Agile Adoption – Crossing the Chasm

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Abstract- Business activities are rapidly changing nowadays and there are increasingly complex requirements set on programming solutions. That puts traditional software development methods also called heavyweight behind and leads to the need for different approaches. Modern approach is called agile or lightweight. Heavyweight methodologies, also considered as the traditional way to develop software, emphasis on comprehensive planning, detailed documentation, and expansive design. Unlike traditional methods, agile methodologies employ short iterative cycles, and rely on tacit knowledge within a team. What is new about Agile methods is not the practices they use, but their recognition of people as the main driving force which can lead to project success. Heavyweight methodologies, also considered as the traditional way to develop software, emphasis on comprehensive planning, detailed documentation, and expansive design. Unlike traditional methods, agile methodologies employ short iterative cycles, and rely on tacit knowledge within a team. The term lightweight or agile can be defined as “1) marked by ready ability to move with quick easy grace or 2) having a quick resourceful and adaptable character” [34]. What does it mean to be agile? Jim Highsmith says that being agile means being able to Deliver quickly, Change quickly, and Change often [1]. An Agile approach is one which delivers business-focused results quickly and effectively. An agile method generally promotes incremental development and delivery. It should be adaptive, having the ability to allow for changes in requirements occurring during the development cycle [2].

The name “agile” came about in 2001, when seventeen process methodologists held a meeting to discuss future trends in software development. In consequence to this meeting, the “Agile Alliance” and its manifesto for agile software development emerged.

A. Features of agile manifesto[3].

1. Individuals and interactions over processes and tools.
2. Working software over comprehensive documentation.
3. Customer collaboration over contract negotiation.
4. Responding to change over following a plan.

Agile methods require close collaboration among the stakeholders including the processes that employ short iterative life cycles and self organizing teams [4]. The practice of self-organizing teams is common in agile [5][6]. Rigid team structure is avoided, with programmers often able to choose the stories (Requirements) that they would like to work on for the current iteration. Such teams organize themselves in a way that best completes the project at hand.

Agile techniques vary in practices (XP, ASD, DSDM, SCRUM, CRYSTAL etc) but, they share common characteristics, including iterative development and a focus on interaction, communication. Cockburn and Highsmith explain what is new about Agile methods is not the practices they use, but their recognition of people as the main driving force which can lead to project success [8]. Alistair Cockburn and Jim Highsmith emphasize severe critical people factors, such as amicability, talent, skill, and communication are the most important factors to a success of a project [5].

It should also offer a set of best practices that allow for rapid delivery of high-quality product; a leadership philosophy that encourages team work, trust, empowerment and accountability; a team-based approach, requiring close customer/developer collaboration, and a business-focused approach that aligns development and delivery with customer needs and company goals. And finally, it should also promote a sustainable pace of working and visibility of
progress [10].

ASD is an iterative and incremental (evolutionary) approach performed in a highly collaborative and self-organizing manner to produce high quality software in a cost effective and timely manner which meets the changing needs of its stakeholders. Let’s take a look on the some of the methodologies which are often used in industry in the following sections.

II. EXTREME PROGRAMING

XP is based on values of simplicity, communication, feedback, and courage. The XP process can be characterized by short development cycles, incremental planning, continuous feedback, reliance on communication, and evolutionary design [37]. XP as a high-discipline methodology that calls for tight adherence to strict coding and design standards, strong unit test suites that must pass at all times, good acceptance tests, constant working in pairs, vigilance in keeping the design simple, and aggressive refactoring [38]. XP is a test driven method and the developer is responsible for unit tests, while the customer is responsible for acceptance or functional tests.

III. SCRUM

Scrum does not provide any specific software development methods/practices but it provides some management practices and tools to compete with unpredictability and complexity [39]. The Scrum Master maintains the processes and works similar to a project manager. Scrum life cycle is based on time boxed development and consists of three phases: pre-game, development and post-game. In pre-game phase there is a constantly updated list of requirements named Product Backlog. Development phase is an agile part of Scrum method [40] in which the system is being developed throughout iterative cycles so called 30 Day Sprints. Integration, testing and other activities required for system delivery are accomplished in the post-game phase.

IV. FEATURE DRIVEN DEVELOPMENT

Feature Driven Development (FDD) approach does not cover the entire software development process but rather focuses on the design and building phases [43]. It emphasizes on the collaboration among team members, feature-based decomposition is used to understand problem and project complexity. Software quality encouraged by using incremental development, design and code inspections.

V. DYNAMIC SYSTEM DEVELOPMENT METHODOLOGY

Non-profit organization DSDM Consortium has developed a framework for RAD development. SDM life cycle is based on evolutionary prototyping and consists of five phases: feasibility study, business study, functional model iteration, design and build iteration and implementation. The first two phases are sequential and done only once, while the others are iterative and incremental [40]. The key practices are Active user involvement, Empowered team to make decisions, frequent delivery of products, iterative and incremental development. Changes during development are reversible. Requirements are baselined at a high level, and Testing is integrated throughout life cycle, Collaborative and cooperative between all stakeholders.

VI. CRYSTAL

Crystal methods are a family of methodologies (the Crystal family) that were developed by Alistair Cockburn and sixteen other software engineers in 2001. Highsmith states that crystal focus on people, interaction, community, skills, talents, and communication which affect the performance. Process remains the secondary [20] Crystal methods are focused on People, Interaction, Community, Skills, Talents, and Communications

VII. ADAPTIVE SOFTWARE DEVELOPMENT

ASD life cycle is based on evolutionary prototyping and consists of three phases: speculate, collaborate and learn. Speculation is the discussion of what is to be done in an iteration. Collaboration means component based development through adaptive development cycles. A review and a preparation for the next phase are being done in the learning phase. ASD does not have detailed principles, but rather it provides a framework on how to encourage collaboration and learning within the project. ASD is not presented as a methodology for doing software projects but rather it is an approach or an attitude that must be adopted by an organization when applying agile processes.

VIII. AGILE ADOPTION

A number of changes may be needed within an organisation in order to adopt an agile approach. Significant user resource will need to be committed to agile projects. This will have a fundamental impact on the work patterns of the users involved. Users will need to be educated in the project approach. Management will need to enable their staff to participate fully in projects. Management must become accustomed to empowering staff to make decisions over which the managers themselves would previously have had full control [10]. Over the past few years organizations have asked the agile community that why agile practices should be adopted?

There are numerous success stories that highlight the benefits gained by organizations that have successfully adopted agile practices, starting from the establishment of Agile Alliance in 2001, a lot of studies have been conducted every year to access the adoption rate of agile practices.
In 2003 an Australian information technology (IT) firm, Shine Technologies conducted a web-based survey to ascertain organizations’ interest in using agile methods. They received 131 responses, the majority of whom around 84% indicated that they have knowledge about agile development, Where XP was the most popular agile method with 59% of respondents using it. 80% or above respondents think that agile process improve team productivity, the quality of the applications, and business satisfaction [13].

In same year a process simulation model to analyze the effects of individual XP practices on development effort was developed by Kuppuswami et al. [14]. Result revealed that large organisations have also stated adopting agile methods which is also shown by forrester research in 2004, that almost two-thirds of large organizations working with Forrester are adopting some form of Agile processes moreover Agile processes deliver business value more quickly and improve overall quality and efficiency [15].

There are also some stories which spot out successful adoption of agile practices for example “Primavera Systems” which provides enterprise project portfolio management solutions found best way out in agile software development. Adopting agile practices is a process of continuous learning and improvement [16].

Some surprising results were found in 2005, a survey conducted in Sweden indicate that practitioner of traditional software development methods were more satisfied with their methods than practitioners of agile methods were, but the agile method practitioners were instead more satisfied with how their method helped them in satisfying their customers’ needs. Their survey suggested that practitioners of agile software development methods had a more positive attitude towards the agile values than practitioners of traditional software development methods had [17].

But time complexities of an organisation become barrier in the adoption of agile process which was revealed by Svensson and Höst. The results also show that the people perceived an improvement of their collaboration with the team, as the team start using agile practices for software development [18]. Same trends have been seen in the study conducted by L. branett which shows that early agile adopters cited lack of management support as a key barrier to their success. Agile improve productivity, quality, and time-to-market [20]. In contrast, Bahli and Zeid state how a Canadian organization shifted from a waterfall process to XP, and found that “even though team members had no prior experience with XP (except one week of training), they found the model easy to use [19].

Survey conducted by Digital Focus points out that popular motivations for adopting agile included the need to tackle projects with ambiguous and/or evolving requirements. Survey got responses from 136 individuals from 128 organizations and 17 different countries. About 90% of the respondents had basic understanding of agile development practices (which is around 94% more than survey conducted by Shine Technologies in 2003[13]) and 81% were either using or planning to use agile methods in their organizations [21]. According to ref [22] among the companies who have adopted agile practices are smaller development organizations. 64% of responses come from companies having fewer than 100 employees in development. About one-third of responders report only modest agile process adoption across their development organization and moreover among smaller development organizations, almost 60% of members have 50% or more of their staff following agile processes. Study conducted by Schwaber and Fichera for Forrester Research, states that about 14% of North American and European companies were using agile approaches and another 19% were planning to adopt them in the immediate future. This study also concludes that while the early adopters were smaller, the recent adopters tended to be group within larger organizations [23]. Which is similar to the survey conducted in past years see ref [15] [17] [18] [20].

According to Ahmed and James Arthur their survey reveals that personal interest is the driving force behind agile adoption, and conversely, organizational resistance and managerial apathy are key inhibitors. The ability to meet client needs and the delivery of quality software products on time are significant benefits of agile development [24]. Willam et al reveals in their study that pair programming in the software development process yields better products in less time and happier, more confident programmers [12]. Microsoft also had conducted an empirical study; found that one-third of the study respondent use agile methodologies to varying degrees, individuals believe that agile practices improve communication between team members. The Scrum variant of agile methodologies is by far the most popular at Microsoft [25]. This view of the positive effects of agile practices on communication was also found by Korkala et al [26].

Some surveys have also been conducted in academics, one of its kind had taken place in Thailand on adoption of Agile Software Development Methods in Thai universities. Results shows that there is little to no knowledge of agile software development methods, and agile project management methods, amongst Thai IS / IT or Computer Science teaching academics [27]. Scoot ambler in his study conducted in 2007 found that 69% of respondents indicated that their organizations are doing one or more agile projects. From those who hadn't yet started, 24% believed their organizations would adopt agile practices within the next year. Co-located agile projects are more successful than non co-located [28]. The success rate of agile projects appears to be very high, 77 percent of respondents indicated that 75 percent or more of their agile projects were successful [29]. Survey conducted by The Software Assembly Experts on CIO’s(Chief Information Officer) to understand the role of CIO’s in agile software development, when asked did CIO’s have a solid understanding of Agile Development Methodologies? 72% said No, 7% said Yes, 14% said Some do, 7% did not know
on the other hand whether CIO’s are open to adopting agile methods, 72% said Yes, 7% said No, 7% said Some, 14% Don’t know, which shows that CIO who has knowledge about agile practices is more open in adopting this practice. On the issue of whether CIO’s from large enterprises are adopting agile methods quicker than small-to-medium size companies? 64% said No, 7% said yes, 29% don’t know, there was a clear cut feeling among respondent that fear, loss of control and uncertainty is the major concern in implementing agile methods [30].

In February 2008, Data Transfer Solutions (DTS) released a brief online survey to the GIS (Geographical Information System) world to gage the adoption of agile practices in the GIS industry. Respondents included 347 GIS professionals from 36 countries. 32% of respondent indicate that they have adopted agile practices, while, 68% indicate their organization had not adopted agile practices[31]. This result is very same of an informal poll conducted by Directions Magazine in December 2007 which found 28% of GIS professionals were using agile practices[7]. However, this figure stands in sharp contrast to the results of a similar survey conducted in March 2007 by Scott Ambler that survey found that 69% indicated that their organization had adopted agile practices and 31% had not [28] Version One conducted survey in June and July of 2007 and found 73% had adopted agile practices and 27% had not and shine technology 2003 which also perceived almost the same result [13]. Recent survey on 524 respondents was concocted on watermall manifesto website contradict all previous surveys that shows majority of respondents are using agile practices this survey reveals that 21.8% uses agile practices and 19.7 % do not use these practices at all. One have to take into account that survey have small base of respondents as compared to previous surveys. Survey also figures out that 5.5% have rejected the agile approach [32]. Almost Same trend comes out when Jiri Lundak conducted a JAX conference’s Agile Day, hosted by Jutta Eckstein. Exceptional was the interest people have in agile software development. 280 people attended the agile track, showing the increased awareness. Quite contrary to this only a few people (about 10) are using Scrum. But even more surprising was the fact that only about another 10 or so signaled their interest to use Scrum in the near future [33]. Many agree that adoption of agile methods in general is on the increase, and not only in number of instances of adoption but in terms of scale, too. Recent statistics on job trends from Indeed.com indicate the there is rapid increase in jobs related to ASD in the past three years [34].

M& T has conducted 2 surveys in 2005 and 2008 the results which we found were quite surprising respondent who are not aware of agile practices have increased from 13% to 26% in 2005 and 2008 respectively, respondent who are not using agile practices have also increased 13 to 16 percent from 2005 to 2008 and trend of using agile in pilot project have been decreased from 4 to 3 percent from 2005 to 2008. Agile practice which is used in building new project has been decreased from 17 to 8 percent from 2005 to 2008 [35][36]. Version one is also analyzing the state of agile development from last decade, it has also come up with some surveys to access the state of agile development. In its state of the art survey in which 722 respondents participated reviles that 84% of organizations have adopted agile practices whereas 18% didn’t adopt [45]. In 2nd annual state of art survey in 2007 [29] had 1700 respondents, 73.2% of organizations have adopted agile practices whereas 26.8% haven not adopted yet. Agile alliance and version One conducted global survey in 2006, when asked What was the most important reason for adopting agile 86% said to accelerate Time-to-Market, 87% Increased Productivity, 86% Reduce software defects. Scrum and Scrum/Xp hybrid are commonly used agile methodologies. In 2008 version one conducted its 3rd annual state of agile development survey in which 3061 respondent participated from which 68.9% of respondents hadn’t participated in previous surveys. , Serum was the most used methodology which contradict the result shown in Microsoft empirical study which see XP as most popular, Serum/XP Hybrid also attract around 22% of respondents where XP comes last with only 8.0% of support [43]. Similar results have found in version one’s latest survey in 2009 with 2527 respondents which found Serum as the mostly used agile methodology and 70% of respondents are new to the survey, 84% of respondents worked in the organizations that uses agile methodologies.
In all surveys conducted by version one found lack of up front planning is the greatest concern regarding adoption of agile development [42].

IX. FUTURE OF AGILE ADOPTION

One thing which has found in each survey is that agile adoption starts from small organization and slowly and gradually expanding to large ones. These surveys will boost them to know the benefits of using agile practices like increased quality, increased productivity, improved stakeholder satisfaction, short delivery time and good communication. but organizations have different point of view in adopting agile practices, there are numerous studies for example [21][22][37] Which shows organizations have greater tendency in adopting agile practices in future whereas in some surveys organisations are little reluctant in adopting agile practices[23][28][32][35].

Now a day’s software development has increasingly become a multi-site, multicultural and globally distributed undertaking. The main objective of this is to optimise resources utilization in order to develop higher quality products at a lower cost than that of co-located developments. Distributed Software Development (DSD) allows team members to be located in various remote sites during a software lifecycle, thus making up a network of distant sub-teams. Some of the principals and practices of Agile Methodologies for example pair programming, onsite customer, daily scrum meeting, face to face communication etc. would appear to present some difficulties for distributed agile development but still surveys conducted by version one in 2007, 2008, 2009 shows organizations are implementing agile practices in distributed environment. In fact it is just this kind of thinking which has led to the comment that ‘Distributed Agile’ may in fact be an oxymoron representing two opposing and incompatible approaches. It is this combination of problems and opportunities which makes agile adoption a challenging task.

X. CONCLUSION

Agile provides greater flexibility, a higher return on investment, and a higher speed and quality of delivered solutions, as perceived by customers of the project. In addition, greater visibility of progress during the development process leads to increased management confidence during the project. The agile approaches give a more controllable project with on-time delivery and a focus on maintaining the quality of deliverables. However, management must accept the cultural changes that Agile involves and acknowledge their responsibility in supporting such approaches if the organisation is to reap the significant benefits.

REFERENCES


