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THE USE OF TRADITIONAL AND AGILE PM METHODOLOGIES IN ICT

Abstract

Objectives:
The main aim of this article was to present the use of traditional and agile project management methodologies in companies in the communication and information technology (ICT) industry.

Material and methods:
The following methods were used to obtain research material and present the obtained results: literature studies, diagnostic survey, descriptive, tabular and graphic.

Results:
The following results were obtained in the study: (1) most of the respondents had the opportunity to work with both traditional and agile project management methodologies; (2) PRINCE2® was the popular traditional methodology and Scrum was the most popular agile methodology among the respondents; (3) the respondents valued higher the agile methodologies included the study (Scrum, XP, FDD) than the traditional ones (PMBoK®, PRINCE2®) in terms of the quality and efficiency of

work; (4) according to the respondents, the most important advantage of traditional methodologies is the use of a transparent structure, whereas the most important advantage of the agile methodologies is defining the project success as an ability to deliver business value to the end-user; (5) according to the respondents, the biggest disadvantage of traditional methodologies is late testing of the implemented solutions, and the biggest disadvantage of the agile methodologies is their lower predictability.

Conclusions:

The article succeeded in achieving the main objective and research tasks as well as verifying the research hypotheses. Due to its limitations, it constitutes a starting point for further analyses of the problem area undertaken.

Keywords: *project management, traditional project management methodologies, agile project management methodologies, quality, efficiency, ICT sector*

Introduction

Over the last 30 years, the communication and information technology (*ICT*) industry has been developing dynamically (Liebert, 2017, p. 272). Rapid processes of digitization and computerization of societies resulted in the creation and implementation of hundreds of thousands of IT (*Information Technology*) projects around the world over the last few decades.

Before starting any project (not only an IT project), it is necessary to choose the appropriate project management methodology (Krysiak, Głowania, 2017, p. 81). There are two main options: traditional (classic) methodologies that are characterized the need for detailed planning of the product and the project implementation and the use of restrictive norms and standards for project management (Wyrozębski, 2011, p. 189), and agile (adaptive) methodologies, which have an incremental character and are based on feedback-based cooperation with the client (Liebert, 2017, p. 276). These approaches differ significantly in several areas, such as: product responsibility, the importance of initial stages of work, the concept of success or change management. It is also worth noting that in the case of traditional methodologies, resources and implementation time may change due to the need to adapt to the pre-imposed, fixed scope of the project (Palmquist et al., 2013, p. 5). When using agile

methodologies, by contrast, this relationship is reversed: resources and time remain unchanged whereas the scope of the project is adapted to the changing requirements (expectations) of the client.

The authors' research showed that the articles so far focused on theoretical aspects of project management with the use of traditional and agile methodologies (e.g. Fernandez, Fernandez, 2008, pp. 10-17; Cervone, 2011, pp. 18-22; Inayat et al., 2015, pp. 915-929). As noted by Žužek et al. (2020, p. 9245) there is a need for in-depth case studies and statistical analyzes in this area. Hence, the main goal of this article is to present the use of traditional and agile project management methodologies in companies from the ICT industry. Four research tasks were stated to accomplish this aim: (1) a critical review of Polish and international literature on traditional and agile project management methodologies, (2) an analysis of the level of knowledge of agile project management methodologies among employees of the ICT industry, (3) evaluation of the quality and efficiency of work with the use of traditional and agile project management methodologies, (4) a presentation of the most important advantages and disadvantages of traditional and agile project management methodologies.

Two research hypotheses were stated:

- H1: Most of the representatives of the ICT industry who participated in the survey are familiar with at least one agile project management methodology.
- H2: Agile project management methodologies are better assessed in terms of the quality and efficiency of work by the representatives of the ICT industry participating in the survey than the traditional ones.

H_1: refers to research conducted by Antlova (2014, pp. 929-933), which showed that companies operating in the ICT industry when compared to companies operating in other sectors more often use agile project management methodologies.

H_2: in turn, refers to the views according to which agile project management methodologies, unlike traditional methodologies, are closer to the specificity of IT projects, which are characterized by a high degree of uncertainty and unpredictability (e.g. Alleman, 2005, pp. 324-334; Cicmil et al., 2006, pp. 675-686).

To the best of the authors' knowledge, these hypotheses, though may seem to be obvious, have not been verified.

The article consists of five parts. After the introduction, the material and research methods are presented. In the next chapter, of a theoretical nature, a review of literature on traditional and agile project management methodologies is made. In the next part, the results of the study are presented and interpreted. The last chapter is a summary and presents the conclusions, limitations and proposals for further research on the subject matter.

The added value of the article is the systematization of knowledge in the field of traditional and agile project management methodologies, as well as recognition of the level of their knowledge and use in enterprises from the ICT industry. Thus, in the opinion of the authors, the article fills the gap in both the theory and practice of project management.

Material and methods

Two methods of obtaining research material were used to achieve the aim and tasks, as well as to verify the hypotheses: literature studies and a diagnostic survey.

The method of literature studies was used to evaluate the current state of knowledge on traditional and agile project management methodologies. Importantly, this method does not assume a priori questioning of existing theories, but focuses on recognizing their discrepancies with specific examples of activities from practice (Walczak, 2015, pp. 22-32). A critical review of the literature is the initial stage of the research procedure. It is especially useful in comparative works, the authors of which try to show similarities, differences and relationships regarding ideas, beliefs and views. It makes it possible to reveal the weaknesses of the conceptual categories and theoretical and methodological concepts presented in the analyzed sources, and, eventually, it allows to propose their modifications, corrections and supplements. When selecting the literature for this article, its availability and credibility were taken into account. Most of the articles cited by the authors have been published in renowned national and international journals.

As far as the diagnostic survey method is concerned, the survey questionnaire technique (the CAWI – *Computer Assisted Web Interview*) was used. The study was conducted on a group of 260 people from April to May 2022. The selection of respondents was purposive. They were representatives of the ICT industry holding various positions. Importantly, they came from different countries including: Poland, Germany and the United States. More on the research sample will be presented in the findings section. Multiple and single choice answers were used in the questionnaire. The aforementioned questionnaire was placed on the Internet in the form of a *Google Form*. It is worth mentioning that the technique used has its advantages and disadvantages. The advantages of the online survey include the high quality of the collected data resulting from the specificity of network communication (Pietrzak et al., 2019, p. 11). There are phenomena of the so-called disinhibition and self-disclosure (Joinson, Paine, 2007, pp. 237-252; Sillence, Briggs, pp. 727-748). Respondents are more likely to admit what they would not admit in traditional surveys, which is caused by the absence of the interviewer and a relatively high sense of anonymity in the net (Jiang et al., 2013, pp. 125-143). Moreover, people who are shy (Saunders, Chester, 2008, pp. 2649-2658), introverted or neurotic (Orchard, Fullwood, 2010, pp. 155-169), people with social phobia (Carlbring et al., 2007, pp. 123-128), people who stutter (Stoudt, Ouellette, 2004, p. 175-194), people with hearing impairment (Barak, Sadovsky, 2008, pp. 1802-1815) or socially stigmatized people (McKenna, Seidman, 2005, pp. 89-110) can take part in the survey. On the other hand, the limitations of the online survey include problems with ensuring representativeness and a low percentage of responses, which make it impossible to generalize the conclusions of the research (Siuda, 2016, p. 60).

Finally, the research material processing methods used in this article included: quantitative and qualitative analysis, synthesis, and deduction. In this process, a *Microsoft Excel 2013* spreadsheet was used. The following methods were used to present the research results: descriptive, graphical and tabular.

Literature review

In order to begin an analysis on IT project management methodologies, it is important to understand the definition and key features of the project first. According to PMI (*Project Management Institute*) (2013, p. 3), the project is a "temporary endeavor undertaken to create a unique product, service or result". In this definition, two keywords should be noted:

- temporary – each project has a fixed start and end, set by a specific time frame;
- unique – each project is unique, therefore is no equality sign between two projects. They can be similar when, for example, they are derived from previously implemented projects, or when two projects of competing companies have the same goal; one will always, however, find differences between them, such as budget, number of employees involved (more broadly, resources), scope.

Before starting the project, it is necessary to choose its implementation method (Soroka-Potrzebna, 2019, p. 90). In this regard, there are two approaches: traditional and agile. Some authors (e.g. Jahr 2014, pp. 35-45; Gemino et al., 2021, pp. 161-175) also point to the possibility of using hybrid solutions.

Traditional project management methodologies have been discussed in great detail in the literature on the subject (Ruel et al., 2010, pp. 43-60; Anantatmula, Webb, 2014, pp. 67-83). They are characterized by adopting a linear approach to project management, often referred to as the "cascade approach" (Dima, Maassen, 2018, p. 317). This means that all project phases are carried out in sequential order, with each phase having to be completed before the next one can start. Consequently, traditional project management methodologies are effective when the client has clearly formulated needs, there is a fixed budget for the project implementation, and a specific project completion date. Moreover, traditional project management methodologies work well when the goal of the project is well defined and the technique for achieving it is clearly and comprehensively formulated. In addition, there must be little likelihood of a change in scope during the project implementation (Soroka-Potrzebna, 2019, p. 92).

The traditional methodologies include: PMI PMBoK® (*Project Management Body of Knowledge*), TenStep, or PRINCE2® (*Projects In Controlled Environments*). The latter is a newer version of PRINCE, which was created in 1989 on the basis of the PROMPT (*Project Resource Organization Management Planning Technique*) methodology (Matos, Lopes, 2012, pp. 787 – 794). It is worth noting that PRINCE2® comes from Great Britain and is still a standard project management methodology (not only IT-related) in this country, used both in the private and public sectors (Sobieraj et al., 2021, pp. 554-555). Theoretical considerations on the differences between the above-mentioned methodologies can be found in the works of authors such as Wideman (2002), and recently Karaman & Kurt (2015, pp. 572-579).

In response to the need to implement projects under conditions of increased uncertainty, agile project management methodologies emerged (Soroka-Potrzebna, 2019, p. 92). Their origins date back to 2001, when on February 11-13, a group of experienced software development practitioners presented the *Manifesto for Agile Software Development* (Rodríguez et al., 2019, p. 137). According to its assumptions, when implementing projects, the following should be valued: "(1) Individuals and interactions over processes and tools, (2) Working software over comprehensive documentation, (3) Customer collaboration over contract negotiation and (4) Responding to change over following a plan" (McKnight, 2014, p. 169). Thus, according to some authors (e.g. Pichler, Schulze, 2005, pp. 371-373), agile methodologies refer to the principles of "lean" thinking, based on flexibility and simplicity.

In recent years, there has been a dynamic increase in publications on agile management methodologies. In the last five years alone, more than 80 articles have been published according to the Web of Science (e.g. Tripp, Armstrong, 2016, pp. 170-179.; Sun, Schmidt, 2018, pp. 234-243; Albuquerque et al., 2020, pp. 135-151; Gjoystdal, Karunaratne, 2020, pp. 95-106; Jimenez et al., 2020, p. 10352; Javed et al., 2021, pp. 132-139; Koch, Schemuly, 2021, pp. 699-720). The most popular agile methodologies include: Scrum, Cobit, Kanban, XP (*eXtreme Programming*), TDD (*Test-Driven Development*) and FDD (*Feature-Driven Development*). It is worth mentioning that nowadays project teams quite commonly do not use only one methodology, but rely on a combination of several methodologies at the same time, for example the recently created

Scrum-ban (Bhavsar et al., 2020, pp. 1626-1634), which is a combination of good practices taken from Scrum and Kanban (Wolf, 2014).

The general scheme of the project life cycle in the case of agile methodologies is based on five phases distinguished by Bhavsar et al. (2020, p. 1627): creating a vision (including defining the scope of the project and the principles of cooperation within the project team), speculation (clarifying the functionality for the product; creating iteration plan), exploration (providing the user / owner of the product with functionality; implementation of mechanisms minimizing the costs of changes), adaptation (review of the product, project team and project implementation method; taking corrective actions), closing (creating a database of experiences for the next project; celebration).

To sum up, agile project management methodologies focus on an iterative, cyclical and collaborative approach, while traditional methodologies, though can be collaborative, mainly consist of well-defined processes taking place in a specific sequence to implement the project.

According to many authors, both traditional and agile project management methodologies have their advantages and limitations (e.g. Walczak, Kuchta, 2013, pp. 75-95; Flora, Chande, 2014, pp. 3626-3637; Špundak, 2014, pp. 939-948; Raharjo, Purwandari, 2020, pp. 123-129; Thesing et al., 2021, pp. 746-756). Hence, in the next part of the article, the results of the authors' own research on the use (popularity) of these methodologies in projects implemented in the ICT industry will be presented.

Research findings and discussion

As indicated earlier, 260 people took part in the study. Men constituted the vast majority (230 people, i.e. 88.5%) of the research sample. Most of the respondents were aged 35-44 (40% of the research sample) and 25-34 (35% of the research sample). More than half of the respondents indicated a city with over 500,000 inhabitants as their place of residence. By origin, 60% of the survey sample was Polish, 25% American, and 15% German. 75% of the respondents declared that they had a university education. When considering the size of the employer's company, nearly 23% of the respondents indicated

the company employing 51 to 100 people. The same percentage indicated enterprises employing from 251 to 500 people. In turn, considering the roles played in the implemented projects, the largest number of respondents (220 people) were responsible for the development of software and its architecture, management (50 people), and decisions in terms of product functionality (product owners) – 35 people. For this last question, respondents could indicate more than one answer.

The first part of the study was devoted to the knowledge of project management methodologies among the respondents. Most of them had the opportunity to work with the use of traditional (60.4%) and agile (84.6%) methodologies. In the case of traditional methodologies, 35.5% of respondents indicated that they knew PMBoK® and 38.7% – PRINCE2®. None of the respondents declared knowledge of TenStep.

In turn, in the case of agile methodologies, Scrum was the most popular. All respondents who declared knowledge of the agile approach also indicated knowledge of Scrum. This is in line with the results of studies obtained by, among others, Ozierańska et al. (2016, pp. 79-96), López-Alcarria et al. (2019, p. 2915). Scrum is a methodology valued for its simplicity and high efficiency (Sienkiewicz, 2012, pp. 62-63). It is worth emphasizing that Scrum is a universal project management framework and can be successfully used not only for software development (IT projects). Apart from Scrum, the respondents declared they knew XP (23.1% of the respondents) and FDD (13.5% of the respondents). Thus, H1, stating that the majority of the representatives of the ICT industry who participated in the survey are familiar with at least one agile project management methodology, was verified positively.

In the next part of the survey, the respondents were asked to evaluate the quality of their work (including overall user satisfaction) and its efficiency using traditional and agile project management methodologies. Work efficiency was defined by the respondents as "the relation of the obtained results to the incurred inputs" (Baran et al., 2015, p. 172). Each of the methodologies could be rated on a scale from 1 to 5 (where 1 meant very unsatisfactory and 5 – very satisfactory). The obtained results are presented in Table 1.

All of the agile project management methodologies identified by the respondents had a higher average assessment of the quality and efficiency of

work than the traditional methodologies. It is worth noting that XP received the lowest marks of all agile methodologies. This is probably due to the fact that this methodology is used to implement projects in which it is impossible to estimate the time needed to implement the adopted assumptions, and it is impossible to define the final effect of the project or the direction in which the project would unfold. Nevertheless, H2 (agile project management methodologies are better assessed in terms of the quality and efficiency of work by the representatives of the ICT industry participating in the survey than the traditional ones), was also verified positively.

Table 1. Assessment of the quality and efficiency of work with the use of traditional and agile project management methodologies

Type of methodology	Type of methodology	Type of assessment	Average grade
Traditional	PMBoK®	Assessment of the quality of work	2.91
		Work efficiency assessment	3.00
	PRINCE2®	Assessment of the quality of work	3.09
		Work efficiency assessment	3.00
Agile	Scrum	Assessment of the quality of work	4.20
		Work efficiency assessment	3.98
	XP	Assessment of the quality of work	3.20
		Work efficiency assessment	3.20
	FDD	Assessment of the quality of work	3.50
		Work efficiency assessment	3.88

Source: Own elaboration based on conducted research.

The next part of the study was devoted to assessing the advantages and disadvantages of both traditional and agile project management methodologies. They were distinguished on the basis of the review of the literature on the subject. The most common advantages of traditional methodologies are (Soroka-Potrzebna, 2019, p. 92): the use of a transparent structure, early definition of requirements and the end goal, ease of management (each phase of the project has specific results and a review process), clear information transfer, creating clear and understandable documentation, diversified responsibilities of project team members. On the other hand, the shortcomings

most often include (Saynisch, 2010, pp. 21-37; Mahalakshmi, Sundararajan, 2013, pp. 192-196): late testing of implemented solutions, in-depth analysis of the client's (or end-user's) needs, the need to precisely define the results of the project before its commencement, absolute compliance with the adopted schedules, problems with the assessment of the progress of the project during its lifetime, rigorous adherence to the project phases.

The respondents were again asked to rate the listed advantages and disadvantages on a scale of 1 to 5 (where 1 meant a completely negligible advantage / disadvantage, and 5 – a very significant advantage / disadvantage). According to the respondents, the greatest advantage of traditional methodologies is the use of a transparent structure – Table 2. Projects implemented using traditional methodologies have a well-planned beginning and end, as well as successive phases. For members of the project team (e.g. developers or testers), this means greater stability and easier estimation of the amount of time needed. Another important advantage of traditional methodologies is the use of comprehensible and readable documentation. Thanks to it, it is much easier for a new employee to start work, as well as to see the cause of any errors in the final product (e.g. software).

The biggest problem related to the use of traditional project management methodologies, according to the respondents, is late testing of implemented solutions (average grade 4.19). According to the guidelines of these methodologies, the product is tested only after its production, and not during the process, which causes delays in the implementation of projects and problems that stem from such delays – Table 2. Another significant drawback of traditional methodologies, according to the respondents, is the need for an in-depth analysis of customer / user's needs. Since software development projects last for months, or even years, the requirements for software functionality can undergo very dynamic changes. Thus, their precise definition at the beginning of the project can be a huge challenge.

Table 2. Assessment of the advantages and disadvantages of traditional project management methodologies according to the respondents

Advantages	Average grade	Disadvantages	Average grade
Use of a transparent structure	3.84	Late testing of implemented solutions	4.19
Creating understandable and readable documentation	3.74	In-depth analysis of the client/ end-user's needs	4.10
Manageability (each phase of the project has well-defined results and review process)	3.65	The need to define precisely the results of the project before it starts	3.90
Clear communication of information	3.42	Rigorous adherence to agreed schedules	3.90
Early definition of requirements and the final goal	3.35	Problems with assessing the progress of the project during its course	3.81
Diversified responsibility of the team members	3.00	Rigorous adherence to project phases	3.77

Source: Own elaboration based on conducted research.

A similar assessment of the advantages and disadvantages was made on agile project management methodologies. Among the advantages of agile methodologies, researchers most often mention: success meaning providing the client with business value, openness to introducing changes, maintaining constant communication with the client / end user, easy to measure progress in project implementation, the ability to adapt the project to changing requirements, regular / constant verification of the progress in the project implementation (Shankarmani et al., 2012, pp. 31-37; Bunsiri, Kumprom, 2016, pp. 23-29). On the other hand, the most frequently mentioned disadvantages of agile methodologies include: poorly prepared documentation, no structured processes, no clear end of the project duration, less predictability (problem with estimating the scope of the required activities), providing new functionalities at the expense of technical debt, the need for constant cooperation and communication with members of the project team (Kumar et al., 2014, pp. 18-27; Koi-Akrofi et al., 2019, pp. 25-44).

According to the assessment of the respondents, the most important advantage of agile methodologies is defining the success of the project as the possibility of delivering business value to the end user – Table 3. Thanks to

the iterative approach, there is a chance to react quickly if the product owner does not agree with the direction in which the project is evolving. The respondents also highly rated: maintaining permanent communication with the client (average score: 4.41), the possibility of adapting the project to changing requirements (average score: 4.36), and regular verification of the progress in the project implementation (average score: 4.36).

Table 3. Assessment of the advantages and disadvantages of agile project management methodologies according to respondents

Advantages	Average grade	Disadvantages	Average grade
Success meaning delivering business value to the customer	4.50	Lower predictability (problem with estimating the scope of the required activities)	3.73
Maintaining constant communication with the client / end-user	4.41	No clear end of the project implementation	3.43
Possibility to adapt the project to changing requirements	4.36	Providing new functionalities at the expense of technical debt	3.30
Regular / continuous review of progress in project implementation	4.36	Poorly prepared documentation	2.77
Openness to introducing changes	4.00	Need for constant cooperation and communication with members of the project team	2.73
Easily measurable progress of the project	3.89	Lack of structured processes	2.18

Source: Own elaboration based on conducted research.

Summary

The ongoing processes of digitization and computerization of societies, as well as the dynamic development of the ICT industry have resulted in the creation and implementation of hundreds of thousands of IT projects in the world during the last few decades. Although there is no ideal solution for project management, managers are moving away from traditional methodologies (Fitsilis, 2008, p. 378), whose success in some industries were emphasized by various researchers (Grundy, Brown, 2004; Whitty, Maylor, 2009, pp. 304-310;

Papke-Shields et al., 2010, pp. 650-662). In the case of IT projects that belong to the group of complex ones, where the requirements of customers / end users change over time, agile methodologies, based on an iterative, collaborative approach are increasingly being used.

Hence, in this article an attempt was made to present the use of traditional and agile project management methodologies in enterprises from the ICT industry. The following conclusions were formulated as a result of the study:

- most of the respondents had the opportunity to work with both traditional and agile project management methodologies;
- PRINCE2® was the popular traditional methodology and Scrum was the most popular agile methodology among the respondents;
- the respondents valued higher the agile methodologies included the study (Scrum, XP, FDD) than the traditional ones (PMBoK®, PRINCE2®) in terms of the quality and efficiency of work;
- according to the respondents, the most important advantage of traditional methodologies is the use of a transparent structure, whereas the most important advantage of the agile methodologies is defining the project success as an ability to deliver business value to the end-user;
- according to the respondents, the biggest disadvantage of traditional methodologies is late testing of the implemented solutions, and the biggest disadvantage of the agile methodologies is their lower predictability (a problem with estimating the scope of the required activities).

Thus, the two research hypotheses (H1, H2) presented in the introduction were accepted.

Of course, the authors are aware that the obtained results can be criticized from the point of view of the adopted research methodology. In the theoretical part of the article, some studies that could be of importance to some scholars with regard to the described issues may have been omitted. Authors, when selecting the literature were guided by its availability and the importance of a journal or a scientific publishing house. Moreover, the empirical part of the article was prepared on the basis of the conducted survey research. The CAWI technique used by the authors has its drawbacks. First, there are difficulties in checking the correctness of the answers and the identity of the respondents.

Secondly, in comparison with classical methods, CAWI gives an average 11% lower response rate (Manfreda et al., 2008, p. 79). Finally, there are problems with ensuring representativeness that prevent the conclusions of the study from being generalized.

The presented limitations also suggest further research directions. First of all, in the future, research should be carried out on a larger research sample. Research can also be carried out with the use of in-depth, computer-assisted interview – CAPI (*Computer Assisted Personal Interview*), in order to obtain more detailed information. An interesting idea for the continuation of research would also be to analyze the degree of familiarity with hybrid methodologies, which are a combination of the traditional approach to project management with the agile philosophy (Marek-Kołodziej, 2019, p. 44). The last possible research direction is a more detailed and insightful analysis of the most commonly used tools in agile project management.

References

Albuquerque, F., Tones, A.S., Berssaneti, F.T. (2020). *Lean product development and agile project management in the construction industry*, *27*(2), 135-151. Rege-Revista de Gestao.

Alleman, G.B. (2005). Agile project management methods for IT projects. in: E.G. Carayannis, Y.H. Kwak, F.T. Anbari (eds.), *The story of managing projects: An interdisciplinary approach*, 324-334. Praeger.

Anantatmula, V.S., Webb, J.B. (2014). *Critical Chain Method in Traditional Project and Portfolio Management Situations*, 5 (3), 67-83. International Journal of Information Technology Project Management.

Antlova, K. (2014). *Agile approach in the project management of the Czech companies*, 16, 929-933. Procedia Technology.

Barak, A., Sadovsky, Y. (2008). *Internet use and personal empowerment of hearing-impaired adolescents*, 24, 1802-1815. Computers in Human Behavior.

Baran, J., Pietrzak, M., Pietrzak, P. (2015). *Efektywność funkcjonowania publicznych szkół wyższych*, 4 (76), 169-185. Optimum: studia ekonomiczne.

Bhavsar, K., Shah, V., Gopalan, S. (2020). *Scrumban: An Agile Integration of Scrum and Kanban in Software Engineering*, 9 (4), 1626-1634. International Journal of Innovative Technology and Exploring Engineering.

Bunsiri, T., Kumprom, T. (2016). *Benefits of Agile Project Management*, 5 (1), 23-29. APHEIT International Journal.

Carlbring, P., Gunnarsdóttir, M., Hedensjö, L., Ekselius, L., Furmark, T. (2007). *Treatment of social phobia: Randomised trial of Internet-delivered cognitive–behavioural therapy with telephone support*, 190, 123-128. The British Journal of Psychiatry.

Cervone, H.F. (2011). *Understanding agile project management methods using Scrum*, 27 (1), 18-22. OCLC Systems & Services: International digital library perspectives.

Cicmil, S., Williams, T., Thomas, J., Hodgson, D. (2006). R*ethinking project management: Researching the actuality of projects*, 24, 675-686. International Journal of Project Management.

Dima, A.M., Maassen, M.A. (2018). *From Waterfall to Agile software: Development models in the IT sector, 2006 to 2018. Impacts on company management*, 11 (2), 315-326. Journal of International Studies.

Fernandez, D.J., Fernandez, J.D. (2008). *Agile Project Management – Agilism versus Traditional Approaches*, 49 (2), 10-17. Journal of Computer Information Systems.

Fitsilis, P. (2008). Comparing PMBOK and agile project management software development processes. in: T. Sobh (eds.), *Advances in computer and information sciences and engineering*, 378–383. Springer.

Flora, H.K., Chande, S.V. (2014). *A Systematic Study on Agile Software Development Methodologies and Practices*, 5 (3), 3626-3637. International Journal of Computer Science and Information Technologies.

Gemino, A., Reich, B.H., Serrador, P.M. (2021). *Agile, Traditional, and Hybrid Approaches to Project Success: Is Hybrid a Poor Second Choice?*, 52 (2), 161-175. Project Management Journal.

Gjoystdal, S., Karunaratne, T. (2020). *Effect of Inadequate Self-Organized Teams in Agile Project Management: A Case Study From the Oil and Gas Industry*, 11 (3), 95-106. International Journal of Information Technology Project Management.

Grundy, T., Brown, L. (2004). *Strategic project management: Creating breakthrough organisations*. Thomson Learning.

Highsmith, J. (2004). *Agile Project Management – Creating Innovative Products*. Addison-Wesley.

Inayat, I., Salim, S.S., Marczak, S., Daneva, M., Shamshirband, S. (2015). *A systematic literature review on agile requirements engineering practices and challenges*, 51, Part B, 915-929. Computers in Human Behavior.

Jahr, M. (2014). *A Hybrid Approach to Quantitative Software Project Scheduling Within Agile Frameworks*, 45 (3), 35-45. Project Management Journal.

Javed, S., Bamford, J., Abualqumboz, M. (2021). *Helping Deluxe Beds to sleep easy: A case study of agile project management*, 22 (2), 132-139. International Journal of Entrepreneurship and Innovation.

Jiang, L.C., Bazarova, N.N., Hancock, J.T. (2013). *From perception to behavior: Disclosure reciprocity and the intensification of intimacy in computer-mediated communication*, 40, 125-143. Communication Research.

Jimenez, V., Afonso, P., Fernandes, G. (2020). *Using Agile Project Management in the Design and Implementation of Activity-Based Costing Systems*, 12 (24), 10352. Sustainability.

Joinson, A.N., Paine, C.B. (2007). Self-disclosure, privacy and the Internet. in: A.N. Joinson, K.Y.A. McKenna, T. Postmes, U.D. Reips (eds.), *Oxford handbook of Internet psychology*, 237-252). Oxford University Press.

Karaman, E., Kurt, M. (2015). *Comparison of project management methodologies: Prince2 versus PMBOK for it projects*, 4 (4), 572-579. International Journal of Applied Science and Engineering Research.

Koch, J., Schermuly, C.C. (2021). *Who is attracted and why? How agile project management influences employee's attraction and commitment*, 14 (3), 699-720. International Journal of Managing Projects in Business.

Koi-Akrofi, G.Y., Koi-Akrofi, J., Matey, H.A. (2019). *Understanding the Characteristics, Benefits and Challenges of Agile IT Project Management: A Literature Based Perspective*, 10 (5), 25-44. International Journal of Software Engineering & Applications.

Krysiak, M., Głownia, Sz. (2017). *Metodyki zarządzania projektami IT i ich ryzykiem: przegląd i wykorzystanie*, 340, 79-98. Studia Ekonomiczne. Zeszyty Naukowe Uniwersytetu Ekonomicznego w Katowicach.

Kumar, R., Gupta, A., Singh, H. (2014). *Agile Methodologies: Working Mechanism with Pros and Cons*, 4 (2), 18-27. Gian Jyoti E-Journal.

Liebert, F. (2017). *Zarządzanie projektami w przedsiębiorstwach branży IT – studium literaturowe*, 101, 271-284. Zeszyty Politechniki Śląskiej. Seria: Organizacja i Zarządzanie.

López-Alcarria, A., Olivares-Vicente, A., Poza-Vilches, F. (2019). *A Systematic Review of the Use of Agile Methodologies in Education to Foster Sustainability Competencies*, 11, 2915. Sustainability.

Mahalakshmi, M., Sundararajan, M. (2013). *Traditional SDLC Vs Scrum Methodology – A Comparative Study*, 3 (6), 192-196. International Journal of Emerging Technology and Advanced Engineering.

Manfreda, K.L., Bosnjak, M., Berzelak, J., Haas, I., Vehovar, V. (2008). *Web Surveys versus other Survey Modes: A Meta-Analysis Comparing Response Rates*, 50 (1), 79-104. International Journal of Market Research.

Marek-Kołodziej, K. (2019). *Model doboru metodyki zarządzania projektami do planowania i realizacji jednostkowego zlecenia produkcyjno-usługowego. Studium przypadku*, 3 (950), 42-50. Przegląd Organizacji.

Matos, S., Lopes, E. (2013). *Prince2 or PMBOK – a question of choice*, 9, 787 – 794. Procedia Technology.

McKenna, K.Y.A., Seidman, G. (2005). Social identity and the self: Getting connected online. in: W.R. Walker, D.J. Herrmann (eds.), *Cognitive technology*, 89-110. McFarland.

McKnight, W. (2014). *Information Management: Gaining a Competitive Advantage with Data is about making smart decisions to make the most of company information*. Morgan Kaufmann Publishers.

Orchard, L.J., Fullwood, C. (2010). *Current perspectives on personality and Internet use*, 28, 155-169. Social Science Computer Review.

Ozierańska, A., Skromna, A., Kuchta, D., Rola, P. (2016). *The critical factors of Scrum implementation in IT project – the case study*, 25 (3), 79-96. Journal of Economics and Management.

Palmquist, S.M., Lapham, M.A., Miller, S., Chick, T., Ozkaya, I. (2013). *Parallel Worlds: Agile and Waterfall Differences and Similarities*. Carnegie Mellon University.

Papke-Shields, K.E., Beise, C., Quan, J. (2010). *Do project managers practice what they preach, and does it matter to project success?*, 28 (7), 650-662. International Journal of Project Management.

Pichler, R., Schulze, S. (2005). *Book Reviews: Agile Project Management: Creating Innovative Products by Jim Highsmith, and Agile Project Management with Scrum by Ken Schwaber*, 22, 371-373. Journal of Product Innovation Management.

Pietrzak, P., Pawlonka, T., Włosik, N. (2019). *Ataki terrorystyczne a rynek usług turystycznych. Studium teoretyczno-empiryczne*. Wydawnictwo Szkoły Głównej Gospodarstwa Wiejskiego w Warszawie.

Project Management Institute (2013). *A guide to the project management body of knowledge (PMBOK guide). 5th Edition*. Project Management Institute.

Raharjo, T., Purwandari, B. (2020). *Agile Project Management Challenges and Mapping Solutions: A Systematic Literature Review*, 123-129. ICSIM '20: Proceedings of the 3rd International Conference on Software Engineering and Information Management.

Rodríguez, M.J.G., Montequin, V.R., Baisera, J.M.V., Suarez, R. (2017). *Comparing Agile and Traditional Methodologies of Project Management for Software Engineering*, 2017, 64-75. Scientific Publications. University of Economics in Katowice.

Rodríguez, P., Mäntylä, M., Oivo, M., Lwakatar, L.E., Seppänen, P., Kuvaja, P. (2019). *Advances in Using Agile and Lean Processes for Software Development*, 113, 135-224. Advances in Computers.

Ruel, H.J.M., Bondarouk, T., Smink, S. (2010). *The Waterfall Approach and Requirement Uncertainty: an In-Depth Case Study of an Enterprise Systems Implementation at a Major airline Company*, 1 (2), 43-60. International Journal of Information Technology Project Management.

Saunders, P.L., Chester, A. (2008). *Shyness and the Internet: Social problem or panacea?*, 24, 2649-2658. Computers in Human Behavior.

Saynisch, A. (2010). *Beyond Frontiers of Traditional Project Management: An Approach to Evolutionary, Self-Organizational Principles and the Complexity Theory-Results of the Research Program*, 41 (2), 21-37. Project Management Journal.

Shankarmani, R., Pawar, R., Mantha, S.S., Babu, V. (2012). *Agile Methodology Adoption: Benefits and Constraints*, 58 (15), 31-37. International Journal of Computer Applications.

Sienkiewicz, Ł.D. (2012). *Collaboration Between the Scrum and Third Party Services in the Network Organization*, 1 (23), 59-66. Business Informatics.

Sillence, E., Briggs, P. (2007). *Please advise: Using the Internet for health and financial advice*, 23, 727-748. Computers in Human Behavior.

Siuda, P. (2016). Ankieta internetowa: zalety i wady – rekapitulacja. in: P. Siuda (ed.), *Metody badań online*, 8-81. Wydawnictwo Naukowe Katedra.

Sobieraj, J., Metelski, D., Nowak, P. (2021). *PMBoK vs. PRINCE2 in the context of Polish construction projects: Structural Equation Modelling approach*, 67 (2), 551-579. Archives of Civil Engineering.

Špundak, M. (2014). *Mixed Agile/Traditional Project Management Methodology – Reality or Illusion?*, 119, 939-948. Procedia – Social and Behavioral Sciences.
Soroka-Potrzebna, H. (2019). *Zarządzanie projektami – podejście tradycyjne czy zwinne?*, 1, 89-98. Zeszyty Naukowe Wyższej Szkoły Humanitas. Zarządzanie.
Stoudt, B.G., Ouellette, S.C. (2004). *Making room for words: People who stutter on the Internet*, 1, 175-194. Qualitative Research in Psychology.
Sun, W., Schmidt, C. (2018). *Control Mechanisms and Agile Methodology Use: Data from the Industry*, 58 (3), 234-243. Journal of Computer Information Systems.
Thesing, T., Feldmann, C., Burchardt, M. (2021). *Agile versus Waterfall Project Management: Decision Model for Selecting the Appropriate Approach to a Project*, 181, 746-756. Procedia Computer Science.
Tripp, J.F., Armstrong, D.J. (2016). *Agile Methodologies: Organizational Adoption Motives, Tailoring, and Performance*, 58, 170-179. Journal of Computer Information Systems.
Walczak, W., Kuchta, D. (2013*). Risks characteristic to Agile project management methodologies and responses to them*, 23(4), 75-95. Operations Research and Decisions.
Walczak, W. (2015). *Analiza krytyczna jako metoda poznawania prawdy w naukach o zarządzaniu*, 1 (58), 22-32. E-mentor.
Whitty, S.J., Maylor, H. (2009). *And then came complex project management (revised)*, 27 (3), 304-310. International Journal of Project Management.
Wideman, R.M. (2002). *Comparing PRINCE2® with PMBoK®*. AEW Services.
Wolf H. (2014). *Zwinne projekty w klasycznej organizacji: Scrum, Kanban, XP*. Helion.
Wyrozębski, P. (2011). Zwinne metodyki zarządzania projektami. in: M. Trocki (ed.), *Metodyki zarządzania projektami*, 189-196, Bizzare.
Žužek, T., Gosar, Ž., Kušar, J., Berlec, T. (2020). *Adopting Agile Project Management Practices in Non-Software SMEs: A Case Study of a Slovenian Medium-Sized Manufacturing Company*, 12, 9245. Sustainability.