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The Essential Prerequisites of Agile Transition and Adoption: a Grounded Theory Approach☆

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ABSTRACT

Prevalence of Agile methods in software companies is increasing dramatically. Software companies need to employ these methods to overcome the inherent challenges of traditional methods. However, transitioning to Agile approach is a topic of debate and there is no unique and well-defined transition model or framework yet. Although some research studies have addressed barriers and strengths behind the successful Agile deployment, it seems that this process still needs to be studied more in depth. The rationale behind this is the socio-technical nature of Agile transition and adoption. Particularly, the challenges and problems that software companies are facing during Agile transition, show that this process in more difficult than expected. Conducting a large-scale research study revealed that Agile transition and adoption process needs to be supported by several critical prerequisites. This study adopted a Ground Theory with the participation of 49 Agile experts from 13 different countries and empirically identified seven transition prerequisites. These prerequisites focus on the different aspects of the transition. The main aim of this paper is proposing these prerequisites and theoretical and practical implication of these prerequisites. Providing these prerequisites before moving to Agile increases chance of success in Agile transition and adoption and leads to fewer challenges during the change process.

☞ keyword : Agile Software Development, Agile Methods, Agile Transformation, Agile Adoption, Transition Prerequisites, Agile Transition, Grounded Theory (GT)

1. Introduction

Software development methodologies directly impress all aspects of software development including planning, project management, product quality, development organization, etc. Software companies and teams need to utilize appropriate development methodologies in order to get better results based on their business goals. For many years plan-driven methodologies have been used in software companies, but now, they are known as traditional methodologies.

Recently, Agile methodologies are frontiers of development methods in software industry. These methods have been officially introduced by creating Agile manifesto in 2001 [1] whereby several new values have been proposed and zoomed by its signatories. After that Agile approach covered several methods which had focused on the proposed values including Scrum, eXtreme Programming (XP), Feature Driven Development (FDD), Test Driven Development) TDD, Crystal family, Dynamic systems development method (DSDM), etc. [2]. These methods however have defined different practices, roles, artifacts, and disciplines, they strongly believe in the values proposed in Agile manifesto.

Despite of huge interesting to Agile methods, leaving traditional methods and using Agile methods, known as Agile transformation/ transition, is not an easy and smooth process as software companies and teams expect. Indeed, they are faced with serious challenges, problems, and obstacles [3, 4].

The most important transition challenges are not technological rather are social and people oriented barriers. Therefore providing helpful prerequisites would be necessary in order to decrease the impact of the potential challenges and barriers.

Conducting a large scale empirical study using GT approach revealed several essential transition prerequisites. Surprisingly, all the proposed prerequisites are associated with the roles involved in the development process.

The rest of this paper is organized as follows: Section 2 describes a brief background regarding Agile transition process

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and its aspects. Section 3 briefly describes the adopted research methodology. Section 4 presents the results of the study followed by Section 5 which gives a concise discussion on the findings. Sections 6 and 7 consequently present implications of the findings on theory and practice. Section 8 provides insights to evaluating the results and Section 9 expresses the research limitation. Finally, Section 10 concludes the paper.

2. BACKGROUND

Agile manifesto [1] defines new values in software industry to distinguish the Agile from disciplined methods. The new values are those that software market really expects to achieve, especially in today's competitive world. Although various reasons can be addressed for adopting Agile methods, the most important ones are accelerating time to market, managing changing priorities, better align business, increasing productivity, enhancing software quality, and increasing customer satisfaction [5].

Various methods are knows as Agile methods including XP, Scrum, FDD, TDD, Lean software development, and Crystal methods [2]. Although these methods have their own particular practices, they promise the values defined in Agile manifesto.

There are some reports explaining the most important problems that software companies are facing during ATP. Among the problems that have been addressed, human-related issues are the main problems faced by ATP [4, 6]. Furthermore, some other studies have addressed various success factors that can facilitate moving to Agile. Most of the addressed drivers, success factors, and facilitators are those that have focused on people-related issues [7-9].

Despite of the aforementioned studies, the number of reports explaining the challenges of ATP is increasing. However, most of the challenges could be predicted before beginning of ATP. This reveals that most often software companies start ATP without providing the required prerequisites. Since ATP comprises all practices and activities required to change the development process, the scope and type of its prerequisites vary from technical to social aspects of the transition process [10-12].

Literature review, quantity, quality, and proper time have been topics of debate in GT [13, 14]. Although formulating a hypothesis or research problem up-front is not considered in GT, conducting a literature review is not forbidden. But, Glaser [15] strictly warned GT researchers about adverse effects of conducting a major literature review in the same area of research during the early stages of GT. Respect to this, we have conducted a minor literature review in early stage of the research mainly to be familiar with the general concepts, basic facts, and terminology. This could help us to be best prepared to carry on the required interviews [15].

Later, a major literature review was conducted when emerging concepts and categories were sufficiently grounded [15]. However, for the benefit of the readers, this section has provided only a short background of Agile software development and ATP [16]. In keeping with the order of the major literature review, the research results are followed by a detailed discussion of existing literature in Section 5.

3. RESEARCH METHODOLOGY

GT has been adopted in this study because of various reasons [17, 18]. The most important reason was the empirical and inductive nature of GT which facilities obtaining a theory which is enough grounded in data. Also, while GT emphasizes on finding of the core concern of the participants of study, people are the most important factors of Agile methods.

GT inductively tries to generate a theory based on the received data whereby it is data which direct ongoing study rather than researchers [19].

3.1. DATA COLLECTION AND ANALYSIS

This study was conducted by voluntarily participation of more several Agile expert across the world whereby the final theory has been generated using viewpoints of 49 of them. The bibliography of the participants can be found in [18]. Attending the participants from 13 countries with different roles, cultures, and nationality made an opportunity to increase the quality of raw data. Furthermore, since all of the participants had experienced at least one Agile transition process and this process was ongoing in about half of the companies they were employed, this study received fresh and high quality data.

Data analysis, as GT expects, has been carried out in a

multi-level process. Through this process, key concepts were extracted from the participants' viewpoints and after three level coding, the final grounded theory (the ultimate goal of GT) has been generated [15]. The whole process of adopted GT has been shown in Figure 1 and has been explained in detail in [17, 18].

3.2. THEORY GENERATION

The last step of a GT is theory building or theory generation [15]. To facilitate this step many patterns have been suggested by Glaser, the founder of GT [15, 19]. Although researchers are not forced to use these patterns, considering them would be helpful.

Data analysis showed that the final theory of this study follows "process" or "Temporal coding" proposed by Glaser [15]. This means that the core concern of the research participants was could be modeled in form of a process.

"Agile transition and adoption process" has been emerged as the final theory of this study in which "Agile transition Prerequisites" was one the its four major aspects [18].

This paper only describes the explored transition facilitators. Interested readers are referred to the [17, 18, 20-23] which have covered various aspects of the transition process as results of the current Grounded Theory study.

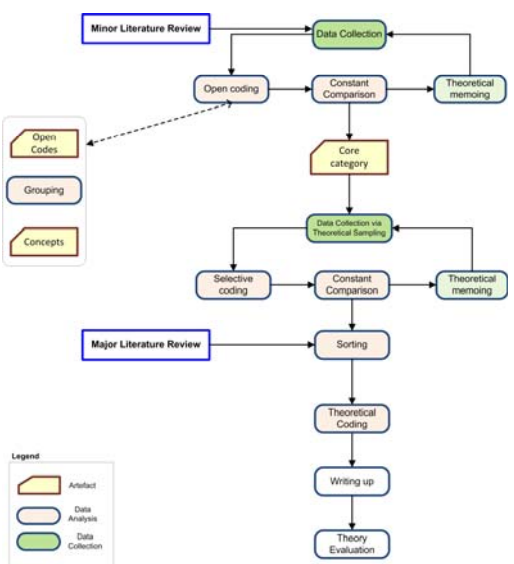

Figure 1. Adopted research methodology

4. RESULTS: AGILE TRANSITION ESSENTIAL PREREQUISITES

As explained before, "Agile transition prerequisites" was one the major parts of "Agile transition and adoption process". Data analysis revealed the most important transition prerequisites which mostly are related to individuals, team organization, and business management.

Figure 2 shows the emerged prerequisites from underlying concepts.

4.1. HAVING CONVINCING REASONS FOR CHANGE

Most of the participants have stressed on the having compelling reasons for moving to Agile. They declared that understanding and feeling the real reasons for starting Agile transition is necessary before the change process.

As they declared, lack of this prerequisite makes transition more difficult as expected. It's also possible that *"…any changes without real feeling, [may] fail."* (Agile Developer, Sweden).

The participants also emphasized that starting transition without having convincing reasons for change and looking at Agile as *"a momentary fashion"* (Scrum Master, Spain), is "wasting time and money" (Agile consultant, Australia). Furthermore, feeling real need to Agile was addressed as a factor that helps people to be strong enough to follow their goals (Project Manager, USA).

Figure 2. Exploring Agile transition prerequisites from underlying concepts

4.2. PEOPLE BUY-IN

Defining business goals before starting the transition has been addressed as another prerequisite which critically impress the change process. Many of the participants stressed on providing this prerequisite before starting the transition. They also believed that business goals directly affect the required activities to change the development process.

In a more radical perspective, one of the participants expressed that Agile adoption is a way to improve business values rather than processes. Furthermore, lack of having appropriate business benefits and goals was addressed as a risk point for software companies and organizations who intend to become Agile.

Among the participants, Agile coaches or those with more experience more than others emphasized on commercial goals of Agile transition.

4.3. DEFINING BUSINESS GOALS

This factor also was addressed by the participants as a very important prerequisite of the transition process. The participants especially believed that getting management buy-in before going Agile is necessary.

The participants also stated that interested supportive managers can manage the transformation process and encourage others to adapt to their new roles. At the same time, lack of the management commitment could cause many challenges for transformation process, either about their own roles and responsibilities or about the others.

Besides management buy-in, other people involvement and commitment were other important factors that were emphasized by the participants. This supports the people oriented structure of Agile methods which was addressed previously by researchers and Agile practitioners strongly.

The participants believed that people's commitment to change can facilitate change in organization. Furthermore, interested and enthusiastic people not only participate in transformation effectively, but also can persuade others.

At the same time, lack of people involvement and buy-in caused some problems during the change process. This issue was also seen associated with external team members like customers and coaches.

People buy-in in Agile teams during Agile transition process, makes them strong enough to deal with challenges, as the participants addressed.

4.4. INITIAL TRAINING

Almost all the participants stated that since Agile approach offers different values from traditional approaches, people should learn new activities and focus on new achievements. They explained that training is so important for being familiar with and adapting to the new roles and activities. Furthermore, lack of adequate and appropriate training can lead to problems and hindrances during the transformation process.

At the same time, some of the participants mentioned that training acts as a helpful tool for handling their challenges during the transformation process.

The participants also emphasized on some specific aspects of training in the transition and declared that since some of Agile practices have rooted in people's behaviors and mindsets, training should be practical and functional.

The participants also stated that lack of appropriate training causes many problems in transformation process including *Unrealistic expiation of Agile, Difficulty of change, Lack of deep understanding of Agile values, Lack of effective collaboration and Low confidence.*

Having a well-defined and flexible training plan facilitates change of development process in the organizations, as recommended by some of the participants. They believed that although training is a critical prerequisite of Agile transition, it should not be limited to specific stage(s) of the transition process and should be provided at all times, if necessary.

4.5. PILOT PROJECT SELECTION

Selecting initial project or projects, called pilot project, for early adoptions was addressed by the participants as one of the important prerequisites of Agile transition.

Pilot project usually *"acts as fair"* (Agile coach, Finland) and "is very useful in that it helps work out any kinks" (Head of Dev. Dept., USA). The participants also emphasized on the importance of pilot project and its role in succeeding with the change process.

At the same time, type of pilot project was a debate between

the participants. While some of them believed that pilot should be a training project, some others believed that it should be a real project. *"It can be a training project. Even it can be a part of project not a complete project"* (Scrum master, USA), or it can be real project because "This is the only way for real migration" (Project manager, Bulgaria) or "real projects show real organization and people's challenges and problems" (Agile coach, USA). Indeed, there was no consensus among the participants about the type and nature of pilot project. Furthermore, some of the participants explained characteristics of pilot project. They mainly emphasized on selecting a small pilot project.

Regardless of type and size of the pilot project for conducting transition, pilot project selection was addressed as one of the critical tasks to be considered before starting the transition. However, *"choosing the best project for transition is an art"* (Scrum master, USA).

4.6. PRE-STARTUP ASSESSMENT

Doing self-assessment, before starting an ATP, was stressed by many of the participants. Their views showed that this prerequisite, if properly done, can be helpful for several purposes. It can be used for "*feasibility study in general scope"* (Project Manager, USA) or even checking a detailed criterion such as "people's motivation" (Agile coach, USA). Also, it can "lead to the prerequisites" (Agile coach, USA).

As the participants declared, self-assessment before starting the transition helps Agile teams and managers to make better decision about team members selection, practice selection, priorities of transition process, activities which should be done, training materials, pilot project pick up and so forth.

Although the participants' views about this activity were different from each other, most of them addressed it as a necessary and helpful stage which should be considered before starting action plan of the transition.

4.7. TEAM SETUP

Team set up was also another critical prerequisite which was stressed by some of the participants. They emphasized on selecting or hiring appropriate people for team set up. Although team set up in all projects is a key activity, in Agile transition is more critical, as stressed by almost all the participants.

Assigning qualified people to the critical roles was so important from some of the participants' viewpoints. They mentioned that some of the roles like Project managers, Scrum masters, coaches and mentors, Product owners and so forth have strong effect on transition. Therefore, appointed people to these roles may play positive or negative role in Agile transition. Considering these facts, shows that team set up before starting the transition, can affect all of its stages and activities.

5. DISCUSSION

After presenting the results, implications of the proposed theory in light of existing literature is described as the latest step of the research methodology [24]. This section covers related works for Agile transition and adoption and its prerequisites.

5.1. CONVINCING REASONS FOR CHANGE

Prerequisites of Agile transformation have been studied in several different studies. However, Most of the prerequisites have been addressed within describing Agile journeys.

Cockburn and Highsmith [11] declared that "Agile development is not for everyone". They stated that without considering this fact and without having appropriate reasons to using Agile methods, organizations are likely to fail. Boehm and Turner, by encouraging people to use their proposed risk-based model, asked them to consider enough compelling reasons for using Agile or plan-based methodologies [25]. Pikkarainen et al. [9] declared that management must have a clear vision, understanding and awareness of Agile methods. Esfahani [26] by stressing on having a real reason for changing development approach and moving to Agile, explained that in most cases the main reason is the removal of "as-is process concerns". This fact supports finding of this study too, where most of the participants addressed it as the main reason for going Agile. Although, it seems that there are lots of clear reasons to replace Agile with traditional methods, each organization must ensure that Agile is useful for them.

5.2. GETTING PEOPLE BUY-IN

Getting people (all stakeholders) buy-in is also necessary for successful ATP. Agile methods are people oriented methodologies and comparing to traditional methods, people involvement and collaboration are more critical. Indeed, for changing development approach, mindsets of people and their behaviors should change [2, 27]. At the same time, people resistance against change is a critical issue in moving to Agile [3, 4]. Conboy et al. [28] explained the role of the people in Agile migration and emphasized that without people interest, processes cannot change well. Tolfo et al. [10] by describing cultural issues and human aspects of Agile migration, emphasized that commitment of people to change process is necessary for moving to Agile. Sureshchandra and Shrinivasavadhani [29] explained that unhappy people make transformation so hard. Furthermore, encouraging people to change, as an Agile transition facilitator, was emphasized in many articles [12, 30, 31]. Misra et al. [8] addressed customer commitment as one of the most important successful factors in Agile migration.

Also, Management support and commitment has a critical role in ATP. Many studies were conducted about this concept [7, 32, 33]. Pikkarainen et al. [9] emphasized that management commitment and continuous support are necessary for moving to Agile. Chow and Cao [34] in their survey discovered that management commitment is one of the most critical success factors in Agile projects. Conboy et al. [28] also explained role of managers in handling challenges in Agile teams and Agile projects. This study also found out that people commitment should be considered as a critical prerequisite of ATP.

5.3. FOCUSING ON BUSINESS GOALS

Having a clear business goal was addressed as another transition prerequisite in this study. The participants emphasized on defining and following business benefits as critical drivers of Agile transition. Qumer and Henderson-Sellers [35] emphasized that business goals at a higher level has a potentially large impact on the Agile adoption, transition and governance of any Agile software development methods. Holtsnider et al. [36] in their book have stressed that Agile organization should focus on the long-term business goals in their development process. Wang et al. [37] explained how business goals and value impress organizations in performing their Agile projects and applying Agile approach. Bachmann et al. [38] by focusing on Scrum teams declared that the basic condition of stability in software development is considering and following long-term goal. However, the impact of business goals and values in Agile software development is not clear yet and needs more investigations [39].

5.4. PROVIDING INITIAL TRAINING

Initial training was addressed as another Agile transition prerequisites. This study discovered that Agile teams need to be trained to being aware of ATP challenges and learn their new roles and responsibilities. Vijayasarathy and Turk [7] showed that training is one of the two critical drivers of promoting, adapting and using Agile methods in organizations. Lynch et al. [40] showed that how practical training can act as facilitator for Agile adoption, especially for Agile dedicated practices that team members never did them before. Wang et al. [41] discussed about the role of the training in mitigation of human related challenges in Agile adoption. Conboy et al. [28] explained how training can be considered as a strategy for dealing with challenges during Agile adoption. Misra et al. [8] showed that training and learning is one of the critical factors in Agile practice adoption.

Furthermore, many other studies also addressed training as a facilitator and driver of transformation process [42, 43].

5.5. PILOT PROJECT SELECTION

Cao et al. [44] discovered that Agile practices are adapted based on the organizational and development context as well as pilot project. Mikulenas and Kapocius [45] by emphasizing on starting adaptation of Agile methodologies by preparation of the project, declared that for each project, may need to consider different Agile methodologies or Agile practices. Cohn [46] believed that absence of a pilot project is a challenge in ATP and Mahanti [47] addressed it as one of the critical success keys in Agile transformation.

This prerequisite becomes more critical in those companies that are working on large projects. This fact is confirmed by previous experiences in Agile transitions in large companies

[48, 49]. Anyway, choosing an appropriate pilot project provides an opportunity for investigating on strength and weakness of organization for deployment of Agile practices [9].

5.6. ORGANIZATIONAL ASSESSMENT

Boehm and Turner [50] from a wider perspective emphasized on self-assessment before choosing development process. They explained by assessing several critical factors, organizations can decide about choosing appropriate development methodology. Sidky et al. [51] and Qumer and Henderson-Sellers [35] defined their proposed Agile adoption frameworks based on the pre-assessment of organization and project. Holtsnider et al. [36] stated that before starting transformation several questions should be answered during a self-assessment process. They emphasized that answers of these questions impress transition process. McAvoy et al. [52] proposed a tool that based on an "Adoption Assessment Matrix" tries to assess the suitability of Agile methods for a specific organization. Taylor et al. [53] by emphasizing on performing an assessment before starting Agile transformation, described a "minimally intrusive assessment approach" for small companies preparing for Agile transformation.

Pikkarainen et al. [9] explained that how an Agile assessment was used to choose Agile practices for piloting. In sum up, many studies emphasized that performing an assessment before starting ATP is helpful for finding organization's weaknesses and strengths and for selecting most appropriate Agile practices.

5.7. PILOT TEAM SETUP

Team set up was emerged as another prerequisite of Agile transformation. Selecting appropriate team members strongly affect transition. Choosing appropriate and qualified members for moving to Agile reduces the transformation barriers and challenges. Furthermore, trust to people as one of the Agile principles and empowering the team, is necessary [1]. Moe et al. [54] discovered that allocation of development resources is one of the critical challenges of shared-decision making in Agile methodologies. Giving team members most of the decision making authority increases collaboration and creativity in Agile teams. Misra et al. [8] discovered that competent and smart people strongly facilitate Agile adoption comparing with indifference people.

Some of the roles in Agile teams may affect other members and considering this issue in team set up is so important. Agile champions are those who play a hidden and effective role to facilitate changes and persuade others to change themselves.

Besides the previous roles, coaches and mentors also play a critical role in Agile transition. Hiring perfect coaches and mentors is so critical in team set up. Coaching and mentoring in Agile methods are also different from traditional methods. Good coaching and mentoring can bring leadership concept to these methods [55]. Augustine [55] explained that such coaching is meant to demonstrate "light touch" leadership. Ganesh and Thangasamy [33] by explaining importance role of Agile coaches and their impress on transition, described personal characteristics of Agile coaches.

6. IMPLICATION FOR THEORY

Agile methods have promised new values to software companies. Although it seems that Agile values and principles are simple, this study supported the previous researches and showed that a successful transition from traditional to Agile methods is not as easy as people expect and lots of issues should be considered in this organizational mutation.

Current study discovered that multiple necessary prerequisites should be provided before starting transition. Among the prerequisites, some of them seem to be more critical than others. For instance, people buy-in is so critical, since it impresses people collaboration which is one of the Agile values. While Agile methods focus on people, people's commitment to change is so critical. In fact, without getting people buy-in, there will be no or less success in changing people development approach. Having a clear reason to use Agile methods is also very important. It can be a check point for making a decision about using/not using Agile methods. Based on the real needs of organization, one or more business goals should be defined that achieving these goals is the ultimate goal of transition. Furthermore, organization assessment and pilot project selection are also two other requirements. Finally, setting up appropriate team(s) before starting transition is necessary.

7. IMPLICATION FOR PRACTICE

This study has substantial implications for practice. The results of this study described a practical Agile transition and adoption which is the core of ATP. Organizations and companies must understand and realize all dimensions of this framework and its prerequisites before starting transformation.

7.1. PREPARATION PHASE

The study showed several necessary perquisites of ATP. All of the emerged prerequisites have their own impact on ATP. However, some of them are more important than the others. Reviewing the previous studies also supported that lack of prerequisites, especially the more important ones, leads to unsuccessful transformation or low business benefit. As a recommendation, organizations may define a preparation phase to providing the required prerequisites. This phase which should be considered before starting transition, affects all steps of transition framework. This strategy helps them to avoid lots of risks and challenging issues.

8. EVALUATING THE RESULTS

Unlike most of the "scientific methods" GT has not a specific validation phase [56]. Glaser stated that GT puts its main emphasis on theory generation, thus, validation of the emerging theory may be accomplished using different methods and by other researchers [15]. However, he suggested four main criteria for evaluating a grounded theory: fit, work, relevance and modifiability [57]. Following this approach, the researchers carried out several activities to evaluate and validate the findings of the study.

9. LIMITATION

All the emerged codes, concepts and categories and their related properties and subcategories came directly from real data which was collected from Agile experts in real environments, therefore, the results and findings of this study are grounded in the context of the real data [57]. Nonetheless, this article does not claim that its findings are universal, because its access to appropriate resources was limited to the participants that voluntarily had attended to this research. But, it claims that its findings describe and characterize the area under study [58]. However, the inherent limitation of GT is that the emerged theory is only grounded in the particular contexts investigated in the research [58].

10. CONCLUSION

This paper reported a part of a large scale research study which investigated the whole process of Agile transition and adoption. Socio-technical nature of this paper makes it so risky mainly because of its various aspects. Changing people and organizations' attitude, roles, and responsibilities result in many challenges when moving to Agile. This study revealed that several prerequisite have to be provided before inception of the change process in which some are associated with people and others with team and organization management. These prerequisites make people and organization more strong to deal with the potential transition challenges. Selecting eligible and qualified team members provided by appropriate training package and getting people buy-in are so critical prerequisites. However, without having clear reasons for change and neglecting to define suitable business goals make the transition so risky and likely to fail. Furthermore, considering an appropriate pilot project and conducting a pre-start up assessment as the last prerequisites facilitate the transition process strongly.

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