

OBSTACLES IN MOVING TO AGILE SOFTWARE DEVELOPMENT METHODS; AT A GLANCE

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Received 2012-10-03, Revised 2013-04-08; Accepted 2013-05-25

ABSTRACT

It is only less than a decade that agile SD methods were introduced and got popular steadily. The defined values in these methods and their outcomes have motivated many software producers to use these methods. Since migration from traditional software development methods to agile methods is growing highly, managers of the companies should be aware of problems, hindrances and challenges they may face with during the agile transformation process. This study focused on challenges which companies may face with and it is necessary that managers think about solving them. Classifying them into four main categories; organization and management, people, process and tools are the areas that challenges have been seen in recent studies.

Keywords: Agile Software Methods, Agile Software Development, Agile Adoption, Obstacles in Agile Transformation, Agile Transformation Process

1. INTRODUCTION

For more than 40 years, traditional Software Development (SD) methods were widely used by all of the software developers. Waterfall model and its incremental methods like Spiral were popular in the entire world. They were supported by huge amount of detailed documentation and valuable experiences. Nevertheless, an innovator group of software experts, by introducing of agility in the SD process, called agile manifesto, suggested changing the mindset of traditional SD formally (Beck *et al.*, 2001; Dingsoyr *et al.*, 2012). However this manifesto did not clearly disagree with traditional SD methods, but, it accentuated values which were against them. In fact achieving agile values was only possible by refusing many activities in traditional SD methods. Traditional SD advocators were cautious in dealing with agile manifesto, but after Boehm's note (Boehm, 2002), which implicitly accepted agile principles and values; a positive atmosphere was gradually created for promoting agile methods.

Although agile production wasn't a new idea in other industries (Sims and Johnson, 2012), but, proposing agility in software industry was completely innovative. Now, after a decade of agile manifesto, many agile methods were introduced. Scrum, Extreme Programming (XP), Lean SD, Crystal, FDD and TDD are some of the agile methods that are used for managing SD process (Cohn, 2009; Dingsoyr *et al.*, 2012). Each of these methods emphasizes on one or more values introduced in agile manifesto and includes many particular activities. Despite of concerns about feasibility of this new approach, customer satisfaction and high quality production (Glazer, 2010) persuade software practitioners to use these methods. Nowadays reputed companies such as IBM, NOKIA, Microsoft, Yahoo, Google, are using agile methods for producing software (Chung and Drummond, 2009; Cohan and Glazer, 2009; Fulgham *et al.*, 2011; Laanti *et al.*, 2011); simultaneously large numbers of managers are interested in implementing agile methods in their companies. However, we did not find any serious report about failing on replacing traditional SD with

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agile methods, but, this mutation in producing software is not simple and quick and should be certainly done after removing the probabilistic barriers and problems. Since the change of the process affects all aspects of a company such as technical, management, personal and cultural aspects, encountering with barriers and hindrances is quite inevitable. Lack of the knowledge about these challenges makes agile transformation too hard, even in small and medium companies.

Following sections in this study subsequently explain agility, traditional versus agile SD methods, challenges of migrating to agile methods and finally summary and conclusion.

2. AGILITY

Agile software development emphasize on agility in software production. Agility in software production is based on some defined values. Agile manifesto emphasizes on four particular values (Beck *et al.*, 2001):

- Individual and interaction over processes and tools
- Working software over comprehensive documentation
- Customer collaboration over contract negotiation
- Responding to changes over following plan

Iteration and incremental development, quick delivery, continuous quality improvement, individual oriented process, self-organizing teams, embracing requirement change (even in last stages), simplicity and particular pay attention to customer satisfaction are principles of agile SD methods (Singh and Soni, 2011; Williams, 2012). Obviously, achieving some or all of them requires fundamental changes in traditional SD methods. It should be said that some of the agile methods mainly focus on software development, like XP (Chromatic, 2013) and some others emphasize on project management, like Scrum (Rubin, 2012). Indeed agility affects on both software development and software project management.

3. TRADITIONAL VERSUS AGILE

Emergent of agile methods was a reaction to traditional methods. Investigating on traditional and agile SD methods indicates a distinct and deep gap between them. Differences between them are in all aspects of their concepts and activities. **Table 1** compares these two approaches briefly (Conboy *et al.*, 2011). In a deeper view, the differences provided in the above table could be categorized as bellow.

Table 1. Comparing traditional and agile SD methods

Properties	Traditional SD	Agile SD
Attitude	Predictive	Adaptive
Project size	Large	Small
Team size/mindset	Large/disciplined	Small/innovative
Project management model	Autocratic	Decentralized
Change attitude changes	Resistant against	Embracing changes
Documentation	Comprehensive	Light and abstract
Upfront planning	Comprehensive	Limited
Life cycle	Tied and bound	Unlimited iteration
Organizational culture	Command and control	Leadership and collaboration
Return of Investment	At the end of the project	Early stages

3.1. Management

From management point of view, agile methods are based on the leadership and personnel innovation. This means that agile methods emphasize on collaboration in projects. Despite of agile methods, in traditional methods, top and middle level managers play “command and control” role and personnel should obey their commands (Ghanam *et al.*, 2012; Pikkarainen *et al.*, 2012; Yang *et al.*, 2009a). Both approaches by acceptance of their own disadvantages emphasize on their positive outcomes and advantages. Finally, decentralized management in agile is against of the centralized and autocratic management in traditional methods.

3.2. Organization

While in traditional software development methods organization is completely defined based on the organizational foundations, there is no intensive idea about organization and organization plan in agile methods. People in traditional methods have pre-defined and strict role and are controlled directly, but in agile methods teams are self-organized and individual-oriented (Hoda *et al.*, 2011). In these methods individual creativity could be seen in the best way.

3.3. Project

In traditional approach, projects are usually large and manage by large size teams. In these methods upfront comprehensive planning, scheduling and budgeting are essential. Despite of traditional methods, in agile methods, projects are mostly small and medium and are managed without comprehensive upfront planning. If necessary, sometimes a limited but not intransitive upfront planning could be performed (Shi *et al.*, 2011).

4. CHALLENGES IN AGILE TRANSFORMATION

Most of the companies interested in agile are those which have many years of experience in traditional methodologies. For moving to agile methods, they should confront with barriers and hindrances (Srinivasan and Lundqvist, 2010). The roots of most of the barriers are organizational culture and structure of which is necessary for traditional approach.

Generally, the barriers of moving to agile could be summarized in next sections.

4.1. Organization and Management Related Challenges

Social structure of organizations is influenced by organizational culture (Kautz *et al.*, 2009). Generally in companies, organizational culture exerts significant influence on innovative practices, social negotiations, problem solving strategies, decision-making processes and planning and control mechanism (Pikkarainen *et al.*, 2012). Clearly, changing mindset of people and their organizational culture could not be an easy process (Ghanam *et al.*, 2012). To transforming from traditional to agile methods, management style should be changed from “command and control” to “leadership and collaboration” (Yang *et al.*, 2009b). It could be facilitated by right blend of cooperation and autonomy. This approach causes enough flexibility and responsiveness in organization and provides advantages of synergy simultaneously. The role of project manager should be altered from planner and controller to director and coordinator (Moe *et al.*, 2009; Monteiro *et al.*, 2011). In fact he/she should coordinate the collaborative efforts of team members; meanwhile, he/she should ensure that creative ideas are reflected in final decision. Group decision making is also an issue, especially in allocation of development resources, alignments of strategic product line and performing development and maintenance tasks in teams (Moe *et al.*, 2012). Another issue is that sometimes project managers could not ignore their previously authority and role. Changing mind set of project managers take a long time and need enough mentoring (Pikkarainen *et al.*, 2012).

In this subject, another challenge is documentation; while in traditional methods knowledge management is based on heavyweight documentation, in agile methods, documentation is limited and knowledge is mostly tacit and reside in the head of the development team members

(Levy and Hazzan, 2009) of course, this approach changes power balance in organization from managers to individuals and could be a big issue mainly for managers that are aware about people and have negative mindset and experiences in human resource in their working life. This challenge could be decreased by defining appropriate knowledge management strategy and distribution of knowledge in different level of organization. This is a fertilize area for doing research in both academic and industrial environment.

There also many issues in regarding to the distributed development organizations. The biggest issue is communication. In such companies due to the distance, face to face meeting is difficult, also time zone offset makes communication harder (Kamaruddin *et al.*, 2012; Lee and Yong, 2010). Cultural difference is also reported as a critical challenge in multi international sites (Dorairaj *et al.*, 2012; Iivari and Iivari, 2011).

4.2. People Related Challenges

Achieving to a cooperative process based on the communication and collaboration between members who value and trust each other is critical for success of agile methods (Dorairaj *et al.*, 2012; Offner *et al.*, 2011). Human aspects most of the time acts as an obstacle in agile adoption (Tolfo *et al.*, 2011). In some of the agile methods there are some individual centered activities e.g. Pair programming in XP (Chromatic, 2013). In this case, managers should select appropriate personnel and provide them necessary training, mentoring and creating a set of work practices that promote process excellence (Srinivasan and Lundqvist, 2010). These types of activities especially for senior traditional developers could not be implemented easily. Another challenge is related to customers. In agile methods customer is one of the development team members and all decision is based on different attitudes, goals and experiences. In this case, some traditional project managers could not adapt themselves with new situation. Customers play a critical role in success of agile methods and they should be responsive, collaborative, authorized, committed and knowledgeable (Conboy *et al.*, 2011). Having such customers is not easy and this role could be as a barrier in success of agile projects especially when they join the team for the first time. About coaching process in movement to agile because of being a lot of human factors affected the process; coaches need to be patient (Srinivasan and Lundqvist, 2010). Managers should pay enough attention to assign an experienced and professional coach in their teams. To sum up, lack of enough training, coaching and mentoring is a critical issue in this area.

4.3. Process Related Challenges

Changing attitudes and moving to agile activities from rigid, adequate and planned activities is not available without spending enough time, effort and investment. In fact, altering attitudes and activities is problematic, especially for companies with high level of CMMI (Babuscio, 2009).

In traditional methods processes are based on defined/standard activities and measurement while processes in agile methods are based on uncertain activities that support rapid development and high quality production (Singh and Soni, 2011). In agile methods finding appropriate measurement practices is a debatable issue. Despite of traditional methods, there are a few popular and acceptable measurement practices in agile methods (Javdani *et al.*, 2012). So, sometimes expectation of traditional developers to finding adequate and documented measuring tools in agile methods causes confusing.

Changing process model from traditional life cycle model to agile (evolutionary and iterative) is an obstacle in altering approaches; because this change has significant influence on strategies, tools, role of the people and techniques. Implementing some agile activities such as continuous integration, developing upfront test code and frequent testing in traditional software developers is hard.

Another issue is choosing appropriate agile method. However all of them are based on agile values, but there are many different practices and activities in them. They are different in priorities, implementation, project and team size, iteration time, code ownership and other factors. Unfortunately there is no unified agile approach, so, organizations should decide about their appropriate agile method. Wrong selection of appropriate method, cause more efforts and cost and even may cause failure in agile movement.

4.4. Technology and Tools Related Challenges

However technological issues in migrating to agile are less than other issues, but companies should be aware of them. Using non-flexible tools and hardware is a barrier in moving to agile. Companies should use tools that can supply incremental evolution, continuous integration, re-working, version management and other agile technologies. Thus considering enough investment and training, could help organization for confronting these challenges. Tools especially in multi sites organization is a big challenge (Brockmann and Thaumuller, 2009). Providing appropriate tools for doing

practices in the best way is necessary to using agile methods in distributed development environment.

5. CONCLUSION

While benefits and advantages of development of agile methods in software companies encourage them to use these methods, they should consider challenges and barriers in moving process. Since values in agile methods are completely different from traditional methods, activities, practices and roles are also different. Thus, moving to agile affects all aspects of organizations. All members of organization should be ready to confront with a lot of challenges in transforming process. The challenges are mainly in organizational culture, management, people and process area. The main origins of these challenges are organizational culture and structure. Also, relinquishing a process centric model and moving to people centric one is not simple. Managers should be cautious about when and how they could change their producing methods. Enough time, effort and training could help them for this strategic decision.

6. ACKNOWLEDGMENT

This study was supported by the International Graduate Research Fellowship (IGRF) by University Putra Malaysia (UPM).

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