

THE INITIAL PHASE OF AN IT PROJECT – AN ATTEMPT TO DEFINE A UNIVERSAL MODEL

Małgorzata Cieciorka, Polish-Japanese Academy of Information Academy in Warsaw

Małgorzata.Cieciorka@pja.edu.pl

Piotr Habela, Polish-Japanese Academy of Information Academy in Warsaw

habela@pja.edu.pl

Małgorzata Rzeźnik-Knotek, Polish-Japanese Academy of Information Academy in Warsaw

Malgorzata.Rzeznik@pja.edu.pl

ABSTRACT

The purpose of this paper was to define the initial phase of an IT project, generic for all types of IT projects, regardless of the methodology chosen. A sample of IT project management practitioners' opinions was gathered and analyzed. Results are presented. Discussion and implications are carried out. The main conclusion of the study is that the initial phase of an IT project that can be considered as common for all project management concepts is the phase before the implementation of the project. It includes understanding the client's real business needs, defining the project's purpose, analyzing the scope and feasibility of the project and ends with making a decision on the project implementation and signing a contract with the client.

Keywords: Project Management, Initial Phase of a Project, IT Project, Scrum, PRINCE2, Agile, PMI, PMBoK.

INTRODUCTION

Project management has been dynamically developing since the beginning of the 90s of the last century, both in theory and in management practice. Many concepts and theories have been developed regarding various spheres of project management, such as, for example, the organization of the whole project (Howes, 2001, Gudiene et al., 2014, Varajao et al., 2014, Berssaneti & Carvalho, 2015), desired project manager competencies (Toor & Ogunlana, 2009, Malach-Pines et al., 2009, Barclay & OseiBryson, 2009), desired competencies of the whole project team (Varajao et al., 2014, Almajed & Mayhew, 2014, Ram & Corkindale, 2014), risk management (Cooper et al, 2005, Rabechini Junior & Monteiro de Carvalho, 2013, Didraga, 2013, Miszczyński, 2015) or the reasons for project failures (The Standish Group, 2014). There have been developed a lot of project management methodologies (e.g. PRINCE2 or agile methodologies) which can be selected for a particular project depending on its type, complexity or size. Regardless of the type of the project or management methodology applied to it, one of the features characterizing every project is the fact that it has its initial phase (just like every project has its end). An important research question would be, therefore, to define key features of the initial stage of the project, including the criteria of distinguishing the end of the initial phase of the project and the challenges associated with this phase. It is worth mentioning here that - as Dąbrowski and Domagała note -, even the moment of starting the project is rather discretionary. According to one of the most extreme views, the mere realization of a business need for a project implementation can be regarded as the beginning of the project; however, it is more often assumed that the moment of starting a project is the moment of making a decision about its implementation, usually associated with the creation of a project team, or at least appointing the project manager (Dąbrowski, Domagała, 2014, pp. 4, 5). Studies on the definition and nature of the initial phase of the project are justified by the fact that - as Besner and Hobbs note – the most important analysis and initial plans are made during the front-end of the project; if the wrong or unclear direction is taken during the early definition phase, it is always difficult to get the project back on track (Besner & Hobbs, 2013, p. 29).

RESEARCH METHODOLOGY

The aim of this study was to define the initial phase of an IT project and challenges associated with its implementation. The selection of the type of project (IT) was due to the fact that the authors of the article are active teachers and researchers in a technical, IT-focused academy; and are planning to use the results of their study in their academic work with IT students. First, a brief literature review on the definitions of the initial phase of the project present in the most popular project management methodologies is presented. Next, the results of twenty in-depth interviews conducted with experienced members of teams implementing IT projects are discussed. Finally, conclusions and a summary are presented.

RESULTS

Main approaches to project management and definitions of initial project phases

In the literature on the subject one can find many types of - generally speaking - approaches to project management. A basic division was proposed by, for example, Kisielnicki, who, following Wysocki and McGary, presented the following project management methods: traditional project management (its implementation is carried out according to a strictly defined plan), adaptive project management (project implementation follows the analysis and definition of its structure; the goal and solutions are defined less precisely than in the previous approach) and extreme project management (project implementation is based on the principle of quick reaction to changes and complex situations, the goal and solutions can be described as unknown) (Wysocki, McGary, 2005, p. 28, quoted after: Kisielnicki, 2014, p. 229). It is worth mentioning here that the most classic approach is the linear traditional project management, which is often referred to as the "waterfall" approach. It consists of the following primary phases: Initiation, Requirements, Design, Implementation, Test, Deployment and Maintenance. The "waterfall" approach assumes that once a phase is complete, it will not be returned to for the duration of the project. A key to "waterfall" is, therefore, the freezing and formal approval of things such as scope, requirements, and specifications prior to development (Wysocki 2009, Baird, Riggins, 2012, Davis, Radford, 2014, pp. 145 – 147).

Regardless of the approach adopted in project management, three main phases can be distinguished: analysis, implementation and exploitation (Kisielnicki, 2014, p. 229). A correct, thorough conduct of the analysis phase is very important, because, according to Schindler's research, the longer the period since making the mistake to its detection, the higher the cost of fixing the mistake; therefore, it is most costly to correct mistakes that were made during the analysis (Schindler, 1990 quoted after: Kisielnicki, 2014 p. 230). Kisielnicki also notes that the analysis itself should be preceded by a pre-design phase as conducting the analysis itself also entails material costs and time consumption. It should be determined in advance, for example, who, how, where, when and for whom should carry out the analysis and what resources will be needed (Kisielnicki, 2014, p. 230). During the analysis, it is necessary to define such elements of the project as, among others, the set of decision makers and users, goals or various types of possible limitations and risks of the project (Kisielnicki, 2014, pp. 230-232).

Apart from the basic division of project management methods presented above, a lot of more detailed project management methodologies have been developed. It is worth noting here that, as Habela points out, it is important to distinguish between - complementary to each other and integrated during project management - *management* methodologies (relatively generic in relation to the field of the project), and *technical* methodologies specific to individual fields, e.g. software development methodologies.

The chosen management methodology is a high level framework, defining the life path of the project, and the technical methodology determines the practical work breakdown structure of the project. (Habela, 2014, pp. 110, 111). As far as the project phases are concerned from the point of view of management methodologies, two periods can be distinguished roughly, broken into two phases. The first period is of conceptual nature and includes a feasibility study (i.e., detailing and validating the justification of the work and assumptions) and planning the work. The second is the implementation of the project, consisting of the construction phase and the phase of the transfer of the final product to the user (Habela, 2014, p. 111).

Examples of the most well-known project management methodologies include Project Management Body of Knowledge (PMBoK) and PRINCE2 (Projects in Controlled Environment), though it should be added that, as Habela stresses, PMBoK should be considered not so much as the methodology in the exact meaning of the word, rather as a framework for specific methodologies (Habela, 2014, pp. 111, 112). PMBoK recommends setting project life cycle stages for each project - they should correspond to the logical sequence of the main partial products of the project, the subsequent creation of which leads to the final product. It also specifies groups of project management processes, the first of which is the initiating (next are: planning, executing, monitoring and controlling and closing), which includes: analysis of the needs and possibilities of their fulfillment, selection of the project, defining the scope of the project, documenting the assumptions, constraints and risks of the project, identification and analysis of the requirements of the client and other project stakeholders, preliminary determination of the scope of the project, development of the Project Charter and obtaining the approval of the Project Charter (Kulejewski, 2009, pp. 48, 49).

The following project stages can be distinguished in the PRINCE2 methodology: the Pre-Project Stage, the Initiation Stage, the Subsequent Delivery Stage(s), the Final Delivery Stage. In the Pre-Project Stage, the project preparation process is carried out to ensure that all elements necessary to start the next stage (initiation) have been collected. The reasons for the project and the expected results are identified. A Project Management Team is

designed and appointed, and Initiation Stage Plan is created. In the Initiation Stage, then, it is determined whether the implementation of the project is justified. A Business Case is created (in fact, it should be mentioned here that its formulation begins already in the Pre-Project Stage and in the Initiation Stage it is completed and is officially validated at the end) and the allocation of resources to the next project stage is done. The management of the project is passed on to the Project Board (Habela, 2014, pp. 117, 118).

It is also worth noting at this point that the above-mentioned methodologies, in particular PRINCE2, are widely regarded as representatives of classic, strongly formalized methodologies, in which it is considered to be important to follow the established plan or to prepare extensive work documentation. They are often contrasted with agile methodologies, created as a result of the protest of the IT specialists against traditional methods of software development - the criticism of traditional methods of running IT projects and postulates of new solutions were presented in the Agile Manifesto (Agile Manifesto, 2001). The main "agile" values are: good communication with the client, flexible response to changes and focus on quick and efficient delivery of the product to the client meeting their needs.

An example of agile methodologies is the Scrum methodology, one of the characteristic features of which is working in short production cycles called "sprints" - after each of them, during the *retrospective meeting* team members discuss both the results achieved so far and the effectiveness of the applied methods of work. If necessary, appropriate changes are introduced immediately. Defining the initial phase of the project in Scrum is somewhat difficult, because one can find opinions that there is no such phase (Witański, 2013), which would suggest recognizing Scrum as a method of organizing technical work only rather than the whole project. However, one can also find arguments for the recognition of Scrum as a universal methodology of a relatively generic nature, which can serve as a management framework for technically-oriented methodologies and practices and be successfully used in other areas than just software development (Habela, 2014, pp. 154, 155). In this case, the first phase of work in the application of the Scrum approach would comprise a (rather general) formulation of the vision of the project achievements and the creation of the so-called *product backlog* - a document containing all functional and non-functional requirements, the implementation of which will result in the product's vision (Redakcja 4PM.pl, 2016). Next, further sprints are planned - Sprint Planning takes place during a meeting which cannot exceed eight hours and which should result in: Sprint Goal, a list of the Scrum Team (along with the amount of time of their involvement), sprint backlog, date of demonstration and its results, and the time and place of daily Scrum meetings (Habela, 2014, p. 157).

While presenting the definitions and descriptions of methodologies, it is worth mentioning that the classification of the PRINCE2 methodology - widely recognized, as already mentioned, as a typical representative of classical methodologies - can be considered a bit controversial. Certainly, PRINCE2 precisely defines the hierarchy of roles and planning requirements; however, it does not rigidly impose how these plans will freeze the shape of the project. In other words, it does not decide in advance in which of the six PRINCE2 project variables (scope, quality, time, cost, risk, benefits) one should set rigid goals, and in which there is room for flexibility. In 2015, the PRINCE2 Agile manual was published, which explains how to reconcile PRINCE2 with Scrum. An issue that can also be a subject for discussion is the attribution of Scrum to one of the previously mentioned two categories of methodologies (management and technical) - its genesis and character would be an argument for categorizing Scrum as a technical methodology, in particular for organizing software development, but one can also find opinions that - despite some difficulties - Scrum rules can be applied during the entire project implementation (see e.g. Witański, 2013). Finally, it should be mentioned that in the practice of project management, you can often encounter methodologies that could be described as hybrid. These are so-called adaptive methodologies, integrating the "classic" assurance of business control of project work with the "agile", "technical" process of creating the product (Dąbrowski & Domagała, 2014, p. 16).

In the practice of project management, one can come across some hybrid variations of the most popular methodologies or creating by the project team their own approach to project implementation. As far as dividing a project into phases is concerned, as Schwalbe notices, there may be just three phases: the initial, intermediate, and final phase; or there may be multiple intermediate phases as well. There might be a separate project just to complete a feasibility study (Schwalbe, 2017, p. 59). As Schwalbe stresses, however, it is good practice to think of projects as having phases that link the beginning with the end of the project, so that people can measure progress toward achieving project goals during each phase (Schwalbe, 2017, p. 59).

Attempts to determine the initial phase of the project and the challenges associated with this phase - the results of in-depth interviews

In March, April, May and June 2018, twenty in-depth interviews were conducted with experienced practitioners in the field of IT project management aimed at defining the initial phase of the IT project, and the main challenges related to it. The sample was convenient.

All respondents had education in IT and experience in managing IT projects.

The interviews were attended by: a programming specialist supervising the work of a software development team with several years of experience in Poland, Canada and Israel, a manager with experience in managing IT projects in large corporations in Poland, a manager in an American company specializing in computer hardware, computer software, IT services and IT consulting), a manager from a medium-sized Polish company specializing in the implementation of IT solutions in insurance companies, an owner of a medium-sized company specializing in the implementation of management information systems, an IT director in a large Polish cosmetics company, with many years of experience in managing IT projects in a German industrial corporation, a project manager for implementation, migration and systems development IT in the company, professor at one of the leading universities of technology in Poland, manager of many scientific projects in the field of information technology an assistant professor of one of the leading non-public technical universities in Poland, a manager of several scientific projects in the field of technology application information, a manager with experience in designing and implementing IT solutions in the post office services, a team manager with experience in designing and implementing IT solutions for media, telecommunication and advertising companies, a software developer in the IT branch, a software developer in the television, a software developer with experience in creating applications for managing energy and heating networks, a specialist in a team responsible for implementation of OBT (online booking tool) systems in the tourism industry, a specialist in a team responsible for creating a new application for the Sales Department and development of the customer portal in a financial company, a software developer for commercial companies, a specialist in IT projects for telecommunications, a specialist in a team responsible for implementation of a document management system and server migration in an attorney's office, a team manager responsible for implementation of management information systems (ERP, MES) and a manager from a consulting company that underwent implementation of an ERP system.

All respondents were asked the same four questions prepared by the authors of the article:

1. Did you use specific, formally named project management methodologies (e.g. PRINCE2 or Scrum) while working on IT projects? If so, which ones?
2. How - basing on your practical experience - would you define the concept of the "initial phase of the project"?
3. Is it possible to make critical mistakes in the initial phase of the project which could jeopardize the final success of the whole project and would be very costly to repair (or even impossible to repair)? If so, which ones?
4. What should one focus on during the initial phase of the project in order to ensure efficient, undisturbed further development of the project and the final success?

The answers are presented in tables 1-4.

Table 1. Information of respondents regarding the applied project management methodologies

Answer (and number of respondents who gave the answer)	Additional comments of respondents
Scrum (11)	Only in case of IT projects. In case of agile projects
PRINCE2 (6)	For the management process, in non-IT projects
No, we do not use any project management methodology (4)	The board of directors determines what is to be achieved and people involved in the project use their creativity, flexibility and all possible tricks to achieve the goals
Agile methodologies (3)	For the production process
PMI, PMBoK (2)	
Our own methodology (based on Scrum) (2)	There was no discipline in respect of the Scrum discipline or Scrum rituals, but in all of them there were:

	- constant presence (and sometimes hyperactivity) of the customer's representative; - Kanban board; - rapid prototyping of everything that was created; - disgust/reluctance to produce paper documentation (but at the end it was necessary to generate a series of documents)
Microsoft Surestep (1)	
SAP Activate (1)	
Hybrid methodologies (1)	They are the best
Our own methodology (based on PMI) (1)	
Our own methodology (1)	We use modifications of other methodologies worked out by our team on the basis of our previous experience

Source: the authors' own study

Table 2. Respondents' information on defining the "initial phase of the project"

Answer (and number of respondents who gave the answer)	Additional comments of respondents
Analysis, definition, preparation. Trying to understand the client's requirements, planning/building a team and planning the work, analyzing the risks, taking into account budget limits and technical feasibility. Writing down customer requirements, approximate costs. necessary resources, preliminary schedule, division of work and responsibilities. (10)	In my experience this phase was broken down into two parts: one until the offer was written and the second after the offer was selected by the client. As the team planning the offer was often different from the one at the time the offer was selected, the team was often defined twice. A lot of meetings. Finding the exact product/ finding the creator of the exact product that will meet this demand.
Chaos. Taking decisions on starting or giving up the project. (2)	A lot of meetings and arrangements, which later need to be adapted and changed.
Identifying the business need and describing a very general scope of the project. (2)	The scope, budget, time, goals and business rationale, working groups, stakeholders, reporting principles, control and change management are declared on the basis of the identified business need.
A good understanding of the client's needs. (2)	The needs should be understood more as expectations and not just requirements (which are rather easy to specify).
Business analysis, creating an application project but without starting the "real work". (2)	We do not write even a single line of code at this stage.
Definition of goals and selection of tools. (2)	The first 2 weeks are conversations with the client about their expectations concerning the implemented tool.
Understanding the context of the project - the main components of the scope, environment, needs of key stakeholders, key risks. (1)	In PRINCE2 it is called: Preparation of the project, and in AgilePM: Feasibility. This phase describes a very general scope of the project "inch wide – mile deep" - the idea is to describe the whole scope in general, but without going into details. The most important technologies are also selected. The most important is to understand the scope - budget, schedule, technologies are only its derivative.
Presenting a vision of achievements by the stakeholders (1)	There are discussions and writing down conclusions regarding what is supposed to be the effect of the project, as well as how this effect differs from the current state of the company.

Source: the authors' own study

Table 3. Respondents' information on the possibility of making critical mistakes in the initial phase of the project

Answer (and number of respondents who gave the answer)	Additional comments of respondents
Erroneous diagnosis of various aspects (incorrect definition of the problem, misunderstanding the company culture, incorrect analysis of risks, shareholders, communication plan and change management, estimation of scope, time and budget.) (7)	The whole project can be implemented successfully, but at the final stage it is sabotaged by groups with different (and often implicit) interests. Repair possible but expensive Sometimes we just rely too much on analogies from other projects/markets and overestimate our experience.
Bad solutions (6)	Wrong selection of the technical tools, e.g. the architecture, the choice of the database, migration. Not taking into consideration the idea of developing the current system instead of building a new one. Choosing a wrong supplier.
Misunderstanding the client's expectations/business needs (4)	
Problem with correct estimation of the whole scope of the project (4)	
Preparing just a (too) rough draft of a project. (2)	A poorly defined vision of the final product. No project definition, no plan, too fast transition to the implementation phase.
Ignoring technical feasibility (1)	
Team planning - in terms of necessary competencies and job estimation (1)	It may turn out that there are just no such people in the company, or, they are much more expensive; therefore, erroneous estimations usually result in exceeding the planned project costs.
Low risk of making a critical mistake in this phase in agile methodologies (1)	If you incorrectly define the backlog, you can still fix it in subsequent cycles. Similarly, the team is self-organizing (with some support) so repair/change is something natural.
Generally no (1)	

Source: the authors' own study

Table 4. Information of respondents regarding activities in the initial phase of the project that are crucial for the whole project.

Answer (and number of respondents who gave the answer)	Additional comments of respondents
Thorough analysis, planning and appropriate organizational preparation (structure, definition, budget, infrastructure, risks, communication plan). (5)	Before you start working on the project you must have a plan to run it, you need to know what exactly you want to achieve and what it should look like.
Proper understanding of the project solutions and arrangements by all project stakeholders (4)	Determination of operational scenarios in a language understandable for business and end users, so as to avoid mistakes resulting from communication with IT. We should specify what we are going to do and what for; it is very easy to make a mistake if you do not have the right information and arrangements. Informing the client of the restrictions imposed by the chosen option.
The scope, scope and once again the scope (understood as the sum of delivered functionalities) - "a mile wide and an inch deep". (3)	We define the success criteria - it should ensure that the project, if implemented, will meet the

	needs and we will know how to assess whether it was successful and to what extent.
Taking into consideration the technical feasibility of the project. (3)	E.g. capabilities of a specific language/programming platform.
Writing everything down. (2)	Each point of the contract must be approved of by all project stakeholders. Proper formulation of the contract.
Defining the business justification, objectives and plan of the project (2)	
Finding the right people to the application design team. (1)	
Precise specification of specific functionalities expected from the product, doing thorough research in the market and finding the perfect supplier (1)	
Carrying out a pilot mini-project (1)	It is the best way to estimate the feasibility of the project and usefulness of the chosen methods of its implementation.
An in-depth analysis of customer requirements/ Understanding the real goals of the client (1)	This is the most important thing that is often forgotten. What is in the contract is often just a projection of the client's real goals.

Source: the authors' own study

DISCUSSION AND CONCLUSIONS

The key overall conclusion from the literature review, mainly from the analysis of the division of the project into components according to various approaches or methodologies of project management is that in all of them at the very beginning of project works a vision of the project is formulated and basic project documentation is created. Following the division of project phases proposed by Kisielnicki (2014), then, the new "universal" initial phase would comprise all the activities before the implementation phase, i.e. the pre-design phase and the analysis phase. As far as the Scrum approach is concerned, the "universal" initial phase would end with the creation of vision and product backlog (i.e. basic documentation in Scrum).

A slightly larger scope of activities would be included in the initial phase according to PMBoK – it would cover the analysis of the needs, assumptions, scope, constraints and risks of the project, client requirements and would end with the development and validation of the Project Charter. And in the PRINCE2 methodology, famous for its extensive formal structure, the initial phase, i.e. the one that would end before the phase of implementation (or delivery) of the project would cover the following PRINCE2 phases: the Pre-Project Stage (including primarily identification of the causes and expected results of the project) and the Initiation Stage (in which the commencement of the previous phase is refined and resource allocation for the next project activities is defined and approved by the Project Board).

From the above analysis it is possible to draw the following conclusions (shown graphically in Figure 1):

- a phase that includes various types of analysis and planning of the project's objective(s), scope and progress can be considered as a generic, common to all project management approaches initial phase of the IT project;
- the end of this phase is marked with drawing up documentation defining the broadly understood scope of project work, its acceptance by all stakeholders and the decision to undertake project implementation work;
- the key activities of the initial phase of the project include understanding the client's business needs and realistic elaboration of the scope of project work.

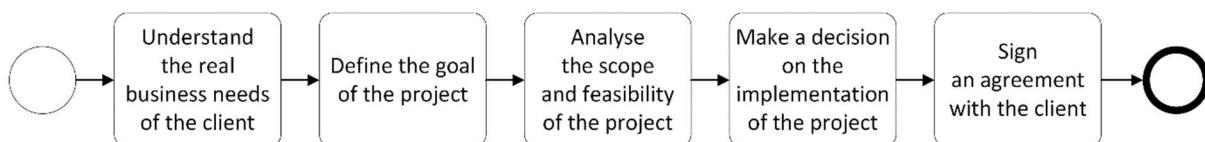


Figure 1. A universal model of the initial phase of an IT project

Source: the authors' own study

The conducted in-depth interviews show that the majority of respondents used various types of methodologies in their project work, if not in the "classical" form, but in some modified ways, using their main tools or assumptions. Various methodologies have been mentioned, including both PRINCE2 (mainly for managerial work) and Scrum, as well as hybrid agile methodologies.

When asked to define the "initial phase of the project", the respondents emphasized the importance of creating a project vision at this stage, understanding the client's needs, defining the expected final effects and conducting a project feasibility study

Regarding the possibility of making critical errors in this phase, which would jeopardize the whole project, the respondents pointed to various errors in communication and reality assessment, such as the problem of understanding real customer needs and the problem of a creating a clear, formal, realistic, error-free definition of the scope of the project that would be accepted by all stakeholders. They also mentioned the inappropriate selection of technical tools. Some of these errors can be caused by too much reliance on the project team members' own knowledge and solutions used in previous projects (instead of focusing on the currently implemented project and the needs of a specific client).

Respondents' recommendations regarding activities at the initial stage of an IT project that are of key importance for the entire project work include, first and foremost, efforts to understand the real needs of the client and, consequently, to define the project's objective(s), then a thorough feasibility study of the project (taking into consideration both the financial and the technical limitations) next, planning the entire scope of the project work, and, finally, signing a formal, clear, comprehensive and transparent agreement with the client.

The information acquired from respondents support the structure of the universal model presented above.

SUMMARY

As a result of the dynamically growing popularity of working in the project system, many project management concepts have been created, such as management or technical methodologies. The most popular examples of project management methodologies are PRINCE2, PMBoK and Scrum. There are significant differences between them regarding, among other things, the degree of formalization of project work, division of work into sections or procedures of forming a project team. They also have common features, such as the existence of the goal, the beginning and the end of the project. The aim of this article was to conduct studies on defining the initial phase of the IT project and the related challenges. After a short review of the literature regarding the division of the project into phases according to selected most popular project management methodologies, the results of in-depth studies carried out on a sample of twenty practitioners in the field of IT project management were presented and discussed. The analysis concluded that the initial phase of an IT project that can be considered as common for all project management concepts is the phase before the implementation of the project. It includes understanding the client's real business needs, defining the project's purpose and analyzing the scope and feasibility of the project and ends with making a decision on the project implementation and signing a contract with the client.

The conclusions presented in the article may be helpful in managing IT projects in practice, in particular in limiting the risk of errors in the pre-implementation phase of the project, such as carrying out too superficial analysis of real customer needs. They can also be the basis for further research on the precise definition of the structure and characteristics of the IT project stages. The limitations of this article include a limited number of in-depth interviews and, as a result, only a preliminary analysis of the data obtained. The validation of the obtained responses by means of objective data, such as an objective evaluation of the results of the project should be also considered as an important direction for further research. Also, another study, focused on IT projects could consider applying the ITIL process, which has not been discussed in the article.

REFERENCES

Agile Manifesto (2001). Retrieved 10 April 2018, from <http://agilemanifesto.org/iso/en/manifesto.html>.

Almajed, A.I., & Mayhew, P. (2014). An empirical investigation of IT project success in developing countries. *2014 Science and Information Conference*, 984-990.

- Baird, A., & Riggins, F.J. (2012) Planning and Sprinting: Use of a Hybrid Project Management Methodology within a CIS Capstone Course. *Journal of Information Systems Education*, 23(3) Fall 2012.
- Barclay, C., & Osei-Bryson, K. M. (2009). Toward a more practical approach to evaluating programs: The Multi-Objective Realization approach. *Project Management Journal*, 40(4), 74-93.
- Besner, C., & Hobbs, B. (2013). Contextualized Project Management Practice: A Cluster Analysis of Practices and Best Practices. *Project Management Journal*, 44(1), 17–34.
- Berssaneti, F.T., & Carvalho, M.M. (2015). Identification of variables that impact project success in Brazilian companies. *International Journal of Project Management*, 33, 638- 649.
- Cooper, D.F., Grey, S., Raymond, G., & Walker, P. (2005). *Project Risk Management Guidelines: Managing Risk in Large Projects and Complex Procurements*. John Wiley & Sons Inc.
- Davis, B., & Radford D. (2014) *Going Beyond the Waterfall Managing Scope Effectively Across the Project Life Cycle*. J. Ross Publishing.
- Dąbrowski W., & Domagała K. (2014). *Wprowadzenie do zarządzania projektem. (Introduction to project management)*. In Dąbrowski W. (Ed.) (2014). *Podstawy zarządzania projektami. (Basics of project management)*. Warszawa, Wydawnictwo PJWSTK.
- Didraga, O. (2013). The Role and the Effects of Risk Management in IT Projects Success. *Informatica Economica*, 17(1), 86-98.
- Gudiene, N., Banaitis, A., Podvezko, V., & Banaitiene, N. (2014). Identification and evaluation of the critical success factors for construction projects in Lithuania: AHP approach. *Journal of Civil Engineering and Management*, 20(3), 350-359.
- Habela P. (2014). *Metodyki zarządzania projektem. (Methodologies of project management)*. In Dąbrowski W. (Ed.) (2014). *Podstawy zarządzania projektami. (Basics of project management)*. Warszawa, Wydawnictwo PJWSTK.
- Howes N.R. (2001). *Modern project management: successfully integrating project management knowledge areas and processes*. New York, NY, Amacom.
- Kisielnicki J. (2014). *Zarządzanie. Jak zarządzać i być zarządzanym. (Management. How to manage and be managed.)* Warszawa, Polskie Wydawnictwo Ekonomiczne.
- Kulejewski, J. (2009). *Zarządzanie projektem według PMBoK. Cz. I. (Project management according to PMBoK. Part I.)*. *Przegląd Budowlany*, 4, 51-52.
- Malach-Pines, A., Dvir, D., & Sadeh, A. (2009). Project manager-project (PM-P) fit and project success. *International Journal of Operations & Production Management*, 29(3), 268-291.
- Miszczynski, P.M. (2015). Project management risk assessment - an overview of the methods. *Ad Alta: Journal of Interdisciplinary Research*. 5(1), 63-66.
- Rabechini Junior, R., & Monteiro de Carvalho, M. (2013). Understanding the Impact of Project Risk Management on Project Performance: An Empirical Study. *Journal of Technology Management and Innovation*, 8, 64-78.
- Ram, J., & Corkindale, D. (2014). How "critical" are the critical success factors (CSFs)? Examining the role of CSFs for ERP. *Business Process Management Journal*, 20(1), 151-174.
- Redakcja 4PM.pl (2016). *Inicjowanie i prowadzenie projektów innowacyjnych w firmie cz. II., (Initiating and running innovative project in a company part II.)*. Retrieved 10 April 2018, from <http://4pm.pl/artykuly/inicjowanie-i-prowadzenie-projektow-innowacyjnych-w-firmie-cz-ii>.

- Schindler, M. (1990). *Computer Aided Software Design*, New York, J. Wiley & Sons.
- Schwalbe, K. (2017). *Information Technology Project Management*, 6th edition, Minneapolis, MN, Schwalbe Publishing.
- Standish Group (2014). *The Standish Group Report.Chaos.*, Retrieved 10 April 2018 from <https://www.projectsmart.co.uk/white-papers/chaos-report.pdf>.
- Toor, S.-u.-R., & Ogunlana, S.O. (2009). Construction professionals' perception of critical success factors for large-scale construction projects. *Construction Innovation*, 9(2),149-167.
- Varajao, J., Dominguez, C., Ribeiro, P., & Paiva, A. (2014). Critical success aspects in project management: similarities and differences between the construction and software industry. *Tehnivcki vjesnik*, 21(3), 583-589.
- Witański, M. (2013). Scrum a metodyki prowadzenia projektów. (*Scrum and methodologies of project management*). Retrieved 10 April 2018, from <http://4pm.pl/artykuly/scrum-a-metodyki-prowadzenia-projektow>.
- Wysocki R. K., & McGary R. (2005). *Efektywne zarządzanie projektami. (Effective project management)*. Warszawa, Helion.
- Wysocki, R. K. (2009) *Effective Project Management: Traditional, Adaptive, Extreme*. Indianapolis, Wiley Publications.