how to achieve internal or external benefits, and effectiveness in actions. The need for relatedness involves a sense of security and satisfying interactions with others, as well as a sense of purpose in performing specific activities. Autonomy, on the other hand, is based on self-initiation of behaviors and their internal regulation, fostering a sense of self-determination. According to the SDT framework, the potential for fulfilling these three needs places an individual in a motivated state. In alignment with the classical approach to motivation, the proponents of the self-determination concept also distinguish between external and internal motivation, recognizing the value of intrinsic motivation. However, they also point out that appropriately regulated external motivation (perceived as internal by the individual) can lead to a similar level of engagement in performing an action. Individuals who perceive the applied regulations as intrinsic tend to be closely aligned with the experience of the state of flow during the execution of specific actions. This represents a situation in which an individual's actions are undertaken for their inherent value, thereby seeking pleasure and joy associated with their performance. Flow is a state in which an individual becomes fully engrossed in the activity being performed, rendering physical needs, emotions, and time insignificant to the individual in question (Ryan, Deci, 2000, pp. 68-73).

Hence, it appears that gamification could also potentially motivate employees to engage in specific actions related to knowledge transfer. Researchers conducted studies concerning the impact of gamification on employee actions within the knowledge transfer subprocess. The results suggest that mutual benefit, recognition, and enjoyment contribute to a heightened motivation for engaging in knowledge transfer activities, thereby indicating the potential of utilizing gamification to enhance the efficiency of knowledge transfer (Silic, Back, 2017, pp. 1310-1312). However, the mere transfer of knowledge is not frequently declared as the primary objective of a gamification solution within an organization. More commonly, these objectives encompass employee selection (Georgiou, Gouras, Nikolaou, 2019, pp. 91-103), increased engagement or motivation (Liu, Huang, Zhang, 2018, pp. 38-51), or training efforts (Stadnicka,

Deif, 2019, pp. 108-122). Nonetheless, is it not imperative for the achievement of all these aims to effectively manage knowledge transfer? Therefore, the key questions to consider are: what is the impact of a gamification project on knowledge transfer? And does any objective of internal gamification also aim to support knowledge transfer?

Methodology and theoretical basis

The preliminary research endeavors to address the following questions:

P1: What is the impact of a gamification project on knowledge transfer?

P2: Does any objective of internal gamification also aim to support knowledge transfer?

The research adopted the following definitions: gamification is the utilization of game elements as a system of stimuli to motivate the target group towards engaging in desired behaviors, which are prerequisites for achieving the established project objectives. Knowledge transfer within an organization is a process involving the exchange of tacit or explicit knowledge, comprising four sub-processes: knowledge acquisition, knowledge distribution, knowledge dissemination, and knowledge sharing. To answer the posed questions, a systematic

literature review and a case study were chosen. The systematic literature review encompasses the Web of Science and Scopus databases. The utilized search terms include: gamification in conjunction with “knowledge transfer”, gamification in relation to “knowledge diffusion”, and gamification tied to “knowledge sharing.” Only publications containing empirical research were taken into consideration. The selected case study method stems from the necessity to comprehensively understand the analyzed phenomenon, which pertains to the utilization of gaming elements in the context of knowledge transfer within an organization. The research sought organizations in Poland that engage in gamification projects primarily focused on objectives other than knowledge transfer.

Results and discussion

Within the conducted literature review, the scope was limited exclusively to articles that depicted the actual impact of gamification on knowledge transfer, rather than the employees’ self-reported potential influence of specific game elements on their motivation to engage in desired actions within the context of knowledge transfer (Table 1).

Table 1. Identified gamification projects

Publication	Research type	Sample size	Main aim of the project	Project impact on the knowledge transfer	Knowledge transfer subprocess involved	Dynamics
(Li et al., 2022)	Questionnaires	255	Inspiring individuals to engage in Q&A interactions	positive	disseminating	individual
(Morschheuser et al., 2017)	Experiment	42	To enhance the perceived pleasure and drive for knowledge transfer	positive	acquiring, distributing	cooperative
(Hoffmann, Pfeiffer, 2022).	Experiment	215	Elevate consciousness and understanding regarding proper waste segregation	positive	acquiring	individual
(Vasilescu et al., 2014)	Case study	3	Augmenting the number of individuals utilizing the Q&A forum	positive	acquiring, distributing, disseminating	competitive
(Weretecki et al. 2021)	Questionnaires	468	To facilitate the exchange of information within complex multi-actor service ecosystems	positive	acquiring, distributing	competitive
(Spanellis et al., 2020)	Case study, blog analyses, interviews	1	To enable and strengthen the capabilities of knowledge workers	positive	acquiring, distributing, sharing knowledge	cooperative

Source: own study.

All the identified works point to a positive influence of gamification on knowledge transfer, which allows for a clear response to question P1. The objectives of the projects considered in the studies encompassed various aspects of human capital management. However, in each solution, a subordinate goal was the effectiveness of one or several knowledge transfer sub-processes. However, due to the selected keywords for the literature review, which already encompassed the knowledge transfer phenomenon, the results should not be considered in addressing question P2, as they are confined to purposes described as related to knowledge transfer.

A case study was conducted within an organization that implemented two gamification projects targeting production employees and individuals working within the logistics department. The primary objective of the first implementation was to enhance efficiency on the assembly line, while the second project aimed to ensure an elevation in the quality of logistic services provided. The characteristics of both projects are presented in Table 2. In both instances, in-depth interviews were conducted with individuals responsible for the gamification implementation, and available project documentation was analyzed. The organization did not grant consent to disclose data that could lead to its identification.

Table 2. Case study gamification projects

	Production	Logistics
Number of employees involved in the project	40	11
Employees participating in the project	production employees	administrative employees, dispatchers
Aim	enhancing efficiency on the assembly line	improvement of the quality of services provided
Objective related to knowledge transfer	knowledge acquisition	knowledge sharing
Dynamics	individual	cooperative
Mechanisms	progress bars, feedback	inter-organizational ranking, monthly team material reward, annual team material reward
Measurable effects of goal achievement (yes/no)	no, stated positive goal accomplishment	yes, service quality indicators, positive goal achievement
IT solution	Excel	none

Source: own study.

The first of the examined instances of gamification implementation is a solution integrated into the production line within the scope of four assembly workstations, employing approximately 40 individuals. This approach primarily relies on progress bars, visually represented as circles. Each circle signifies mastery of one of the assembly workstations and can be filled to a quarter, half, three-quarters, or completely, contingent upon the employee's capabilities. "We utilize these quarters. The scale ranges from zero without a quarter, progressing to one quarter, two quarters, three quarters, and four quarters. And upon what foundation are these quarters established? One quarter embodies fundamental knowledge, meeting the minimal qualifications. During training, the operator functions under supervision... Two quarters denote an intermediate level of knowledge. At this point, the employee is already capable of independently performing tasks, yet there is also the concept of cycle time (an employee with two filled quarters for a workstation does not maintain the cycle time). An employee deemed autonomous, with the capacity to achieve three quarters, comprehends the purpose of their tasks and can independently carry out the work, in accordance with Occupational Health and Safety regulations as well as quality requirements". An individual who has undergone team management training, usually a Team Leader, can attain all four quarters. "...these soft skills, such training, like how to train these new operators without discouraging them right away". Information about achieving each subsequent quarter is provided to the respective employee. In addition to visually representing employee progress, the progress bars are also utilized for differentiating wage rates: "...if an operator is proficient at all stations, then they can transition to the highest wage rate". The project was introduced this year with the aim of knowledge transfer and enhancing efficiency on the assembly line. The primary motivation for implementing these changes was to encourage employees to familiarize themselves with different assembly positions: "These operators seemed to stagnate. They found comfort in knowing the third (assembly station), the first; they were the best at it, could do it by memory, like driving a car and remaining at that level. Our objective here is to rotate them among the positions... which enables us to exert greater control over production because if I know that every operator is skilled at every station... (production continuity can be maintained)". Quantitative monitoring of implementation effects is absent; positive achievement of goals is

declared: "...as I mentioned, they used to stick to one or two positions and were content, simply uninterested in learning more. Now, they are significantly broadening their knowledge and are taking the initiative themselves... (to learn tasks related to other assembly positions)".

The second of the analyzed projects was introduced within the logistics department. The department is divided into teams: freight forwarders and administration. All employees collectively bear responsibility for serving various clients. The gamification project was inspired by one of the organization's key clients and aims to enhance the quality of services rendered: "We have a particular client who, upon achieving the appropriate quality indicators... provides a monthly reward in the form of a certain percentage of turnover obtained in the respective month." Gamification is based on an organization ranking maintained by the client and material rewards. Each month, department employees receive information about their position in the ranking and whether or not they have received a reward, which is subsequently distributed among them. Once a year, a gala is held to recognize organizations that have maintained the highest service quality throughout the year. Project objectives are evaluated based on selected KPIs, in terms of improved quality of services, as evidenced by their ranking position: "This year, we received a statuette for the past two years and were awarded the title of the best service provider". A declared result of implementing this solution is the improvement of inter-departmental collaboration within the organization: "...they communicate more frequently, share information with each other, I even know that after work... the freight forwarding group is more supportive of the administrative group, because they know that everyone will work towards that success..." and enhancement of client collaboration: "...we also had quality issues. When we attended occasional meetings, be it during negotiations for further contacts or discussing the overall situation, these meetings were sometimes challenging

because it's difficult to talk about rate increases when the client immediately states: well, listen, there's an issue here, because there are so many delayed deliveries, loading is behind schedule, we have problems at the warehouse because nothing arrives in the window, forklift operators have nothing to do... (after implementing the solution) we hear that they find it pleasant to collaborate with us..., here we can always come to an understanding..."

As revealed through conducted interviews, the primary objective of both projects was not knowledge transfer. Nevertheless, when questioned about the impact of the implemented gamification elements on the four knowledge transfer sub-processes, the individuals involved in the implementation of these solutions consistently characterized it as significant and positive. It is important to emphasize that these are preliminary studies. However, the insights they provide underscore the necessity for further research in the realm of gamification implementation within the context of supporting knowledge transfer within an organization.

Conclusions

Both the literature review and the conducted case study indicate that gamification projects implemented within organizations have a positive impact on knowledge transfer, regardless of their objectives. However, it's essential to note that these are preliminary studies. It can be assumed that knowledge transfer is significant in the implementation of gamification within an organization, but to definitively address the posed questions, further empirical research is necessary. Such research would help determine the variables influencing the positive effects in the realm of knowledge transfer. A promising direction appears to be investigating the relationship between the dynamics of a gamified solution and its influence on the effectiveness of the four subprocesses of knowledge transfer.

References

- Adamczyk, J. (2017). Dyfuzja koncepcji zrównoważonego rozwoju i społecznej odpowiedzialności przedsiębiorstw [Diffusion of the concept of sustainable development and corporate social responsibility]. *Marketing I Rynek* 11, 5-15.
- Csikszentmihalyi, M. (2005). *Przeptyw: psychologia optymalnego doświadczenia* [Flow: The Psychology of Optimal Experience]. Wałbrzych: Moderator 2005.
- Fazlagić, J. (2014). *Innowacyjne zarządzanie wiedzą* [Innovative Knowledge Management]. Warszawa: Difin.
- Georgiou, K., Gouras, A., Nikolaou, I. (2019). Gamification in employee selection: The development of a gamified assessment. *International Journal of Selection and Assessment*, 27(2), 91-103.
- Hoffmann, G., & Pfeiffer, J. (2022). Gameful Learning for a More Sustainable World. *Bus Inf Syst Eng* 64, 459-482.

- Hunicke, R., Leblanc, M., Zubek, R. (2004). *MDA: A Formal Approach to Game Design and Game Research, Proceedings of the Challenges in Games AI Workshop. Nineteenth National Conference of Artificial Intelligence* (San Jose, CA: AAAI Press, 2004).
- Kania, K., Smolarek, M. (2017). Analiza rozwoju gamifikacji biznesowej na przykładzie przedsięwzięć realizowanych w Polsce [Analysis of Business Gamification Development Using the Example of Projects Implemented in Poland]. *Informatyka ekonomiczna*, (2), 60-71.
- Koza, I. (2022). Diversity and Technological Development as Manifestations of Innovation. *Administracja i Zarządzanie* (58), 45-53.
- Li Y., Li Y., Ma K., & Zhou, X. (2022). Consumer Online Knowledge-Sharing: Motivations and Outcome. *Front. Psychol.* (13), 871518.
- Liu, M., Huang, Y., Zhang, D. (2018). Gamification's impact on manufacturing: Enhancing job motivation, satisfaction and operational performance with smartphone-based gamified job design. *Human Factors and Ergonomics in Manufacturing & Service Industries*, 28(1), 38–51.
- Łukasik, P. (2019). Creative Industries and Knowledge Replication. *Management Sciences*, 24(3), 10-15.
- Mikuła, B. (2006). *Zadania organizacji w zakresie zarządzania wiedzą* [Organizational Tasks in the Field of Knowledge Management]. *E-mentor*, 5(17).
- Moczulska, M., Winkler, R. (2018). The "Burden" of Knowledge: Unwanted Knowledge in Management – The Perspective Of Individual and Organizational Level. *Management Sciences*, 23(1), 37-44.
- Morschheuser, B. Maedche, A. & Walter D. (2017). Designing Cooperative Gamification: Conceptualization and Prototypical Implementation. In: *Proceedings of the 2017 ACM Conference on Computer Supported Cooperative Work and Social Computing (CSCW '17)*. Association for Computing Machinery, New York, NY, USA, 2410–2421. doi: 10.1145/2998181.2998272
- Passalacqua, M., Sénécal, S., Frédette, M., Nacke, L.E., Pellerin, R., Léger, P.M. (2020). *A Motivational Perspective on the Personalization of Gamification. Proceedings of the Nineteenth Annual Pre-ICIS Workshop on HCI Research in MIS. Virtual Conference*, December 12, 1-5.
- Pietruszka-Ortyl, A. (2020). *Kooperacja w perspektywie zasobów niematerialnych organizacji* [Cooperation from the Perspective of Intangible Resources in Organizations]. Warszawa: C.H. Beck.
- Ryan, R., Deci, E. (2000). Self-Determination Theory and the Facilitation of Intrinsic Motivation, Social Development, and Well-Being. *American Psychologist*, 55(1), 68–73.
- Schacht, S., Maedche, A. (2015). Project Knowledge Management While Simply Playing! In: *Gaming Mechanics in Project Knowledge Management Systems: Gamification in Education and Business*. Springer, 593-614.
- Silic, M., Back, A. (2017). Impact of Gamification on User's Knowledge-Sharing Practices: Relationships between Work Motivation Performance Expectancy and Work Engagement. In: *Proceedings of the 50th Hawaii International Conference on System Sciences*. 1308-1317.
- Spanellis, A., Dörfler, V., & MacBryde, J. (2020). Investigating the potential for using gamification to empower knowledge workers. *Expert Systems with Applications*, 160, 113694, doi: /10.1016/j.eswa.2020.113694.
- Stadnicka, D. Deif, A. (2019). A gamification approach application to facilitate lean manufacturing knowledge acquisition. *Management and Production Engineering Review*, 10(4), 108–122.
- Swacha, J. (2015). Gamification in knowledge management: motivating for knowledge sharing. *Polish Journal Of Management Studies*, 12 (2), 150-159.
- Vasilescu, B., Serebrenik, A., Devanbu, P., & Filkov, V. (2014). How social Q&A sites are changing knowledge sharing in open source software communities. *Proceedings of the 17th ACM conference on Computer supported cooperative work & social computing (CSCW '14)*. Association for Computing Machinery, New York, NY, USA, 342–354. doi: /10.1145/2531602.2531659
- Weretecki, P., Greve, G., Bates, K., & Henseler, J. (2021). Information management can't be all fun and games, can it? How gamified experiences foster information exchange in multi-actor service ecosystems, *International Journal of Information Management*, 61, 102391, doi: /10.1016/j.ijinfomgt.2021.102391.
- Witoszek-Kubicka, A. (2020). Implementation of Gamification in Polish Companies – Stages, Elements, Ethics. *Information* 11, 371. doi:10.3390/info11080371.
- Zichermann, G., Cunningham, Ch. (2012). *Grywalizacja. Mechanika gry na stronach www i w aplikacjach mobilnych* [Gamification: Game Mechanics on Websites and Mobile Applications]. Gliwice: Helion.