The Agile Transition in Software Development Companies:

The Most Common Barriers and How to Overcome Them

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Abstract

The purpose of this paper is to investigate the most common barriers facing the greater adoption of Agile approaches to project management, and ways to overcome these barriers during an Agile transition. First, based on a literature review, this paper describes the Agile approaches and practices in general. The review also covers the previous work around the adoption of Agile, which provides considerable information about the challenges of doing so. This includes some prerequisites, key decisions, transitional frameworks, and recommendations to overcome organisational, cultural, and structural barriers. Next, this paper reports on a recently conducted Agile project management survey. Using this method, this research project gathered information about the important issues that software development companies have to overcome in order to be successful in an Agile transition. The survey was given to Scrum masters, project managers, chief executive officers, and IT professionals, who have participated in companies that have migrated from a traditional methodology to an Agile methodology. Several barriers were highlighted: general organisational resistance to change, lack of user/customer availability, pre-existing rigid framework, not enough personnel with Agile experience, concerns about loss of management control, concerns about lack of upfront planning, insufficient management support, concerns about the ability to scale Agile, need for development team support, and the perceived time and cost to make the transition. Finally, the paper offers concise recommendations to overcome each of the barriers as well as ideas for future research.

Keywords: Project management, Team work, Software development business, Agile, Change management

1. Introduction

The aim of this study is to help software development businesses understand whether or not they are capable of implementing an Agile project management methodology to improve their software development processes.

In general, Agility means the ability and flexibility of a company to adapt and change within a new context. In software creation, this includes short development iterations ranging from two to six weeks where each team can make decisions and adjustments according to new information. Three of the widely used Agile project management methodologies include Scrum, Kanban and eXtreme Programming (XP).

The Agile iterative development process is different from the traditional waterfall methodology (Awad, 2005). According to Augustine, Payne, Sencindiver, and Woodcock (2005), traditional methodologies have linear, processes, and are based on an assumption that requirements are stable, known, and consistent. In an iterative model, the progress involves iteration after iteration whereby the requirements and the feedback are collected progressively. For example, as illustrated by Patterson and Erturk (2015), constant feedback and openness to change is beneficial for User Experience (UX) designers. On the other hand, the traditional waterfall concept dictates a sequential development where the outputs of each phase are the inputs of the following phase. Thus, it has an emphasis in providing certainty to collect all the requirements and perform the correct initial analysis, to ensure that re-planning is not going to be necessary. As a side note, although these two approaches are often used exclusively, there have been hybrid cases whereby a combination of traditional and agile has been employed (Cram & Marabelli, 2017).

Agile methodologies have challenged the traditional ones in recent decades. According to Highsmith and Cockburn (2001), the market demands high-quality software and innovation as soon as possible. The Agile methodology responds to this expectation by reducing the cost of software requirement changes. The Agile approach was

influenced by four distinct factors: object-orientation, evolutionary development, internet technologies, and methodology engineering (Strode, Huff, & Tretiakov, 2009).

This topic is motivated by the primary author's extensive project management background, including large-scale multi-country software implementation in both traditional and Agile methodologies. This experience is combined with membership in the Project Management Institute (PMI), a leading project management organization with over 450,000 global members (http://www.pmi.org/about), and membership in the Scrum Alliance which is the largest and most influential professional certification organization within the world wide Agile community with more than 500,000 certified practitioners worldwide (Scrum Alliance, 2017b).

On the particular topic of adoption of Agile approaches, this research paper has collected relevant information from a literature review, and then through the Agile project management survey distributed in this study. Firstly, the literature review includes current Agile adoption theories, which have provided considerable information about the barriers. These works show some prerequisites, key decisions, transitional frameworks, and several recommendations to overcome organisational, cultural, and structural barriers to Agile. Secondly, the survey has contributed to this original research by gathering field data which helps identify the very important issues that software development companies need to overcome in order to be successful in an Agile transition. The online survey has consisted of 23 quantitative and qualitative questions and has collected data from Scrum masters, project managers, chief executive officers, and IT professionals who have participated in companies that have migrated from a traditional methodology to an Agile methodology.

This study proposes to answer the following research question: "What are the most common barriers and how to overcome them during the Agile transition?" Therefore, the intention is to provide relevant information for software development companies transitioning from a traditional approach, such as the System Development Life Cycle to an Agile approach.

2. Literature Review

First, it is necessary to build the theoretical framework and the perspectives of this research, based on the theories covered in the existing literature. Some of the existing theories are based on prerequisites and key decisions. According to Gandomani et al. (2013), there are several critical prerequisites for an Agile transformation. These are: business goals setup, addressing training needs, team set up, pilot project selection, and method selection. Each company will also experience their own Agile adoption process differently because each software company has unique factors, management practices, organizational structure, policies, values, and norms. This adoption itself can be considered an iterative process; it is based on the ongoing interactions between company employees trying to agree on their development methodologies (Khalil & Khalil, 2016).

In terms of business goals, an organisation should have an authentic reason for an Agile transformation. The focus on identifying the business goals and finding a reason for change are critical. Organisations cannot be motivated to embrace the Agile values and principles without clear business objectives (Gandomani et al., 2013). Also, without the key executive decision of keeping an ambitiously early release date, the transition may be unsuccessful. The managerial decisions should reinforce the Agile principles of delivering early and frequently (Fry & Greene, 2007).

According to Gandomani et al. (2013), training is the most important and critical prerequisite. Also, the training should be complete and cover all of the different roles. The training materials may depend on the knowledge and experience of each team. However, Agile values and principles should be covered regardless of software development experience. Inadequate training may cause problems such as unrealistic expectations from Agile, lack of collaboration, and resistance to change (Fry & Greene, 2007). Next, the selection of the suitable members is extremely important. This includes advising team members to choose the right people for starting the transition. When people with different skills, knowledge, and backgrounds become part of the Agile team, it is important to emphasize accessibility, transparency, and ownership of the transition (Gandomani et al., 2013).

Furthermore, it is important to choose the best pilot project for Agile transformation. Project selection may affect the future of Agile in the organisation because there are some risks that need to be avoided, such as other employees who may be waiting for a pilot project failure, or a product owner who does not like to be involved in development (Gandomani et al., 2013). Finally, it is necessary to identify the appropriate Agile method or methods, depending on business goals, organisational abilities and constraints. Different Agile methods are suitable for different purposes; therefore, managers have to decide which methods or practices are the most suitable. However, an organisation can still start with a particular method, and later use another, depending on their needs (Khalil & Khalil, 2016).

Focusing on the Agile principles helps employees understand the Agile process. The company should put effort into inculcating principles such as communication, empowering teams, continuous improvement, and delivering customer value early (Fry & Greene, 2007). Software project teams also have to identify issues in their software development process and address them with a set of best practices (Khalil & Khalil, 2016).

An Agile infrastructure is the foundation for the enterprise's Agility. The Agile infrastructure has to constitute an alignment between Agile practices and the organisational structure and culture. Thus, project managers assess how the organisational structure can support the Agile practices, and how Agile practices fit with the organisational structure and resources. In addition, collaboration tools and training programs have to be implemented to increase effectiveness in an Agile environment. Companies also have to decide the amount of resources and the projects or areas in which to invest. Khalil and Khalil (2016) add that the organisation should select the most strategic projects that are ready for Agile. Automation and integration tools can positively support the transition. Fry and Greene (2007) found that, with the help of automated development and testing tools, the team was allowed to run much more frequent check-ins and tests which may have been critical for short development test cycles.

Iamandi, Popescu, Dragomir, and Morariu (2015) summarise the Agile Project Management Framework (APM) which was developed by Highsmith (2009), who contributed to the production of the Agile manifesto. This model considers the Agile advantages along with the disadvantages experienced during the application of some of the Agile principles. The framework includes a cycle consisting of five stages: envision, speculate, explore, adapt, and close. It is an iterative model which adheres to Agile principles. The APM can also include tools, methods, and best practices from traditional project management methodologies.

The APM framework also tries to address one of the potential deficiencies of Agile methods: the connection to organisational practices, structures, and governance. Also, in order to manage risks: iterations are used to catch and prevent risks. The timeframe is similar to a Scrum sprint, from one to four weeks, using the same artefacts. Iamandi, Popescu, Dragomir, and Morariu (2015) conclude that APM provides an improved structure compared to the Scrum methodology.

Sidky (2007) proposes a four-stage Agile adoption framework, which is a structured and repeatable approach designed to guide and assist Agile adoption efforts. This framework consists of four stages to determine if an organisation is capable of moving towards Agile and capable of identifying which Agile practices the organisation should adopt. The first stage is the addressing of factors for discontinuation. It is necessary to find out the issues which can prevent the Agile adoption from happening. Sidky (2007) suggests three significant issues: an inappropriate need for Agile, the absence of executive support, and lack of sufficient funds.

The second stage of the Agile adoption framework involves doing a project level assessment. This determines the desired level of Agile appropriate for a particular project. The third stage is the organisational readiness assessment. This assessment determines the target level of Agile that the organisation can achieve. The activities examine the areas that need some improvement before an adopting an Agile process. The company characteristics that are usually analysed include: the nature of its customers, the developers, the managers, their software tools, the organisational culture, their project management approach, the software development processes, and the physical environment. It is crucial to understand the organisational culture while carrying out the Agile transition. A mismatched culture is difficult to deal with, and Sahota (2012) recommends identifying Agile practices that are potentially compatible with the dominant culture and emphasizing them. In the final Reconciliation stage, it is necessary to determine the Agile practices to be adopted for properly reconciling the Agile level for a given project identified in the second stage, and the Agile level of the organisation as assessed in the third stage. There are three possible scenarios during the final stage:

1. The Organisational Readiness Level is higher than the Project Target Level. Thus, no extra effort is needed because the organisation is ready to use the chosen Agile practice for the project.

2. The Organisational Readiness Level is equal to the Project Target Level. No catch up is needed here either as the project can achieve 100% of its Agile potential.

3. The Organisational Readiness Level is less than the Project Target Level. A further reconciliation is necessary. There are two options for the reconciliation. The first option is to bring about some initial change within the organization; this depends on the willingness of the organisation to change in general. The second option is to lower the expectations. If the organisation is unwilling to invest more time or money, it can adopt only those new Agile practices that are within its current capacity.

According to Gandomani et al. (2013), there are organisational, cultural, and structural barriers for companies who are willing to adapt the Agile approach for their software development methods. The organisational structure is influenced by the underlying culture and changing people's mindset is not an easy task. The transformation from traditional to Agile is more likely when the management style changes from "command and control" to "leadership and collaboration". Thus, the organisation will have adequate flexibility and responsiveness to realize the advantages of teamwork and cooperation. The project manager role should be modified from being a planner and controller to being a director and coordinator, by ensuring that creative ideas are reflected in the final decisions. Furthermore, documentation is another challenge. Whereas traditional methodologies are based on intensive documentation, in the Agile approach, the documentation is limited. This challenge should be addressed by selecting appropriate a knowledge management strategy, based on the abilities of the organisation.

Another set of challenges are people related. To have success with Agile methods, it is necessary to have communication and collaboration between team members. To take advantage of some of the Agile methods such as pair programming and XP, managers should select the suitable staff and provide them with mandatory training. Customers are another important challenge. Agile practices need the customer to be a part of the software development team. Customers and end users have a critical role in the success of Agile approaches. Therefore, they need to be knowledgeable, committed, authorised, collaborative, and responsive.

There are also process related challenges. The traditional approach has processes based activities and measurements in contrast with Agile, where activities are based on fast support and high-quality software development. The expectations of traditional developers trying to finding adequate documentation in Agile projects can be frustrated. To change the development model from a traditional life cycle to an Agile one that is evolutionary and iterative is a complicated and exhausting task because it impacts strategies, tools, people and techniques. Choosing a suitable Agile method can be complicated because the choice is affected by differences in project size, implementation, priorities, and software code ownership. Hence, organisations have to decide the most appropriate Agile method according to their own software development practices and procedures.

Finally, technology and tool related challenges need to be considered. These issues for migrating to Agile methodologies can be less frustrating than the others. Companies should implement software development tools that can support incremental work, continuous integration, and version management, among other features. This is even more important for distributed organisations with multiple sites. Using the appropriate modern development tools will support the adoption of the Agile approach in distributed development environments.

3. Method: The Agile Project Management Survey

A 23-question mixed survey was conducted online to collect both quantitative and qualitative data. The aim of this survey was to analyse information from Scrum masters, project managers, chief executive officers, and IT professionals who have worked in companies that have migrated from a traditional project methodology to an Agile methodology. The significant aim of this survey is to gather data to help answer the proposed research question: "What are the most common barriers and how to overcome them during the Agile transition?"

The questionnaire includes open-ended questions, rating questions, and multiple-choice questions. The open-ended questions ask the participants to record their ideas in their own words in the space provided. The survey also includes Likert scale questions which ask the participant to rate each factor on a scale.

The survey has been distributed online through LinkedIn and Google platforms for six weeks and it has collected 107 responses from IT professionals in Argentina, Belgium, Brazil, Chile, China, Colombia, Costa Rica, Dominican Republic, Germany, Guatemala, Honduras, India, Mexico, New Zealand, Nicaragua, Peru, Philippines, Spain, Switzerland, United States, and Uruguay. The findings of the survey are discussed in this article. The survey is divided into two sections. First, it contains questions that are aimed to gather information about the surveyed professionals' software development and project management experience, and about their companies. Second, the survey gathers information about the Agile transition and its impact, according to these IT professionals and their experiences during the transition.

4. Results

First, it seems to be verified that the target sample has been relevant and appropriate for this study. More than 68% of people surveyed have more than 10 years of professional experience. 71% of them are currently working on Agile methodologies, and most importantly 46% have participated in an Agile transition already.

Figure 1 shows that 56.5% of the professionals have a development, technical, or architectural position. The other 12% have more responsibility for the customer processes and functional knowledge, for example, as a product owner or business analyst. However, 33% are project or program managers, and directly related to the transition.
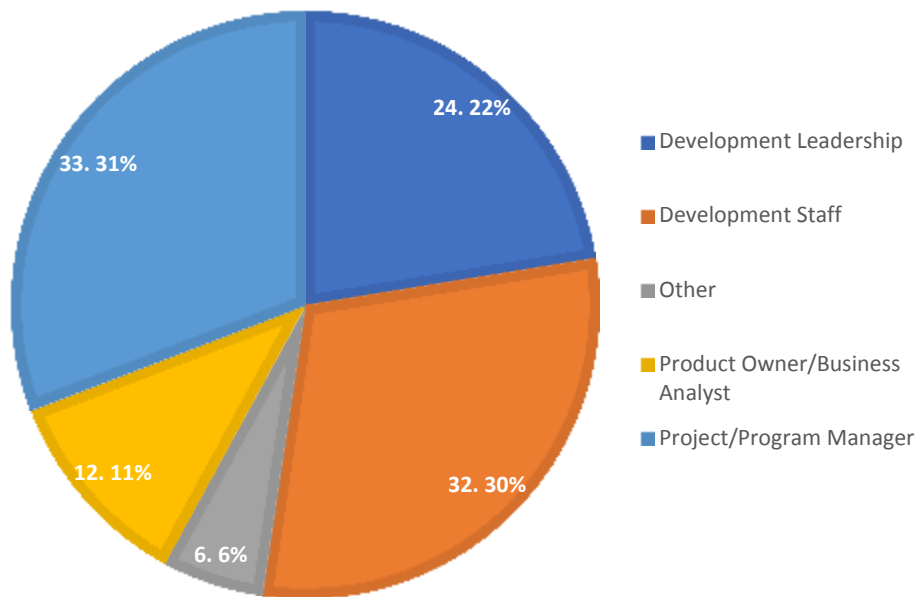

Figure 1. Current IT Positions

Figure 2 shows that more than two-thirds of the surveyed professionals work for companies with more than 100 employees. This point needs to be considered in the analysis and conclusions. Because this is an international and heterogeneous sample, it is important to examine results from a company perspective rather than a country perspective.
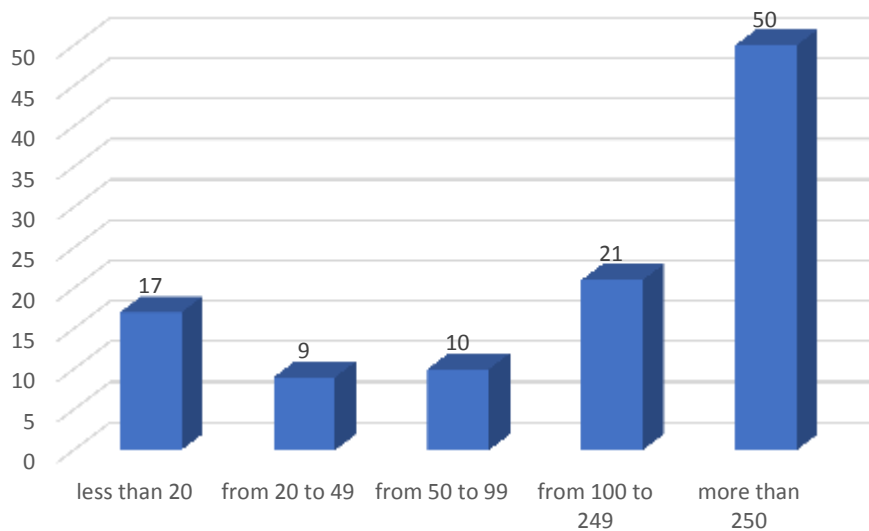

Figure 2. Company Size

The responses summarised in Figure 3 highlight the amount of experience of this group of IT professionals. Most of them (i.e., 89%) have more than five years of work experience in software development companies. As a result of their strong experience, their responses to the other questions are expected to be very relevant and useful.
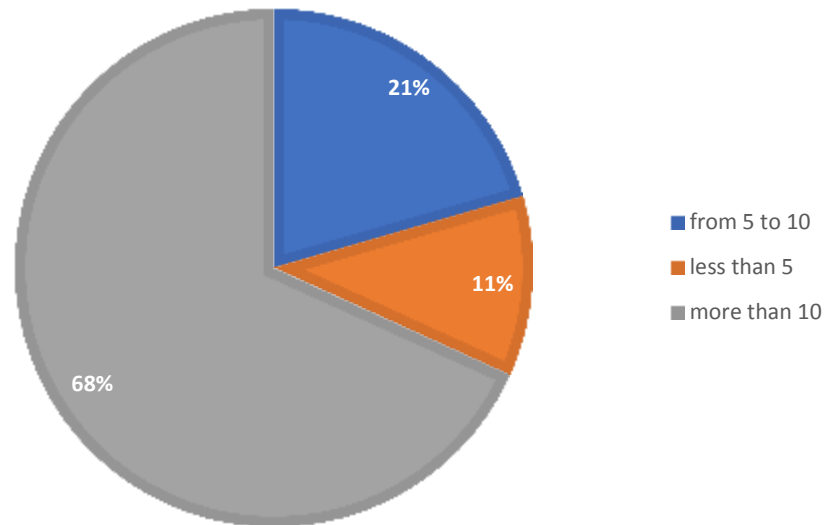

Figure 3. Years of Work in Software Development Companies

Another interesting finding is that more than 52% of the survey respondents indicated that their organisation had practised Agile for a period of less than three years. Therefore, Figure 4 below shows that Agile practices are a relatively new concept for many software development companies.
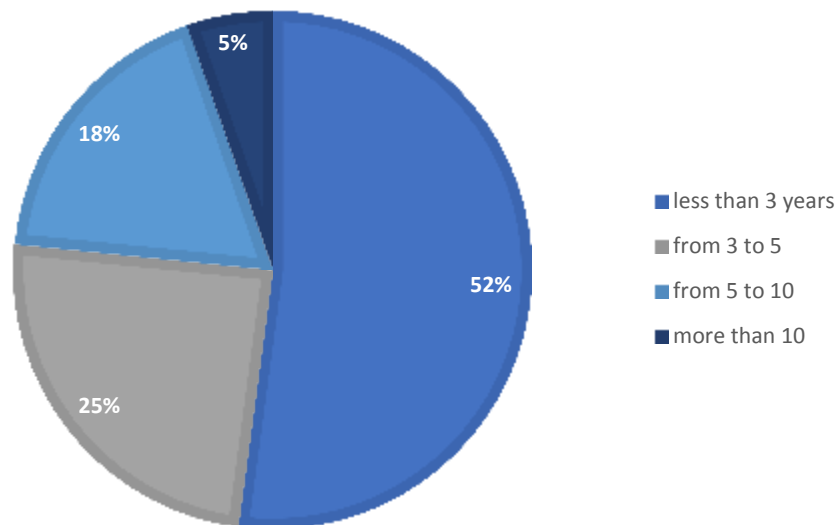

Figure 4. Years of Agile Practice in Software Development Companies

Twenty-nine percent of IT professionals stated they had more than ten years in traditional approaches. Only 4.7% of them have indicated more than ten years with Agile approaches. No figure is provided in this report for the responses to the traditional waterfall methodology question. However, when taken together, the responses to Agile approaches and to traditional methodologies, suggest that there IT professionals have had comparatively more experience with traditional methodologies during their past career.

Figure 5 summarises the responses to the question "Which Agile methodologies have you worked with?" Among IT professionals, the most common Agile methodology is Scrum with more than 81%. The second most commonly used

Agile approach is Kanban (39%), and the third one is XP (18%).The respondents were allowed to select more than one methodology for this survey question.
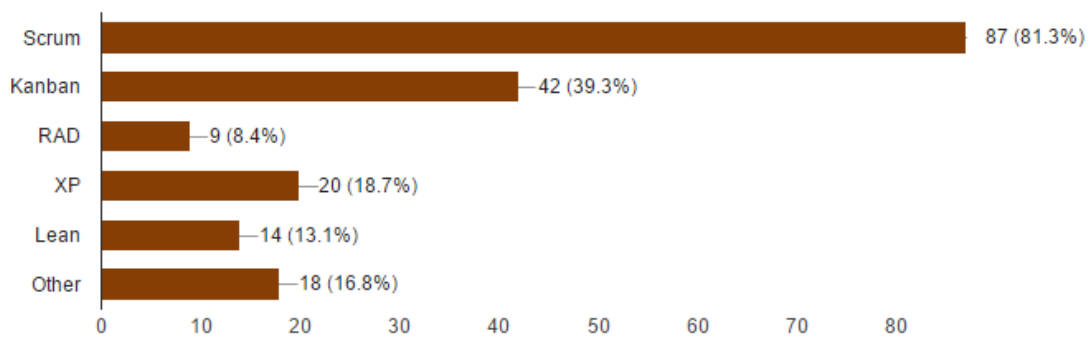

Figure 5. Agile Methodologies Used

There was a series of questions in the survey about the Agile transition, the first of which asked whether the respondents had ever participated in an Agile transition process. Close to 46% answered "yes". Of the 49 respondents who answered affirmatively, 35 indicated that the Agile transition process took more than six months. On the other hand, 12 described the transition as being from one to six months (see Figure 6).
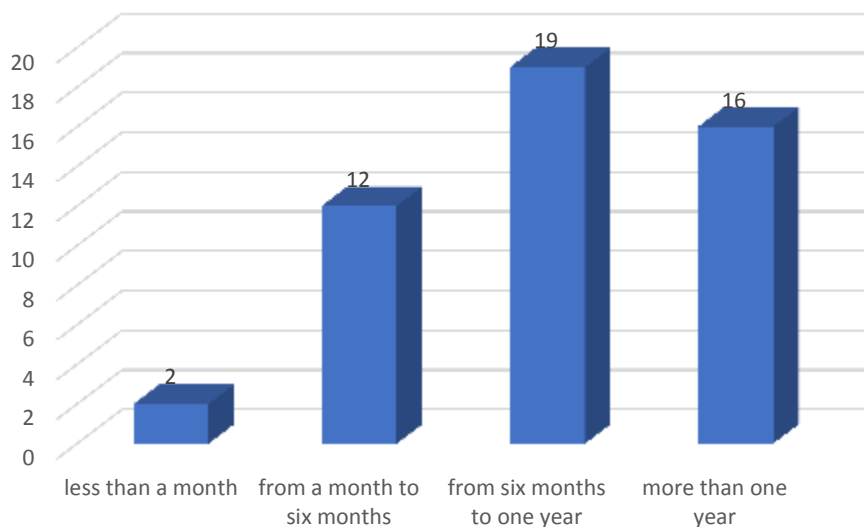

Figure 6. Time Required for the Agile Transition

Among those who have participated in an Agile transition, 77% agreed that the time response (in providing the software product or service) to the stakeholders has improved since the Agile approach was adopted. See Figure 7 below.
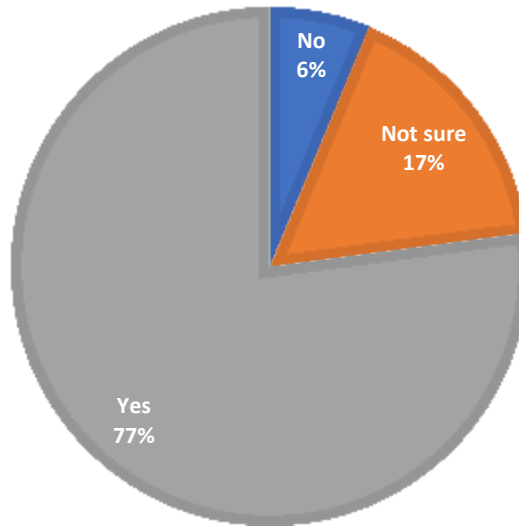
Figure 7. Stakeholders Time Response Improvement

The survey included a multiple-choice question with the ability to choose more than one option: "Which are the biggest barriers to further Agile adoption?" See Table 1 below for the percentages for each response. According to the results, it can be highlighted that most of the survey respondents agreed that the following three items are the most common barriers that companies face during an Agile transformation.

- General organisational resistance to change
- Lack of business/user/customer availability
- Pre-existing rigid/waterfall framework

The next four other important barriers selected by the IT professionals are:

- Not enough personnel with the necessary Agile experience
- Concerns about a loss of management control
- Management concerns about lack of upfront planning
- Insufficient management support

Table 1. The Barriers to Agile

Percentage	Barrier
65.3%	General organisational resistance to change
51.0%	Lack of business/user/customer availability
51.0%	Pre-existing rigid or waterfall framework
40.8%	Not enough personnel with necessary Agile experience
38.8%	Concerns about loss of management control
34.7%	Management concerns about lack of upfront planning
28.6%	Insufficient management support
18.4%	Concerns about the ability to scale agile
18.4%	Insufficient development team support
14.3%	Perceived time and cost to make the transition
10.2%	Restrictions arising from regulatory compliance

The findings for the last three questions of the survey are summarised in Figures 8, 9, and 10 below. These questions were aimed at determining how certain issues may affect the Agile transition process. The three particular issues evaluated were:

- The resistance to change
- The misunderstanding of the Agile process
- The failure to adapt roles

For these three situations, the respondents tended to agree that these issues strongly affect an Agile transition.

20. In a scale from 1 to 5 with 5 being the strongest. How may the resistance to change may affect an Agile transition process?
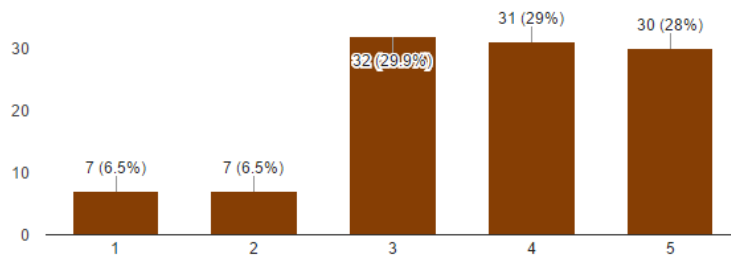(107 responses)

Figure 8. The Resistance to Change in the Agile Transition

21. In a scale from 1 to 5 with 5 being the strongest. How may the misunderstanding of the Agile process affect an Agile transition process?
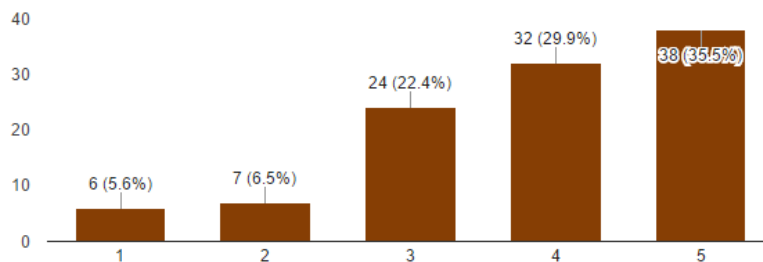(107 responses)

Figure 9. The Prevalence of the Misunderstanding of the Agile Process

22. In a scale from 1 to 5 with 5 being the strongest. How may the failure to adapt roles affect an Agile transition process?
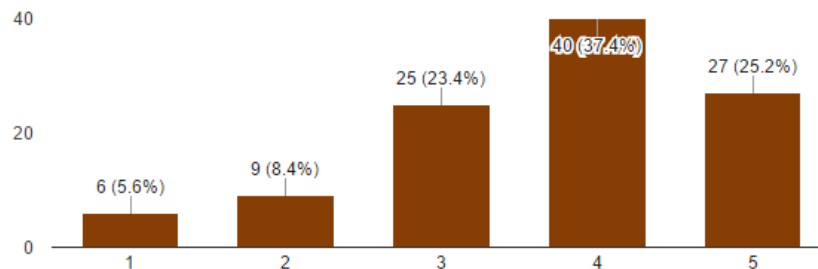(107 responses)

Figure 10. The Failure to Adopt Roles in the Agile Transition

At the end of the survey, there was an option for participants to write detailed comments. There were 38 comments submitted. Of these, some comments were removed because they were not relevant or provided no additional information, e.g., comments such as "Nothing to add" or "No, Thank You." The themes identified across the written comments were:

- Agile mindset
- Agile methodology
- Agile team
- Agile project
- Training and coaching
- Agile literature

These comments are interesting because the knowledge provided by the respondents helped to determine if this research has been addressing the relevant topics and issues. The feedback emphasised some of the important issues to overcome the Agile transition, such as the importance of both the organisational and customer mindset (e.g., "I think that is not just about changing a methodology, but the **mindset**. More often than not, teams that try Agile for the first time get it wrong, but that's the whole point of Agile, get better, and try again, is a model for growth and focus.", "**Mindset** is key. People should feel that they are working with each other.", and "Agile is a **mindset**, not a methodology.").

The understanding of the Agile methodology needs to be learnt as well (e.g., "Agile is like any other **methodology**; you can take **practices** that add value to your company and discard the ones that are not possible to implement.", "From my humble point of view, and based on my experience, it is not a good idea to work strictly with a **methodology**, instead ... we need to use them as a **tool** and NOT AS A PARADIGM.", and "To be truly successful requires **a full transition**.").

Having an Agile sponsored project pilot in the company is significant (e.g., "The Agile methodology is very practical for the **small projects** but is very complicated use in big projects.", and "If your main customer is not **Agile minded** it is really hard to make an organised and clean transition. We have developed **very long projects** (+3 years), and we are struggling with our transition for the too long time that Is very easy to lose focus.").

The relevance of starting the Agile transformation by creating the best Agile team is important because it helps to spread the knowledge within the organisation (e.g., "I think that even when **teams** adopting Agile may have issues with certain aspects of it, the worst issues come from their misunderstanding what Agile means.", "It really depends on the software factory and **team**, but it can be implemented, and it can be a really nice way to make projects work.", and "My suggesting to the transition is to set up new **Agile teams** and select people from existing organisation. It is good to filter unqualified people at the initial stage.").

Some of the comments have also suggested an interesting and high-quality bibliography. This was another theme that emerged (participants providing references to support some of their own arguments or to provide information about how they learnt Agile or plan to learn more about Agile), although this was not the main intention of the survey question (e.g., "I think that Agile software development is way better than waterfall methods. I can highly recommend **articles** of DZone: https://dzone.com/agile-methodology-training-tools-news. Good **Books**: - Agile Estimation & Planning, Mike Cohn: If you want to read one book on Agile planning, read this one. - Scrum & XP from the trenches, Henrik Kniberg: with practical tips on how to apply Scrum practices in a team. - Scaled Lean & Agile Development, Larman & Vodde: a good book describing Agile concepts.").

According to these comments, understanding the importance of the Agile mindset is critical for a successful Agile adoption. If the organisation does not accept that the main point is "to get better and try again", the transformation can be very difficult. Additionally, some comments emphasise the importance of starting to use Agile first with a small project and with a transitional team. For some organisations, it can be reasonable to do this in phases rather than a big bang adoption. However, the characteristics of these two different ways of methodology adoption have to be discussed more deeply, and may require further research on the part of these managers and developers.

Finally, several comments highlight the significance of providing good training and coaching to the Agile teams (e.g., "Maybe the organisation may consider **giving adequate certification for every staff** around this Agile methodology as a part of an investment of moving to this new management style.", "By having **insufficient staff** for the transition entails the organisation to significant losses.", and "It is vital to **have coaching and the management support** to adopt this methodology. In my case, it was useful to have strong customer support due to the good results obtained from a **pilot** project. Without all these points, it is very hard to perform changes."). Therefore, training has been recognized on numerous occasions as helping organisations be successful in the Agile transition.

The following Figure 11 shows how the 107 IT professionals have answered the question: "What are the biggest barriers to further Agile adoption?"
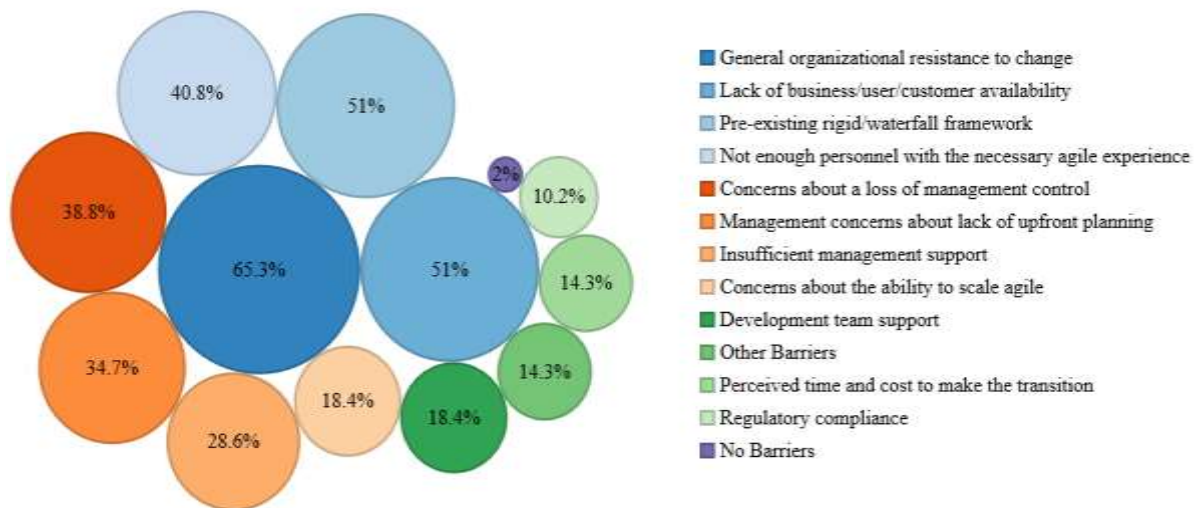

Figure 11. The Barriers to Agile Bubble Chart

It is clear that the general organisational resistance to change, the lack of business/user/customer availability, the pre-existing rigid/waterfall framework, and not having enough personnel with the necessary Agile experience, are the most common Agile barriers chosen by those surveyed. However, it will depend on the particular organisational context which one will be more relevant. By synthesising the information gathered from the literature and the survey, the findings and the conclusions will revisit the research questions and make summarised recommendations for software developers and project managers.

5. Discussion

One of the biggest barriers to the Agile transformation is to deal with stakeholders' objections, resistance and fear, which is in line with previous literature (Hirsch, 2005). Chan and Thong (2009) describe that, despite the advantages of using a methodology, there is often a low adoption rate for new methodologies by organisations. There are three

main reasons for this: the development team may ignore the new methodology, the wrong idea about the new methodology, and a misunderstanding that the methodology cannot be adjusted. These types of issues have to be overcome by training, through an immersion in the new Agile methodology, by using Agile coaches to avoid losing focus in the process. It is necessary to make sure that business analysts and end users have enough time to inform the customers about their roles. Both managers and developers need to work continuously on their improving their Agile project management skills.

Lack of business user and customer availability has also emerged as an important issue in the survey. This is not easy to overcome. For example, Hoda, Noble and Marshal (2011) describe ten different approaches against this barrier: changing customers' mindsets, providing options, buffering, changing priority, risk assessment, story owners, customer proxy, just demos, e-collaboration, and extreme undercover. These approaches may be implemented in ways that do not undermine the Agile principle of people working together based on goodwill.

The pre-existing rigid waterfall framework has also received a significant response in the survey. The literature has different recommendations to avoid this issue, one of which is gradualism. A gradual and voluntary change may make the transition easier (Cohn & Ford, 2003; Dilkert, Paasivaara, & Lassenius, 2016).

Not having enough personnel with the necessary Agile experience and development team support is a common concern. In addition to training the team members, it is very important to provide coaching because not all Agile methods work exactly in the same way. Therefore, Agile coaches can be helpful in implementing Agile procedures and ceremonies, while producing the desired software product.

It is clear that companies have to decide what kind of training and coaching is needed to overcome the Agile adoption. It will depend on variables such as the size of the organisation, or if the change takes place suddenly or gradually. Management should agree to the training plan, and provide the proper funding and sponsorship.

Furthermore, the inclusion of staff members with previous Agile experience can be exceptionally positive. These previously trained people can transfer their Agile knowledge to other team members. Thus, it can solve the training issue by reducing the costs. Nevertheless, it may be difficult to find people with a lot of Agile experience to teach other team members.

According to the Agile survey performed during this research project, 40.9 % of those surveyed answered that their companies hired an external consultancy to implement the Agile transformation process. It is a suitable solution for providing both training and coaching for a reasonable period of time until team members feel confident to perform an outstanding Agile software development process.

6. Limitations and Implications

This research study has a number of limitations. The first one of these is the sampling method for the survey. This is an example of a convenience sample. The participants were all recruited from the Project Management Institute's online (Linkedin) community, represented more strongly (nut not limited) by the groups involving practitioners from North and South America, which the authors had easier access to. However, there are many project managers and software developers who are not members of the institute or part of those online groups, who may have valuable feedback on this topic. The survey was also a helpful and reflective exercise for the participants; therefore, another implication of the convenience sample is that future Agile research or training projects should consider how to contact and assist practitioners who are not part of the same network.

Secondly, many of the responses are self-reported data (as is the case with many other academic studies). Whether or not the respondents see a particular project or methodology as a success may be subjective, if they were not informed by other financial or quantitative measures. This is also in parallel with the non-longitudinal nature of this study. Because some of these projects are ongoing and the perceptions of the participants may be changing, the findings (although valuable) may be viewed as a snapshot of the industry's situation up until the completion of the survey. A replication of the survey in the future, and a comparison of the results between the two instances, may reveal some other interesting information. In summary, the limitations of this study also provide potential hints for these authors, other researchers, and everyone else interested in Agile project management approaches.

7. Conclusions and Recommendations

Agile methods put more emphasis on people, interaction, working software, customer collaboration, and change, rather than on procedures, tools, contracts, and plans. Despite the clear differences between traditional versus the more dynamic and flexible Agile approach, it cannot be stated that one model is better than the other. The proper

selection of the project approach depends on each software development company and their organisational characteristics.

The Agile project management survey has shown that the commonly used Agile methodologies are: Scrum, Kanban, and XP. Scrum is a framework created for incremental product development adopted by self-organizing cross-functional teams (Scrum Alliance, 2017a). It prescribes the roles, artefacts, rules, and meetings to dynamically adapt and manage their software development processes. This methodology uses short iterations called sprints to create and deliver a shippable product focused on customer value. Kanban is a concept related to just in time (JIT) production, and to Lean Management which uses the demand rate to control the production rate (Corona & Pani,2013). Furthermore, Scrum and Kanban may be used together in an approach called Scrumban (Sudeora, 2017). Lastly, XP is also a widely used Agile methodology which is based on the Agile Manifesto values, such as communication, simplicity, feedback, and courage (Beck et al., 2001), and also defines a set of practices. XP is a collection of 12 software development practices that together have been successful in initially small teams and changing projects (Beck, 2000).

Although there are theories in the literature that explain the factors involved in an Agile transition, they do not contain enough instructions on how to overcome all the barriers that companies have to deal with in order to become an Agile organisation. Exploring and encouraging further solutions has been one of the main motivations for this research study.

Overall, it is not possible to assert that all of these barriers can be easily overcome. 71% of the respondents are working in large organisations with more than 100 employees. This may affect some of the strategies because the change management mindset required for a large organisation may be different for a small one where personal and incidental factors may play a bigger role.

The previous literature about the Agile barriers or issues during an Agile transition or adoption was still small, as the study of Agility in organisations is a relatively new or recent topic. Lastly, the previous literature was somewhat based on the authors' own experiences. In contrast, using a survey has the benefit of gathering data from a variety of IT positions, rather than from only the IT managers or Agile evangelists.

Although the present research has contributed to the literature, it is necessary to delve deeper in some aspects. Firstly, this study has not distinguished countries, although national culture may be a relevant characteristic as changing to different methodologies may come across different barriers within particular cultural settings. Secondly, the organisation size can be another complex factor since the size of a company also influences the organisational culture which in turn may shape the barriers or influence how those barriers may be avoided.

Finally, a new framework which takes into consideration the Agile barriers, the company culture and other characteristics such as a phased (gradual) or a big bang (direct) Agile implementation, and the selection of the most suitable Agile project management methodology will be interesting. The development of a new framework requires further analysis and study, which can be continued through a future research project.

According to the Agile project management survey, more than 70% of IT professionals are currently working with an Agile project management method. Therefore, it is advisable for project managers and software developers to be well trained in this methodology due to the increasingly agile future of software development. In summary, the Agile approach is still growing, and will offer innovations and improvements for IT businesses that have the willingness to adopt it. As a result, there will be a variety of job opportunities, training and consulting roles for IT professionals around the world in the near future.

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