

Agile vs. Traditional Methods for Managing IT Projects - A Case Study*

Anja Vresk, Igor Pihir, Martina Tomičić Furjan

University of Zagreb

Faculty of Organization and Informatics

Pavlinka 2, 42000 Varaždin, Croatia

{avresk, ipihir, mtomicic}@foi.unizg.hr

Abstract: Agile methods of project management have been a relevant topic for several years and are especially relevant in IT fields. One of the assumptions is that agile methods in IT projects are a better choice than traditional ones; therefore, this paper compares traditional and agile approaches with the aim of research on real case studies. Based on assumptions and a literature analysis, a survey was conducted on a realistic sample of 16 IT experts from project managers or members of project teams with experience in projects guided by both approaches. The results respond to the assumptions and give a picture of the advantages and disadvantages of both approaches, and the paper summarizes recommendations for their implementation in IT projects.

Keywords: project, project management, agile methods, traditional methods, comparison of methods

1 Introduction

With all its achievements, inventions, and the knowledge that people possess, today's world is constantly accelerating and improving. Business strives for greater work efficiency and process efficiency. Modern products are designed and manufactured by increasingly complex processes, and the time from idea / design, to development, sales and application is getting shorter. All of the more complex products, services, or generally non-standard processes that are carried out to achieve the specific goals of the organization, have a dose of innovation and risk for organizations, and they are not routine are called projects. The discipline that deals with the improvement of the way of working and methods for leading/implementing projects is called project management, and the methods and techniques used are continuously improved. According to Kerzner (Kerzner, 2009, p. 6), project management is actually about time, cost, performance and resources, i.e. how to choose the best mix to achieve the project goal.

Projects and project management are used in various industries such as construction, the development of new products, technologies, and materials; and the production of complex products such as aircraft or ships. In particular, the discipline of project management is important in the information technology (IT) industry where the development and advancement of technologies, the requirements of new users and the adaptation of existing solutions change very quickly. Such conditions set challenging goals for IT project management. The products made by IT companies and teams of IT experts are unique such that they are specialized and fully tailored to the client. In order to achieve such goals through projects, as well as to make them feasible and as efficient as possible in a certain period of time with available resources and within a certain budget, it is necessary to manage projects in the right way. This is helped significantly by the selection of appropriate methods and techniques that can be categorized as traditional and agile, where the choice of methods and techniques depends on the characteristics of a specific project.

Based on the above, this paper seeks to explore the application of agile and traditional methods in IT project management and it compares their advantages and disadvantages on a realistic sample of project participants. The research is focused on the employees of an IT company - the case study. It was identified that only a few years ago this company switched to using project management according to the agile approach as opposed to the previously used traditional approach. This situation makes its employees (project managers and project team members) ideal candidates to test and compare both approaches.

The paper is organized as follows. The introduction to the topic is followed by a chapter on the methodology where the sample, methods, implementation of research and the case study itself are described. Following that, a theoretical framework is presented, which describes the validity of concepts and methodologies according to traditional and agile approaches. The theoretical framework and existing

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research are followed by results and discussions. The paper ends with the conclusion and references.

2 Methodology

This paper is based on research conducted as part of the final work and practical work in the company case study. Research on project management methods was conducted at Emil Frey Digital, which deals with: the development of innovative software solutions, web development, image processing, artificial intelligence and machine learning, the Internet of Things, and data integration and business intelligence (Emil Frey Digital, 2020).

The research was conducted in 2020 in two steps. A structured interview was conducted with two employees (project managers) which ensured that the questions were calibrated and that the final questionnaire for the main research was defined for the second step. This second step was carried out with 52 of the 57 employees. The sample involved experienced project managers and project team members who were mostly IT professionals with a university degree working in the case study company. Based on the theoretical framework of agile and traditional methods, and the assumptions that those agile are more efficient and by that a better choice when it comes to IT projects, this research aims to investigate and compare the two approaches and make recommendations for their implementation in IT projects. According to the above assumptions as well as the well-known theory related to concepts such as projects, project management, agile and traditional methods, etc., a set of questions was compiled that served as a structured survey for interviewing two employees of the selected company. Through interviews, it was checked whether the case study company was the ideal choice of company in which research on traditional and agile methods could be conducted. This was based on the company's project management policy and the knowledge of individuals on the chosen topic. As these employees within the case study company are in positions that are closely related to Scrum as an agile method, and that they have experience in working with traditional methods, it was possible to compile a new survey based on their answers relating to the main survey. Survey was conducted online and send to a selected sample of employees included in the main research.

The online survey for the main research consisted of 33 questions of different types (open-ended questions, closed-ended questions, and questions of agreement with a statement according to the Likert scale). Surveys for research purposes were sent to two groups of respondents within a sample of 52 employees, i.e. to project managers and members of project teams. The number of surveys sent to project managers was 8, while the number of surveys sent to team members was 44. The number of employees who responded was 4 project managers, which is 50% of the

total number of managers within Emil Frey Digital. When it comes to project team members, the percentage of respondents is 27% or 12 out of 44 project team members to whom the survey was sent. After collecting answers from both groups of respondents, an analysis of the results was performed. Based on this, this paper presents the findings and explains how they are connected with the original assumptions. It also compares these two approaches and gives recommendations for their application in IT projects.

3 Theoretical Framework

Traditionally, project management is the application of tools, skills, techniques and knowledge in project activities in order to meet the objectives of the project or the requirements of the client and their set scope. Traditional project management includes 5 phases: project initiation, planning, execution, monitoring and control, and closure. All five phases are carried out under the guidance and support of the project manager as well as the project team. (Project Management Institute, 2013, p. 5)

The features of traditional methods are visible in the fact that they are implemented by organizations in which projects are implemented that are fully defined and their changes are predictable. Management itself is based on commands and controls, communication is formal, and the development model is based on a life-cycle model. It is a matter of complete planning and the examination of the results that comes at the end. When it comes to the result itself, whether it is a product or a service, the requirements related to it are stable and pre-specified. Traditional methods as such are mostly used in large teams (Engelhardt, 2019, p. 15-16)

In addition to the above, traditional project management is based on a definite, stable, predictable and linear model. In other words, projects that are traditionally run are focused on a plan prepared in advance with the aim of meeting the time limits, budget and performance objectives of the project. One of the biggest features of such a plan, as well as the traditional methods themselves, is that it is largely isolated from the environment in which the project is implemented and which changes during the project (Shenhar & Dvir, 2007, p. 19).

The best known and most common traditional method is the traditional waterfall method or waterfall approach. The main phases are gathering specifications/ requirements, design, implementation/ development, testing and maintenance. In some versions, there are additional stages of the observed traditional method, but the five listed are a mandatory set in each of the existing versions (McCormick, 2012, p. 3, 5, 6). From the point of view of IT projects, the project team spends a lot of time on the specifications/ requirements phase in terms of planning and design. As well, when the implementation / development phase

starts, there are no additional requirements, doubts or undefined parts of the project related to the final result. For this reason, projects that have a long duration are suitable for the waterfall approach/method (McCormick, 2012, p. 4-6).

Another traditional method considered in this paper is PRINCE, an abbreviation for Projects IN Controlled Environments. PRINCE2 is a traditional method that is considered a "process driven" method. It answers the questions 'what' and 'why', and partially the question 'how'. PRINCE2 was developed by the UK government, and recently the rights to use the methodology have been granted to the public-private company Axelos (Axelos, 2020)

The Project Management Institute (PMI, 2020) is an organization that has developed and maintains the PMBOK Guide. It is a methodology for classical project management, which is one of the strongest classical methodologies globally aimed at transferring good practices. This is also the case with the PRINCE2 methodology. PMBOK is considered a set standard or project management tool, and it is a set of knowledge and good practices when it comes to project management.

The PMBOK Guide and PRINCE2 are the most common classical project methodologies in projects globally and in Croatia. A Croatian survey (Fabac, Pihir & Radšević, 2009, p. 5). showed that only 16% of Croatian companies use the PMBOK or PMI standards, and they mostly combine approaches. Both methods have recently received an agile variant and a corresponding certificate (PMI, 2020 and Axelos, 2020).

Another well-known method that permeates all of the above is the Critical Path Method (CPM). It is based on a logical and mathematical model for projects. It is centred on determining the optimal time required for a particular process in a project and the simultaneous use of the most economical available resources, regardless of it being human labour, equipment, finances, etc. (Antill & Woodhead, 1991, p. 1,2,4,5, 8-10). The main advantage of CPM is that it determines the sequences that do not have adequate time/timing (critical path), and it recognizes the sequences of activities that have them.

The combined features of traditional methods are presented in Table 1 (according to Engelhardt, 2019, p. 15,16)

Table 1. Features of traditional methods

User requirements	Clearly defined at the beginning, during the first phases of the project
Size of the team	Larger teams
Inclusion of the client during the project	Very small (at the very beginning when the user gives his requests and finally, when delivering

	the final result / product / service)
Duration of the project	Long
Management	Based on command and control
Communications	Formal
Development model	Life-cycle model
The amount of risk and change	Minimum amount of risk and change

Agile methods are believed to have first appeared in IBM in 1957, but were developed in the mid-1990s as an alternative to traditional or standard methods. The agile approach or methods have several explanations. In terms of IT projects, they are interactive and incremental methods through which project requirements together with solutions are developed through the cooperation of multifunctional self-organizing teams (Islam, 2013).

The greatest emphasis in agile methods is placed on flexibility and a quick response to change. Likewise, agile methods are considered adaptive, saying that a project can move based on one idea but in the end, the result turns out to be something different from the original idea. When there is a change within the project itself, agile methods are the ones that adapt to them very quickly and that is one of the main reasons for their existence. When it comes to the course of developing the end result, teams working on agile principles are allowed to develop part by part the final product/service as they see fit. They decide for themselves which functionalities they take as a priority for the project. According to that prioritization, they take the features, either one by one or a smaller set of several of them, and develop them in iterations. For this reason, the team is considered to be self-organizing in agile methods (Islam, 2013). According to the authors (Merzouk et al., 2018, p. 3, 4) and their comparison of agile methods, it is necessary to observe team size, the project and repetitions (or iteration length) when choosing the correct agile method for a project.

Regarding the representation of agile approaches, the most common one is Scrum. Its representation can mostly be attributed to its simplicity in functioning. It is applicable to any type of project. Regarding the level of the entire company, it can be applied to the company's business policy and its global operations (Stellman, Greene, 2017, p. xii, 12). For example, a project manager can take on the role of scrum master or product owner, and then redefine his/her role and take on the responsibilities of the previous job (project manager) along with the responsibilities of the role he/she currently takes on. (Kothari, 2019).

In addition to the listed roles as well as the ceremony, the term "backlog" is an indispensable part of Scrum. There are product backlogs and sprint backlogs. A product backlog is a list of all the features of the end result that the team must develop in order for the result to be satisfactory. A sprint backlog is a set of

all the features that the product owner and his team decide to develop in the sprint that follows. The features themselves are taken from the product backlog, from which the features are taken in order of priority (Stellman & Greene, 2017, p. 4, 74).

Kanban is the second most famous agile method. It was created in the 1940s by Taiichi Ohno in Toyota. Kanban had its beginnings in Toyota’s manufacturing process. Kanban is a method based on term ‘just-in-time’ production (Moondnen, 2011).

The visualization of work within the project and its activities is done using Kanban boards (Stellman & Greene, 2017, p. 280-281). A task board or a board that can be used in Scrum is used in Kanban to limit the work in progress in relation to a set of parallel activities per unit of time. It gives an overview of the entire work as a means to see the whole picture (Kniberg & Skarin, 2010, p. 15,16).

Scrumban is a method that combines Scrum and Kanban into one method. It takes the parts of Scrum and the parts of Kanban that are most applicable in practice and combines them to come up with a generally accepted method of project management. Scrumban is a very adaptable method that many IT teams opt for because it provides the advantages of sprint in Scrum and the visibility and necessary control from Kanban (Slović & Stojanović, 2019, p. 41).

Extreme programming (XP) was developed by Kent Beck and Ward Cunningham in the mid-1980s. This development followed as a part of their work in the Tektronix research group. After starting the idea, Beck embarked on the further development of Extreme Programming and added new principles and ways to apply the observed method to projects using the most important items: a) communication, b) simplicity, c) feedback and d) courage (Pap, 2008, p. 25-26, 31).

The way in which program code is created and regulated is achieved with many of the principles that XP explains as a part of its method. Some of them are: pair programming, feedback, joint code ownership, frequent and thorough testing, reliance on metaphors, 40-hour work week, and continuous integration (Tadić, 2005, p. 237, 242).

According to the author's work (Malik, Ahmad & Hussain, 2019, p. 656), the flexibility of agile methods is the most significant feature; whether it refers to Scrum, XP or other methods. In addition, they state that one of the problems of agile methods is that in more complex projects, parts of agile methods, such as meetings or phone calls, are necessary and can be difficult to implement in international teams that have different time zones.

XP as a project management method in fact puts more of its focus on software development or best practices for its development, while leaving aside, or assigning less priority to, best practices in how to achieve the entire project within a given budget and within defined deadlines. (Javanmard & Alian, 2015, p. 1391). To facilitate this application in projects of greater complexity, it is recommended to use project

management software where according to the authors (Fabac, Radošević & Pihir, 2010, p. 466), it is possible to divide it into three categories: project management software, process management software and time tracking software.

The combined features of agile methods (according to Engelhardt, 2019, p. 15, 16) are found in Table 2.

Table 2. Features of agile methods

User requirements	They are not clearly defined. The end result is determined without the detailed features or complete vision
Size of the team	Smaller teams
Inclusion of the client during the project	Large (involvement is present throughout the project)
Duration of the project	All project lengths
Management	Based on leadership and cooperation
Communications	Informal
Development model	Evolutionary, iterative

Based on the characteristics listed below, the results of the case study are presented.

4 Results

The results of the main research were divided into two surveyed groups (project managers and team members), and demographic and general data on them were presented separately. The main results related to the methods were presented together for both groups of collected respondents. When it comes to general information on the respondents, the first observed characteristics are gender, years of experience and the highest level of education achieved. Figure 1 shows that within the case study company, regardless of whether or not the person is a project manager or team member, men predominate. Of the total number of respondents, 75% of the project managers are men, while 67% of the team members are also men.

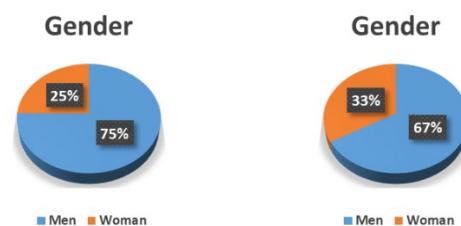


Figure 1. Gender of respondents (left side – project managers, right side – team members)

Figure 2 presents the years of work experience of the respondents. It is evident, when it comes to project managers, that these respondents' work experience range evenly. 50% of them have 10 to 15 years of work experience and 50% have ≥ 15 years of work experience. On the other hand, looking at the respondents in the group of team members, it is evident that there is very diverse work experience. 33% of them have up to 5 years of experience. Likewise, 33% of them have 5 to 10 years of work experience, 25% have 10 to 15 years of experience, while only 9% have more than 15 years of work experience. From the comparison of these two graphs, the respondents in the group of project managers have more work experience than the respondents in the group of team members. This is expected considering the roles.

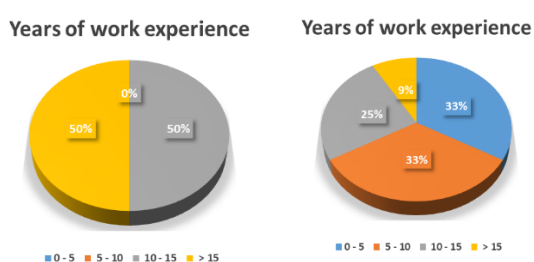


Figure 2. Years of work experience (left side – project managers, right side – team members)

Traditional and agile methods have great differences in their main features. Apart from the fact that their differences are visible in terms of the theory, the respondents confirmed that there are differences through their answers to the questions within the survey. Knowledge of the methods and answers given related to their features are considered credible given the number of projects they have completed or managed. The respondents' answers show that on average they worked on a large number of projects guided by agile methods. The average number of projects the respondents worked on with traditional methods is 4.4 projects, while the average number of projects completed with any of the agile methods is 7.9. Thus, respondents worked on almost twice as many projects with agile methods as opposed to those guided by traditional methods.

When it comes to the reasons for choosing a certain group of methods, the main three reasons given by the respondents are provided in Table 3.

Table 3. Reasons for choosing project management methods

Reasons for choosing traditional methods	Reasons for choosing agile methods
When it is known exactly what needs to be done during the project	When only the rough requirements and goals are known.

When a project cannot be split into smaller parts	When flexibility is needed
When the client does not have technical people to check individual parts, and is only interested in the final product	When it is expected that changes will occur during the project and it will be often

Although it was found that some respondents did not understand the reason for choosing certain types of project management methods, it was shown that they still understand the features of them. Most of the respondents answered the set questions correctly (according to theory) Once again, there is a case where the characteristics of traditional methods are the opposite of those of agile ones, which is shown in Table 4.

Table 4. Features of traditional and agile methods

Features of traditional methods	Features of agile methods
Size of teams	Teams of 4 to 7 persons
It is very hard to makes changes after the project starts	High level of flexibility
The phases are analysis, documentation, development/coding, testing, implementation and maintenance	The phases are initiative, iteration and the release of a portion of the product

Most of the research conducted on agile methods has obtained similar results. However, there are a few findings whose results have stood out. One finding is in the research conducted by Livermore (2008, p. 35). He found that when it comes to team sizes, there was no significant correlation between team size and the success of a method's implementation. He states that this is an unexpected result, considering that a large amount of research on the mentioned topic concludes that agile methods are less successful in larger teams.

Results like these support the fact that methods, especially agile ones, are adaptable to different teams and situations. Their flexibility is not only applicable in terms of responding quickly to additional requests, but they are themselves flexible in their adaptation over a team or project – in terms of team size, team role, and sprint length. The advantages and disadvantages of the observed types of methods, stated by team members (open-ended questions), are largely in line with the researched literature and generally coincide with the theoretical assumptions of other authors. This means that respondents in this case study are familiar with working on projects according to both approaches, and that the theoretical descriptions of the methods are accurate in relation to the practical application. The results regarding the comparison of advantages and disadvantages are shown in Table 5.

Table 5. Advantages and disadvantages regarding traditional and agile methods

Traditional methods		Agile methods	
Advantages	Disadvantages	Advantages	Disadvantages
Not a lot of time lost at meetings	Difficult to adapt to potential problems, less flexibility	Flexibility, quick adaption on changes	Fewer specifications and documentation
The requirements are known at the beginning	Slowness, sluggishness	Greater team involvement, members contribute with their own ideas	Potentially higher costs
Detailed specifications and documentation	Less expressiveness concerning the individuals ideas	Cooperation with the client	Difficult to hold deadlines due to frequent changes
Easy to predict problems	Rare deliveries	Frequent deliveries	Daily meetings can take up too much time

In the conducted research, four already mentioned characteristics of project management methods were observed and their evaluation was carried out on a scale from 1 to 5, where 1 represents the characteristic happens “very rarely” and 5 means the characteristic is “very often.” In this part of the research, different approaches in traditional and agile methods are especially seen. The graphs in Figure 3 show the difference in team involvement, i.e. their contribution with their own ideas in different types of methods

during a project. When it comes to traditional methods, most respondents said that team involvement with their own ideas is rare or happens only sometimes. Meanwhile, most of the same respondents agreed that team involvement is often or very often in agile methods. In observing the average response of the respondents, it is seen that the involvement of the team with their own ideas in traditional methods is rated at 2.2, while with agile methods it is rated at 4.2 (on a scale from 1 to 5).

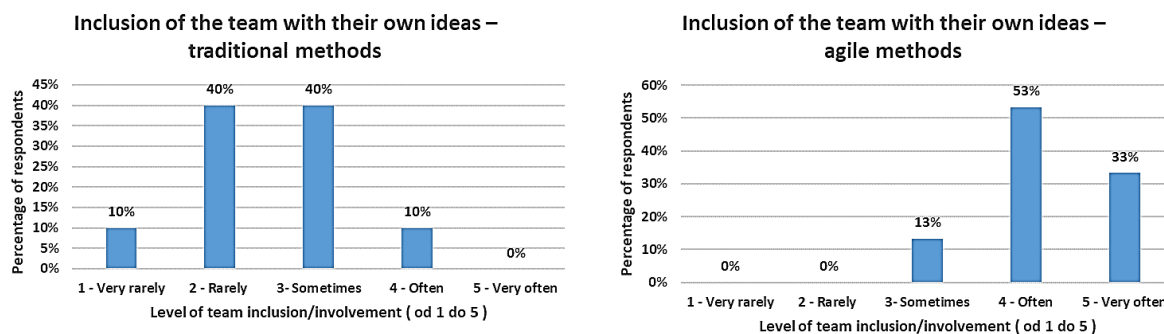


Figure 3. Inclusion of the team with their own ideas in traditional and agile methods

The situation is similar when it comes to the frequency of meetings (Figure 4) where respondents claim (as can be seen in the features, advantages and disadvantages they stated) that meetings are less common with traditional methods than with agile ones (where they are very common). This is ultimately considered an advantage, but it can also be a

disadvantage. In the graphs in Figure 4, the average for traditional methods is 2.1, while the average for agile methods is 4.6 on a scale from 1 to 5. This confirms the assumption that with agile methods more time is needed for project meetings and much more frequent they are done .

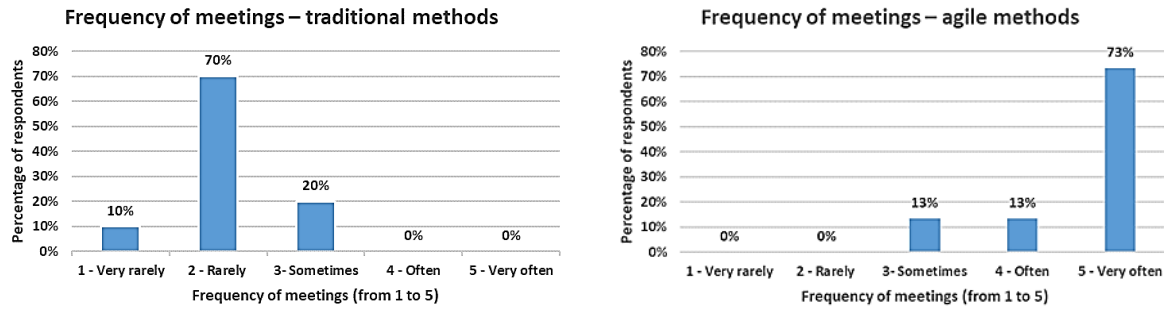


Figure 4. Frequency of meetings in traditional and agile methods

The frequency of changes (Figure 5) in the final product is closely related to the flexibility of a particular method. Respondents reported that agile methods are flexible while traditional ones are slow and sluggish.

According to them, their conclusion is that product changes during the project duration are rare in traditional methods, on average 1.7, while those in agile methods are often or very often, on average 4.2 (on a scale of 1 to 5).

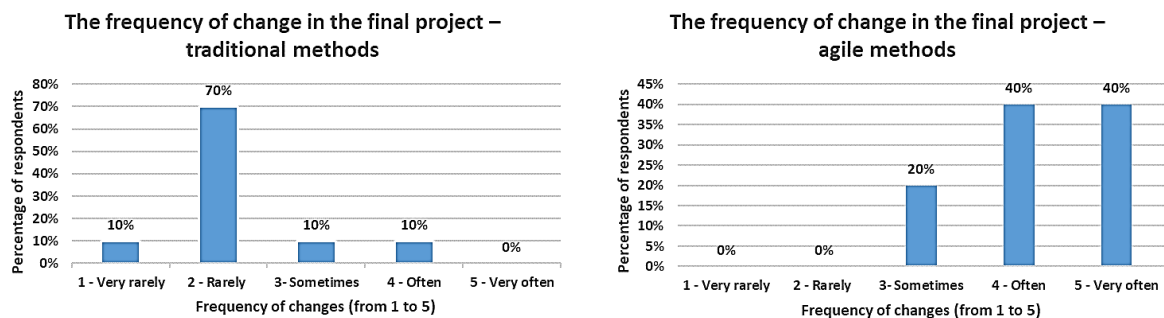


Figure 5. Frequency of changes in the final product in traditional and agile methods

Finally, the respondents expressed their opinion about the client's familiarity with the project during its implementation (see Figure 6). In the opinion of the respondents, on average the client is rarely familiar with the project in traditional methods. This means that the clients are only sometimes actively involved in the project. The average rating is 2.1. To the same question, but with reference to agile methods, respondents answered that familiarity with the project among clients is often or very often.

The average response is 4.2. This points to the need for the client to be involved in defining and redefining the requirements during the project, which is much more often the case with agile methods than with traditional ones. In traditional methods, it is considered that the requirements are defined at the beginning of the project and are usually not changeable during the project. The client does not have to be referred to the project or have expert knowledge in the project domain.

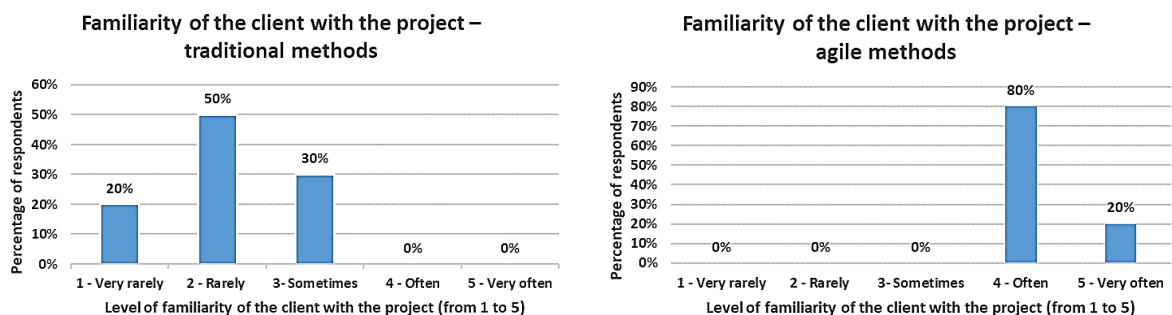


Figure 6. Familiarity of the client with the project in traditional and agile methods

5 Conclusion

When it comes to IT projects and methods that are more adequate to manage them, according to the results of the research, it is evident that the sample of employees agreed with the assumption that agile methods are a better choice in most IT projects compared to traditional methods. In most IT projects, not all requirements or characteristics of the results are known at the very beginning and a high level of flexibility of the project management method is needed in order to respond quickly and easily to these changes. Requests for IT solutions mostly come from other industrial sectors. The final requirements that would be sent to the client of an IT product or service are unclear even to them. Due to the lack of a clear vision regarding the solution and the requirements at the beginning of the project, difficulties and misunderstandings often occur. Traditional methods are limited in this sense because it is impossible to clearly define the project and project plan at the beginning and the results are visible only at the end of the project.

Thus, agile methods are ideal for these types of project results. They provide the mentioned flexibility and take into account frequent product changes. At the same time, greater client familiarity ultimately leads to greater satisfaction and the success of the project. Furthermore, agile methods are those where the project team is more involved in providing their own ideas. The team communicates more, and more freely, and it has a better response to client requests due to the existence of different opinions and views on a particular problem. This again leads to a more successful end result.

Of course, agile methods have their drawbacks. The biggest of them is certainly the frequency of meetings, where it is easy to spend a lot of time on them. There is also the lack of project documentation.

Ultimately, the choice of methods depends on the initial requirements and the product/service that the project team develops. There will always be projects within the IT sector whose management will be better served by traditional methods. However, in a broader context, agile methods are much more adequate for IT projects than traditional ones. This is supported by offers made by traditional institutions / certifiers / educators that work according to established traditional methods such as PMI, PRINCE2 and other globally known methodologies in which they offer an upgrade of their methodologies with agile approaches.

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