sciendo

„Journal of Management and Business Administration. Central Europe"
Vol. 27, No. 2/2019, p. 83–96, ISSN 2450-7814; e-ISSN 2450-8829

IT Reliability and Innovation in SMEs: Empirical Research

Katarzyna Tworek[1], Katarzyna Walecka-Jankowska[2], Anna Zgrzywa-Ziemak[3]

Submitted: 27.07.2018. Final acceptance: 27.05.2019

Abstract

Purpose: Analysis of theoretical views and empirical research concerning the relation between IT reliability and the innovation level of organizations.

Methodology: The pilot (sample: 100) and main (sample: 400) survey was conducted in 2017 among SMEs located in Poland.

Findings: The empirical analysis shows that there is a relation between IT reliability and innovation level. Moreover, information reliability appears as a factor that may influence the organization's ability to create innovations. Furthermore, service reliability proves to correlate with innovation level as well, which provides additional conclusions that support the realization that service is an important feature, which may also influence employees' ability to employ IT appropriately and efficiently, thereby supporting the generation of innovation.

Implications: Findings enable us to indicate the direction of further promising research that should concern the relationship between IT reliability and innovation in the context of stages of the innovation process and different types of innovation, which should be analyzed separately.

Value: The article presents a new factor that may influence the possibility of creating various types of innovations. Usually, papers focus on IT systems, while the relationship between IT reliability and innovation allows us to look deeper into this relationship.

Keywords: IT reliability, innovation, empirical research

JEL: 031

[1] Wrocław University of Science and Technology
Correspondence address: Wrocław University of Science and Technology, Department of Computer Science and Management, wyb. Wyspiańskiego 27, 50-370, Wrocław, Poland; e-mail: katarzyna.tworek@pwr.edu.pl; ORCID: 0000-0002-6276-2436.

[2] Wrocław University of Science and Technology
Correspondence address: Wrocław University of Science and Technology, Department of Computer Science and Management, wyb. Wyspiańskiego 27, 50-370, Wrocław, Poland; e-mail: katarzyna.walecka-jankowska@pwr.edu.pl; ORCID: 0000-0002-2764-6763.

[3] Wrocław University of Science and Technology
Correspondence address: Wrocław University of Science and Technology, Department of Computer Science and Management, wyb. Wyspiańskiego 27, 50-370, Wrocław, Poland; e-mail: anna.zgrzywa-ziemak@pwr.edu.pl; ORCID: 0000-0002-6904-8040.

Ministry of Science and Higher Education
Republic of Poland

English-language editing of that article was financed under Agreement 672/ P-DUN /2019 with funds from the Ministry of Science and Higher Education allocated to the popularization of science.

DOI: 10.7206/jmba.ce.2450-7814.254

Introduction

Today, in the era of the fourth industrial revolution, competition among organizations grows and becomes increasingly transnational. Żmuda (2017) captures the intensity of the new age of macrocompetition in a scientific simile between organizations' battle to survive in an integrated global market and organisms' struggle for biological existence in the context of environmental transitions. Since 1990, there simultaneously rapidly develops a broad interest in innovation. There is widespread agreement among authors, researchers, consultants, and thinkers in the field of management that innovation is the central capability for all organizations interested in maximizing their opportunities for success in the twenty-first century. Now, innovation is considered to be a crucial aspect that allows organizations to survive, grow, achieve, and maintain their competitive advantage. Enhancing the innovative ability of organizations is" one of the most important levers to increase the profitability and growth of organizations" (Dobni, 2010, p. 49). One may indicate other determinants of innovation, among others, corporate culture (Molasy et al., 2018), the level of interorganizational trust (Kay and Willman, 2018; Swann, 2018, Zhu et al., 2018, Walecka-Jankowska, 2016), organic structure, or main process (Walecka-Jankowska and Zimmer, 2018).

This article concentrates on IT reliability. Hence, the purpose of this article is to show that IT reliability can support organizational innovation. Currently, Francis Bacon's saying that "knowledge is power" receives truer meaning than ever. Rapid access to information is the critical factor of success for many organizations (Palmius, 2007; Shu-Hsien, 2003), and it enables their innovation. Thus, IT that supports acquisition, location, transfer, and codification of knowledge is an important field of study (Tworek et al., 2016, Soto-Akosta et al., 2018). On the other hand, there appear articles arguing that human factors and knowledge-worker dynamics are more important than IT and system approach in the automation of knowledge, or big data approach in the accumulation of knowledge (Frank et al., 2015; Sumbal, Tsui and See-to, 2017, Shujahat et al., 2018). Moreover, both practitioners and theoreticians deal with problems of managing innovation, as they seek its determinants in minimizing the barriers to the creation and implementation of innovations. Many consider IT to be the decisive factor in organizational innovation. Furthermore, innovation can be practiced and taught. The goal of researchers is to show how to formulate and implement each determinant of innovation, including IT, to promote the development of innovation and its effective use in the development of long-term value in organizations. This article concentrates on one dimension of IT – its reliability – as a new approach to moderate innovation determinants in organizations, and it offers an empirical verification of the proposed theoretical framework.

Innovation

We currently observe a pressure to innovate, which leads to building an internal corporate culture oriented toward innovation and creativity that would support employees and their risk-taking (Davila, Epstein and Shelton, 2006). For the first time, innovation tops world rankings as the most important value (Rek, 2013). Depending on the discipline that scrutinizes the term innovation – be it organization theory, economics, sociology, or applied science – scientists show various approaches to the matter. Most authors emphasize the aspects of an organization's search for new solutions in response to changes in the environment; both changes in customer needs and in organizational environment elements like technology. Most interpret innovation as an introduction of a new product and associate it with the production process of, especially, technology. Fewer relate innovation to organizational, administrative, and cultural changes (Davila, Epstein and Shelton, 2006). This differentiation also results from the understanding of innovation as a process or result/outcome of a process. However, most definitions emphasize innovation novelty objectively and subjectively. The objective approach is macroeconomic: it views innovation as an absolutely new, pioneering work. The subjective approach is microeconomic: it views innovation as new to organizations, which develop and implement it regardless of whether a particular solution exists in other organizations. Innovation means that the organization is successful as a result of its implementation; that is, innovation is not simply a theoretical assumption or a new idea. Innovative activity should be reflected in an improvement in the use of resources or the generation of socio-economic benefits, such as economic profit, personal development of employees, higher job satisfaction, better communication within the organization, or increased knowledge and experience resources (Walecka-Jankowska, 2016).

This study assumed that innovation is a change that leads to an improvement in product, production process, marketing, or the organization itself, which is developed to achieve economic or social benefits. The activities related to innovation include changes in both the incremental and radical transformation of existing solutions. However, the adoption of a subjective understanding allows one to achieve a high level of innovation, even if the organization implements changes that exist in other entities; especially when the changes contribute to the improvement of the organization. The literature mentions many different innovation determinants, among other things intraorganizational: corporate culture, trust, leadership (as soft variables) along with the type of technology, systems, management methods, and strategy. The literature also mentions the extraorganizational determinants: the market, the industry, the financing methods, and the institutions that support the R&D activities. For at least two

 DOI: 10.7206/jmba.ce.2450-7814.254

decades now, particular attention has been paid to providing information that allows new knowledge to emerge. Information – and knowledge – management became one of the most frequently indicated method that allows for the use of knowledge in the organization. This means that one must also acquire knowledge from outside the organization more effectively and, certainly, more consciously (Walecka-Jankowska, 2016). Hence, the information system, and the technology that supports it, plays an important role, because it allows organizations to locate existing knowledge, transfer it between employees in need, and save it for future use.

IT Reliability

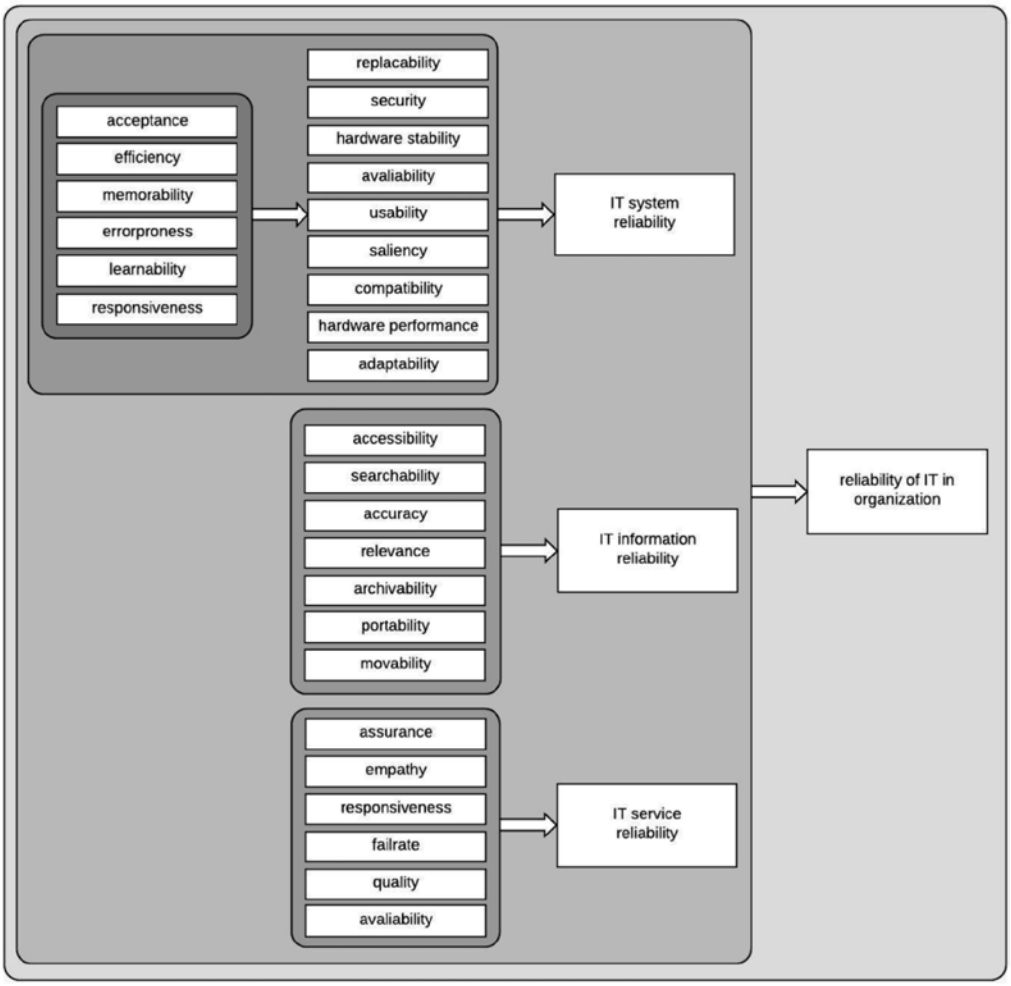
Almost every organization operates with some kind of information technology (IT). IT's reliability seems to be one of the key factors that influence the organization's competitive advantage from its application to the ability to benefit from IT during the entire innovation process. Moreover, while facing new global Internet threats – such as WannaCry ransomware or massive hacker attacks – the maintenance of IT's reliability, security, and accuracy in the organization becomes one of the biggest challenges of IT management (Tusubira and Mulira, 2004). Hence, this situation is a crucial step in supporting knowledge transfer and security, which proved to be of utmost importance in the organization's innovation.

The current paper's notion of IT reliability largely refers to IT management and the everyday use of IT in the organization, which influences the latter's ability to support the innovation process. This is mainly because it causes a significant and immediate business impact in modern organizations when a critical IT solution is unavailable in any way. Such a situation not only affects the business operation but also, as such, disproportionately affects the business perception of IT in the organization and undermine its potential for supporting business processes. Moreover, the situation also affects the ability to remain competitive on the market and create innovations. Hence, it makes IT reliability the critical issue for modern managers and businesses. Moreover, this issue is especially important for organizations that seek to retain or boost their innovation.

We understand IT reliability in the organization as a measurable property of IT, one that is useful for its control and management, identifies its quality level, and indicates potential problems (Zahedi, 1987); and it is directly linked to the efficiency of IT components, especially those critical to its proper operations. Therefore, we may say that IT reliability in organizations is a notion engendered by factors connected to three

different IT theories. First is DeLone and McLean's (2003) success model, second is Lyytinen's (1987) four types of Information Science (IS) failure, and third is the TAM model by Davis (1985). Thus, in order to fully develop the notion of IT reliability, we must identify the factors that construct each of the four identified variables proposed in the IS reliability model (see Figure 1). To identify all four, we searched for articles published in 2000–2018 with key words "IT in organization," "IS in organization," and "measurement" in EBSCO and ProQuest databases. From all available publications, we purposefully selected those concerning lists of factors that describe IT in organizations. Based on these studies (Finne, 2005; Irani, 2002; Niu, Da Xu and Bi, 2013;

Figure 1. IT reliability in the organization model



Source: Tworek (2019).

 DOI: 10.7206/jmba.ce.2450-7814.254

Palmius, 2007), we identified all the factors potentially related to IT reliability in the context of the three abovementioned IT theories and assigned them to the proposed four variables (Niu, Da Xu and Bi, 2013).

A model of IT reliability in the organization was meticulously prepared by Tworek (2016) and we include it below in Figure 1. IT reliability in the organization consists of four factors: (1) the reliability of information included in IT in the organization, (2) the reliability of support services offered for IT in the organization, and (3) the reliability of system itself, which also includes (4) the usability of this system (Tworek, 2019). Each factor constitutes a series of items (see Figure 1).

IT and Innovation: Discussion

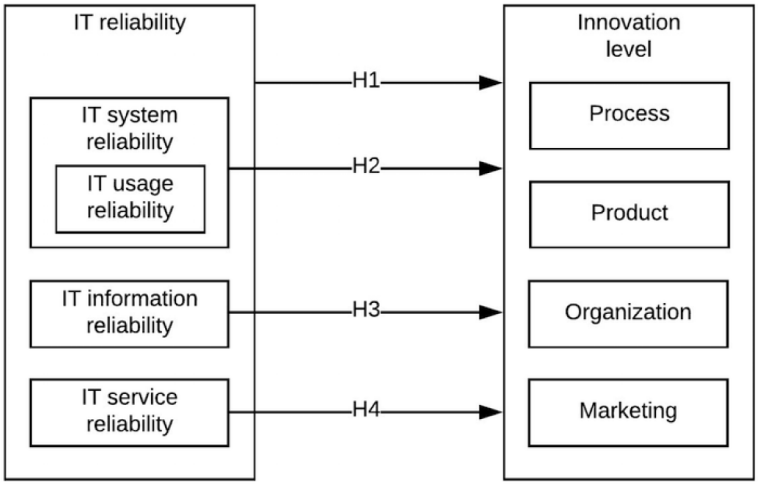
The role of IT in supporting innovation in the organization is broadly known (Chen et al., 2015; Morawski, 2009; Hosseinin et al., 2017). However, the relation between IT and innovation is especially visible when concentrating on different stages of the innovation process, not only because it enables communication between employees but also because it now is one of the key factors that support information security.

IT can be crucial for decision-making – by supporting the mechanism of identifying, processing, and selecting reliable information – because, most importantly, it can support receiving signals from the environment. Looking through the prism of various types of innovations – be it a product, process, marketing, or organizational innovation – we notice a relation between IT and the different types of innovation (Oslo Manual, 2005). Organizational innovation should result from the employees' deep conviction that it is an important value in the organization, which requires support at every organizational level. Although the role of top-level managers as they are those who create a vision, translate it into strategic goals, and create support for innovations is very important; also lower-level managers are those who can directly support the creativity of employees. As they are part of the organization, all employees create and support the climate conducive to innovation. The availability of a secure, relevant, and up-to-date information is crucial in every stage of the innovation process (irrespective of which level of hierarchy there are employees participating in it). At every level, one must develop, locate, and diffuse knowledge to all employees, then access up-to-date information that allows proper decision-making; all these tasks strongly rely on IT reliability, which secures the ability of IT to support all of them (Trantopoulos et al., 2017). Moreover, the support of innovation results from the fact that organizational values concentrate on constant development and knowledge sharing, but also

on discovering new knowledge thanks to experimentation, an attitude open to risks, and the support of individual activities (Walecka-Jankowska and Zimmer, 2015). Creating and implementing innovations requires independent, professional, and knowledgeable employees, who can find solutions to constantly changing problems in a flexible way (Walecka-Jankowska, 2016). They are characterized by the willingness to acquire new knowledge, high competences, diversity-seeking through cooperation (Srikantaih, Koenig, 2001), and an innovative approach, as they notice opportunities for creating new knowledge, create ground-breaking changes, manifest innovative entrepreneurship, encourage others to think creatively, and cooperate with others in this respect (Morawski, 2009). All that is impossible without the employees' conviction about the reliability and security of IT, as they use it as a tool to generate innovations. In order to offer unconventional solutions, knowledge employees require great freedom and independence in their actions. IT supports the independence of employees, because it provides access to necessary data and allows a free, multidirectional, formal, and informal communication. Moreover, IT reliability influences the perceived level of the actual usefulness of information systems available in the organization to the employees and influences their ability and conviction to benefit from using them.

Based on the literature review and the theoretical model of IT reliability proposed by Tworek (2016) presented above, we formulate the hypotheses below, gathered in Figure 2, in which H1 is the main hypothesis, and H2–H4 are specific hypotheses.

Figure 2. Research hypotheses



Source: own elaboration.

 DOI: 10.7206/jmba.ce.2450-7814.254

H1: The more reliable the IT in the organization, the greater the level of innovation.
H2: The more reliable the IT system in the organization, the greater the level of innovation.
H3: The more reliable the information included in the IT in the organization, the greater the level of innovation.
H4: The more reliable the support service of IT, the greater the level of innovation.

Empirical Research

We conducted a survey to identify the relation between the level of IT reliability in the organization and innovation. The pilot survey occurred in 2017 in a group of 100 organizations. This survey led to the collection of random answers in case of several questions, indicating the need for rewriting them into more precise statements. They were rewritten to obtain more reliable results, which ensured an informed response from respondents. The main survey was conducted later, in 2017, among small and medium enterprises (SMEs) located in Poland, via an online survey service SurveyMonkey. One survey was conducted per organization. The statistical population (SME operating in Poland) is finite but very large: we received 400 valid responses. Since the results responded to a prepared form, the online system counted only those fully and correctly filled.

The survey was anonymous, but we made sure that the questionnaire was filled by employees with a broad view of the entire organization. Therefore, the respondents were the higher level managers from small and medium organizations that operate in Poland. We asked the respondents to evaluate the innovation level of their companies in sixteen questions by marking actions/activities implemented by their organization on the <0,1> scale. Four types of innovations were evaluated, according to the Manual Oslo (Manual Oslo, 2005). The first part of questions (5 items) concerned in particular technological processes, machines/devices/ equipment/tools, and software. Product innovations were another type tested, and so the respondents had to assess whether the organization implemented a new or improved product/service (1 item). The next four questions concerned marketing innovations: the change of appearance in the implemented product, customer segmentation, and positioning of products or services. The last group (6 items) concerned organizational changes like methods of personal development of employees, methods of business organization (i.e quality management system), systemic knowledge management solutions, methods of delegation of responsibilities, and decision-making. These questions were the basis for formulating the innovation indicator.

We asked respondents to evaluate the IT in the organization based on the list of factors on the Likert scale: from "very poor" to "very good" with the middle point "fair." We asked for the general opinion about the reliability of system, usage, information, and service, then for the evaluation of each factor by constructing these four variables. Likert scale to measure IT reliability seems an appropriate choice. First, IT reliability in the organization is a subjective notion. Employees' perspective and opinion concerning aspects of IT reliability is the best source of knowledge since their perception matters the most, which is why IT influences the organization mainly through its potential to influence the everyday work of employees. Although quantitative methods are commonly used to assess the software and hardware features linked to reliability, they do not give information about the actual perception of this notion within the organization.

Research Results

There were two main variables: IT reliability and innovation level. IT reliability consists of three dimensions, theoretically distinguished in previous paragraphs. Noteworthy, Cronbach's α was 0.890 and higher for every variable, which indicates a high internal reliability of the scales and measurements. We calculated the descriptive statistics for all the measured variables (Table 1).

Table 1. Descriptive statistics

	Average	Median	Minimum	Maximum	Std. Deviation	Cronbach alpha
IT reliability	3.73	4.00	1.44	5.00	1.00	0.890
information reliability	3.71	4.00	1.43	5.00	1.02	0.910
system reliability	3.74	4.00	1.39	5.00	0.98	0.915
service reliability	3.79	4.17	1.50	5.00	1.03	0.890
Innovation level	0.88	1.00	0.00	1.00	0.21	–

Source: own elaboration.

We calculated the r-Pearson correlation coefficients (for which the correlation is considered as mild when $r < 0.3$, as moderate when $0.3 < r < 0.6$, and as strong when $r > 0.6$) between *IT reliability* and *innovation level* (Table 4). The results show that the variables are significantly correlated and the correlation is moderate. We should underline that the correlation analysis does not allow to conclude anything about the cause-and-effect relation.

 DOI: 10.7206/jmba.ce.2450-7814.254

Table 2. Correlation analysis between IT reliability and innovation level

		Innovation level
IT reliability	Corelation	.437**
	Significance	.000
	N	371
system reliability	Corelation	.475**
	Significance	.000
	N	383
information eliability	Corelation	.479**
	Significance	.000
	N	379
service reliability	Corelation	.508**
	Significance	.000
	N	389

Source: own elaboration.

The correlation analysis shows that there is a statistically significant relation between innovation level and all the aspects of IT reliability. Moreover, information reliability – especially important for the organization's innovation level support in the literature review – also proved significantly correlated with innovation level. Hence, we may conclude that all four proposed hypotheses are positively verified based on the obtained sample of responses from Polish SMEs.

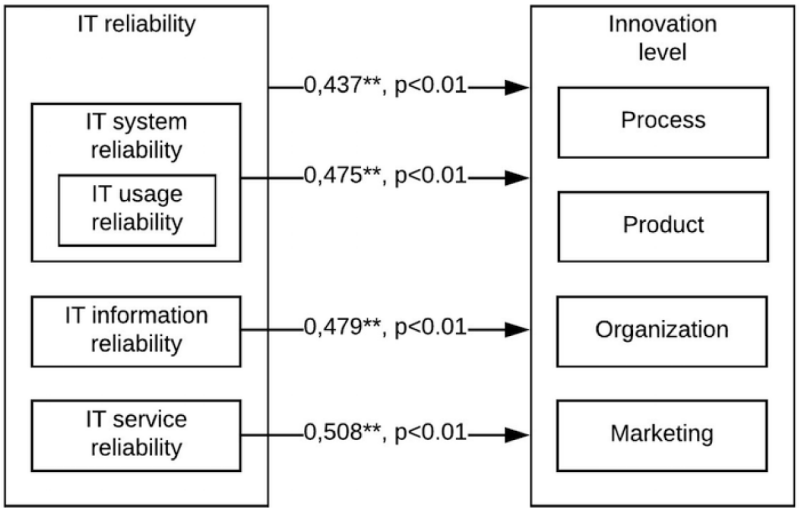
Conclusions

The main aim of this article was to empirically verify the relationship between IT reliability (and its constructs) and the level of the organization's innovation. The empirical analysis clearly showed that there is a relationship between those two notions. The results are presented in Figure 3.

Currently, when the use of IT is part of organizational procedures, managers can focus on those IT features that enable the use of knowledge to a greater extent along with faster access to knowledge that comes from reliable and secure sources. The research

results allow us to draw a set of conclusions that answer the question: Which features of IT reliability are particularly important for innovation in the organization?

Figure 3. Research hypotheses verification



Source: own elaboration.

Information reliability is statistically significantly correlated with all types of innovation in the organization, which was the basis for the verification of hypotheses H1–H4. First, it seems that, indeed, IT reliability is related to the level of innovation in the organization. Hence, it proves the conclusions, which arose from the literature review, that reliability and security of IT is an important feature that may influence the organization's ability to create innovations. IT enables communication between employees and influences the information flow within the organization, but also because it now is one of the key factors that support information security, which can reflect on the quality of decision-making. Second, the literature considers information reliability – connected also with the problem of knowledge safety described by Zięba (2017) – as an important factor that influences knowledge employees' conviction to use IT so as to generate innovation (Tworek, Walecka-Jankowska and Martan, 2016). The searchability and accuracy of information is especially important due to employees' ability to quickly gain access to information already available in the organization. The result is that the time of idea creation can be considerably shortened, which positively influences the possibility to generate innovations. Moreover, the relevance of information is crucial for the elimination of information, which are not useful for the organization. Third, service reliability proved to correlate with innovation level as well, which

 DOI: 10.7206/jmba.ce.2450-7814.254

shows that the quality, responsiveness, and availability of IT service is also important in the process of innovation creation. This realization provides additional conclusions that support service as an important feature that may also influence employees' ability to use IT appropriately and efficiently, which translates into better support for generating innovation.

We should underline that the above research has some limitations. The hypotheses verification is based on a sample of 400 organizations that operate in Poland and further verification in different business contexts is required. However, the research presented here is a solid first step in the process of framework verification. Moreover, it allows for initial conclusions from the verification process, which will influence further research on the subject. Further research should concern the indication of the relation between IT reliability and innovation in the context of the stages of the innovation process, while different types of innovation should be analyzed separately. IT has a different role for different innovation types in each of the stages. For example, organizations apply IT more often as a communication channel or a database source on good practices. Moreover, IT reliability can be assessed as a more important factor in those stages, in which it is particularly important to make quick decisions based on accurate and up-to-date information.

References

Chen, Y., Wang, Y., Nevo, S., Benitez-Amado, J. and Kou, G. (2015). IT capabilities and product innovation performance: The roles of corporate entrepreneurship and competitive intensity. *Information & Management, 52*(6), 643–657.

Davila, T., Epstein, M.J. and Shelton R. (2006). *Making innovation work: How to manage it, measure it, and profit from it?* Upper Saddle River, NJ: Pearson Education

Davis, F.D. (1985). *A technology acceptance model for empirically testing new end-user information systems: Theory and results* (doctoral dissertation, Massachusetts Institute of Technology).

Delone, W.H. and McLean, E.R. (2003). The DeLone and McLean model of information systems success: a ten-year update. *Journal of Management Information systems, 19*(4), 9–30, http://doi.org/10.1080/07421222.2003.11045748

Dobni, C.B. (2010). Achieving synergy between strategy and innovation: The key to value creation. *International Journal of Business Science and Applied Management, 5*(1).

Finne, A. (2005). *Blueprint for General Quality Attribute Model*. Proceedings of IRIS'28.

Frank, A.G., Ribeiro, J.L.D. and Echeveste, M.E. (2015). Factors influencing knowledge transfer between NPD teams: A taxonomic analysis based on a sociotechnical approach. *R&D Management, 45*(1), 1–22.

Hosseini, S., Kees, A., Manderscheid, J., Röglinger, M. and Rosemann, M. (2017). What does it take to implement open innovation? Towards an integrated capability framework. *Business Process Management Journal, 23*(1), 87–107.

Irani, Z. (2002). Information systems evaluation: navigating through the problem domain. *Information & Management*, *40*(1), 11–24, http:// doi.org/10.1016/s0378-7206(01)00128-8

Kay, J. and Willman, P. (2018). Managing technological innovation: Architecture, trust and organizational relationships in the firm. In: P. Swann (ed.), *New Technology and the Firm.* London: Routledge.

Lyytinen, K. (1987). Different perspectives on information systems: problems and solutions. *ACM Computing Surveys (CSUR)*, *19*(1), 5–46.

Manual Oslo (2005). *The measurement of scientific and technological activities. Proposed Guidelines for Collecting an Interpreting Technological Innovation Data. Statistical Office of the European Communities*, http://doi.org/10.1787/9789264013100-en

Molasy, M., Walecka-Jankowska, K. and Zgrzywa-Ziemak, A. (2018). Kształtowanie kultury organizacyjnej wspierającej innowacyjność przedsiębiorstw. *Zeszyty Naukowe Politechniki Poznańskiej. Organizacja i Zarządzanie*, *77*, 205–221.

Morawski, M. (2009). *Zarządzanie profesjonalistami*. Warszawa: PWE.

Niu, N., Da Xu, L. and Bi, Z. (2013). Enterprise information systems architecture – Analysis and evaluation. *IEEE Transactions on Industrial Informatics*, *9*(4), 2147–2154, http:///doi.org/10.1109/tii.2013.2238948

Palmius, J. (2007). Criteria for measuring and comparing information systems. *Proceedings of the 30th Information Systems Research Seminar in Scandinavia IRIS 2007.*

Rek, K. (2013). Co się liczy dla firm? *Harvard Business Review Polska*, *122*(04).

Shujahat, M., Ali, B., Nawaz, F., Durst, S. and Kianto, A. (2018). Translating the impact of knowledge management into knowledge-based innovation: The neglected and mediating role of knowledge-worker satisfaction. *Human Factors and Ergonomics in Manufacturing & Service Industries*, *28*(4), 200–212.

Shu-Hsien, L. (2003). Knowledge Management technologies and applications – literature review from 1995–2002. *Expert Systems with Applications*, *25*, 155–164, http://doi.org/10.1016/s0957-4174(03)00043-5

Soto-Acosta, P., Popa, S. and Martinez-Conesa, I. (2018). Information technology, knowledge management and environmental dynamism as drivers of innovation ambidexterity: a study in SMEs. *Journal of Knowledge Management*, *22*(4), 824–849.

Srikantaih, K. and Koenig, M. (2001). *Knowledge management for the information professional.* Medford, NJ: Information Today, Inc.

Sumbal, M.S., Tsui, E. and See-to, E.W. (2017). Interrelationship between big data and knowledge management: An exploratory study in the oil and gas sector. *Journal of Knowledge Management, 21*(1), 180–196.

Swann, P. (ed.) (2018). *New technologies and the firm: Innovation and competition (Vol. 48)*. Routledge.

Trantopoulos, K., von Krogh, G., Wallin, M.W. and Woerter, M. (2017). External knowledge and information technology: Implications for process innovation performance. *MIS Quarterly, 41*(1), 287–300.

Tusubira, F. and Mulira, N. (2004, September). *Integration of ICT in organizations: Challenges and best practice recommendations based on the experience of Makerere University and other organizations*. International ICT Conference Held at Hotel Africana, Kampala, Uganda. 5th to 8th September.

Tworek, K. (2016). Model niezawodności systemów informacyjnych w organizacji. *Zeszyty Naukowe. Organizacja i Zarządzanie*, *88*, 335–342.

Tworek, K., Walecka-Jankowska, K. and Martan, J. (2016). Information Technology as an Indirect Factor Supporting Knowledge Management in Organization – Mediating Role of Organizational

Structure. *Information Systems Architecture and Technology: Proceedings of 36th International Conference on Information Systems Architecture and Technology – ISAT 2015–Part III, 115-125,* Springer, Cham. http://doi.org/10.1007/978-3-319-28564-1_10

Tworek, K. (2019). *Aligning IT with business.* Springer, Cham.

Walecka-Jankowska, K. (2016). Relationship between Knowledge Management and Innovation. *Social Sciences*, *90*(4), 55–66, http://doi.org/10.5755/j01.ss.90.4.14260

Walecka-Jankowska, K. and Zimmer, J. (2015). Corporate Culture in Support of the Strategy: the Key to Organizational Innovation. *Przegląd Organizacji*, *10*, 43–48.

Walecka-Jankowska, K. and Zimmer J. (2018). Technology, organizational structure and innovation – in organizations operating in Poland. In: P. Jedlička, P. Marešová and I. Soukal (eds.), *Double--blind peer-reviewed proceedings part II. of the international scientific conference Hradec Economic Days 2018*, January 30–31. Hradec Králové: University of Hradec Králové.

Zahedi, F. (1987). Reliability of information systems based on the critical success factors-formulation. *MIS Quarterly*, 187–203.

Zhu, B., Habisch, A. and Thøgersen, J. (2018). The Importance Of Cultural Values And Trust For Innovation – A European Study. *International Journal of Innovation Management*, *22(02)*.

Zięba, M. (2017). Knowledge Safety – Insights from the SME Sector. *Journal of Management and Business Administration*, *25*(3), 78–96, http://doi.org/10.7206/jmba.ce.2450-7814.203

Żmuda, M. (2017). Towards a Taxonomy of International Competitiveness. *Journal of Management and Business Administration*, *25*(3), 97–116, http://doi.org/10.7206/jmba.ce.2450-7814.204