

A Preliminary Study of the Adoption of Agile Software Development Methods in Jamaica: Students' Perspectives

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Abstract

Studies of more than eight thousand information systems (IS) projects revealed that most project failures involve people problems. Five of the top six reasons for project failure are rooted in communication problems between the development teams and the customer. Agile software development methods seek to address this challenge by relying on people and their creativity rather than on processes. Research has demonstrated that adopting agile methods in software development can improve the management of the development process and customer relationships. As a result, this approach to software development is becoming very popular. However, there is an appeal in the literature for more empirical studies of agile software development, especially in regards to its adoption. In addition, there is relatively little research in this domain in Jamaica. Hence, this study explored the adoption and benefits of agile methods in Jamaican software development firms. Preliminary indications of the study revealed that 52% of the firms surveyed are using agile methods, with Scrum being the main method. The main benefit being derived from these agile methods is improved customer satisfaction. These findings provide the basis to support the claim for future research to explore the underlying causes for the average uptake of agile methods in Jamaican firms.

Keywords: Agile methods, adoption, information systems success, Jamaica, software development firms

1. Introduction

Studies of more than eight thousand information systems (IS) projects revealed that most project failures involve people problems (Ceschi, Sillitti, and Succi, 2005). Five of the top six reasons for project failure are rooted in communication problems between the development teams and the customer (Boehm, 2002). Agile software development methods seek to address this challenge by relying on people and their creativity rather than on processes (Nerur, Mahapatra, and Mangalaraj, 2005). These methods aim to answer a need to develop software quickly, in an environment of rapidly changing requirements. They take an iterative approach which emphasize early delivery of increments of software functionality with high business value (Duggan and Chevers, 2008).

The main problem in software development is delivering products with all the features on time (Ceschi et al., 2005). This claim is further supported by the Standish Group (2013) report which shows 43% of IS projects being challenged. A project that is classified as being challenged is one that is late, over budget, and with less than the required features and functions (Standish Group, 2013). The literature makes reference to factors that can contribute to successful IS projects with executive management support being number one, but agile methods is ranked in the top six factors (Standish Group, 2013).

Furthermore, research has demonstrated that adopting agile methods in software development can improve the management of the development process and customer relationships (Ceschi et al., 2005). As a result, this approach to software development is becoming very popular (Ahmed, Ahmad, Ehsan, Mirza, and Sarwar, 2010). It was discovered in a survey that 41% of software development projects have adopted agile methods, and agile techniques are being used in 65% of such projects (Ambler, 2006). Some of the methods include Extreme programming (XP), Scrum, Feature-driven development, Adaptive software, Crystal family of methods and Dynamic software development method, Lean software development (Dyba and Dingsoyr, 2008). In a survey conducted with 240 students, it revealed that 78% of the respondents believed that using XP can improve the productivity of small teams, 76% suggested that XP improved the quality of programming codes and 65% of all respondents would recommend XP to their respective workplace if allowed (Melnik and Maurer, 2005).

However, there is an appeal in the literature for more empirical studies of agile software development (Dyba and Dingsoyr, 2008), especially in regards to current understanding of the process of their adoption (Cao, Mohan, Xu, and Ramesh, 2008). It is claimed that most of the evidence of agile methods effectiveness is anecdotal (Melnik and Maurer, 2005). In addition, there is relatively little research in this domain in Jamaica. Hence, this study explored the adoption and benefits of agile methods in Jamaican software development firms. The research questions are:

1. What is the adoption rate of agile methods in Jamaica?
2. What are the main agile methods used in Jamaica?
3. What are the main benefits derived from agile methods in Jamaica?

It is hoped that the findings of this study will assist IS professionals with the production and delivery of more successful information systems, which by extension could bridge the digital gap (Heeks, 2002) between Jamaica and the developed world. Another contribution of the study is to guide policy makers in the formulation of the national IT policy in Jamaica in the quest for growth and development.

2. Literature Review

The literature makes reference to technology, process and people being major determinants to the successful deployment of IS projects (Espinosa-Curiel, Rodriguez-Jacobo, and Fernandez-Zepeda, 2013). However, this study is concern about the people paradigm of software development which has led to the birth of agile methods (Highsmith, 2001). Proponents of agile methods believe that several of the underlying assumptions of especially the process paradigm to software development are flawed (Highsmith and Cockburn, 2001; MacCormack, 2001). They argued that it may not be possible to plan information systems projects well in advance due to the volatile nature of the software industry. Furthermore, they believe that success is not merely determined by the degree of conformance to the project plan but by the ability of the delivered software product to add business value.

The main objective of software development firms is to satisfy customers at the time of delivery with value-adding systems. In addition, there can be major changes in the requirements, business processes and technology that are outside the control of the project team due mainly to the lengthy time from project initiation to deployment (Duggan and Chevers, 2008). Agile development can be defined as being able to deliver quickly, change quickly and change often (Cockburn and Highsmith, 2001). Freezing project scope early in the development cycle as is customary in the process paradigm is suboptimal, because it is strongly believed that developers need to facilitate changes throughout the development cycle (Duggan and Chevers, 2008).

Developing software in iterations allows the project team to adapt quickly to changing business processes and changing software requirements (Cohen, Lindvall, and Costa, 2004).

More so because these methods, especially XP, promote co-located development teams of developers and users, as well as two-person programming teams (pair programming) to design and construct system modules (Beck, 2000). In general, agile methods emphasize iterative development, small and frequent releases of software, rigorously tested code and frequent consultation with the customer (Cao et al., 2008). In fact, this close collaboration between developers and users can enhance quick and meaningful decision making in the development cycle. It is believed by some scholars that what is new about agile methods is the recognition of people as the main determinants of project success (Cohen et al., 2004). This emphasis on people have given rise to the term ‘programmer power’ in agile software development (Cohen et al., 2004) because agile software development teams are empowered to make decisions (McAvoy and Butler, 2009).

The Agile Manifesto articulates the fundamental principles and beliefs of these methods as distilled by (Vinekar, Slinkman, and Nerur, 2006). These include:

1. The ingenuity and competence of people and their interactions and collaborations are of greater value than tools and processes. This principle discounts both technology and process as key determinants of project success
2. Delivering a high-quality working system to the customer is more important than producing heavy documentation
3. The active participation and constant involvement of the customer in systems development yields greater benefits than the fulfillment of predetermined requirements specified in a contract
4. Recognizing the inevitability of change and embracing it, is better than extensive planning in a very turbulent software industry.

The issue regarding the method to be adopted and steps to be taken by software development firms in order to deliver faster, high-quality and cheaper software products has been discussed in the IS community for years (Dyba and Dingsoyr, 2008). Agile methods have been proven to be useful towards these ends and have been gaining in popularity (Ahmed et al., 2010). However, some scholars have criticized the approach and the claims made in agile methods. For example, firstly, agile development is seen as nothing new because these principles and practices have been in place in software development for many years (Merisalo-Rantanen, Tuure, and Matti, 2005). Secondly, the lack of focus on architecture is bound to create sub-optimal design-decisions (McBreen, 2003). Thirdly, there is little scientific support for many of the claims made by the agile community (McBreen, 2003). Finally, agile methods are suitable for small teams in small firms and not for large teams executing large projects (Cohen et al., 2004).

Small firms are defined as having less than fifty employees and an annual turnover of up to ten million euros (European Commission, 2005). Based on the size of some small firms, especially those in developing countries, they might find it difficult to embrace some of the agile practices like co-location of developer-user and pair programming. In general, the objective of most small firms in developing countries is to survive (Kituyi and Amulen, 2012) due to resource constraints. Some of the constraints being experienced by these firms are lack of finance, lack human resource, heavy reliance on imported IT solutions and foreign exchange shortage (Avgerou, 2008; Berisso and de Vries, 2010; Bhatnagar, 2000; Kodakanchi, Kuofie, Abuelyaman, and Qaddour, 2006; Niazi, 2012). But the adoption of agile methods is a necessity as these firms strive to become competitive and bridge the digital divide between themselves and the developed world (Pee, Kankanhalli, and Show, 2010).

Jamaica, a developing country in which most of the firms are small, has a debt to GDP ratio of 113%, which is one of the highest in the world (Williams and Jones, 2010). For decades Jamaica has depended on agriculture, bauxite mining and tourism as sources of economic development. In fact, tourism is Jamaica’s number one foreign exchange earner, accounting for 25% of the jobs and 10% of the GDP (Jamaica Travel Secrets, 2013).

In 2012, tourism contributed close to US\$4 billion dollars to the economy (Jamaica Travel Secrets, 2013). Hopes were high that tourism would enable the country to address their balance of payment woes (Hayle, 2011). The developmental benefits that tourism was expected to deliver have failed to materialize (Singh, 2008).

In fact, tourism, agriculture and bauxite mining have been declining in recent years. In response to this decline, the Jamaican national policy is to use information and communication technology (ICT) as the means to achieve growth and development. Off-shore IT/IS contracting is the main strategy being employed by the government to achieve the outcome of growth and development. To be competitive and win global contracts, software development firms must develop high-quality and successful software products (Sulayman, Urquhart, Mendes, and Seidel, 2012). Based on the competitive nature of the industry, it is important for IS professionals (i.e. developers, programmers, analysts, managers and IT/IS policy makers) in Jamaica to expand their understanding regarding the application and benefits of agile methods.

Research has demonstrated that adopting agile methods in software development can improve the management of the development process and customer relationships (Ceschi et al., 2005), which by extension can increase the likelihood of producing high-quality and successful software products. In a survey conducted in the US and Europe it was discovered that 14% of software firms are using agile methods. Furthermore, the survey found that 49% of the firms that were aware of agile methods were interested in adopting these methods (Dyba and Dingsoyr, 2008). In another survey conducted with 240 students, it was found that 78% of the respondents believed that using XP can improve the productivity of small teams, 76% suggested that XP improved the quality of programming codes and 65% of all respondents would recommend XP to their respective workplace if allowed (Melnik and Maurer, 2005). An earlier study involving forty-five students discovered that the overwhelming majority of the students experience were positive in the use of extreme programming (Melnik and Maurer, 2002). In essence, agile methods have been claimed to improve software quality, reduce time to market, enhance productivity and fulfill the needs and expectations of users (Ahmed et al., 2010) As a result of these findings, software development firms are increasingly recognizing the need to adopt and use agile methods as much as possible (Lyytinen and Rose, 2006).

3. The Methodology

This study is intended to be the first part of a two-part survey to ascertain the level of adoption and benefits of agile methods in Jamaica. Part 1, the preliminary study provided early indication in this area of interest among students at the University of the West Indies who were pursuing their Master in Information Systems. The survey was self-administered and could be classified as a convenient sample but control measures were taken to ensure that all participating students were software developers and a pilot test was conducted with five information systems lecturers for face validity of the survey instrument.

The survey instrument had twenty-one questions which included demographic data, firm data and the survey items. Nine survey items regarding the benefits of agile development were 7-point Likert-type scaled questions with 1 being strongly disagreed and 7 being strongly agreed. The unit of analysis was information systems projects. Microsoft Excel was used as the analytical tool to conduct the inferential statistics. Twenty-five questionnaires were distributed and nineteen were collected and analyzed. This gave a 76% response rate.

Part 2, is intended to be a more in-depth study with respondents from a wider cross section of IS professionals across the country. It is hoped that the sample size will be much larger and so analytical tools such as Statistical Package for the Social Sciences (SPSS) and Partial Least Square (PLS) can be used to do the analysis. It is envisioned that an online survey approach will be taken for the Part 2 study.

The profile of the survey respondents in Part 1 are seven male and twelve females, all having an average years of service in the IS/IT industry of 3.61 years. The positions held in the respective projects in order of frequency are team members, network specialist, software developers, programmers, software analysts, database administrators, team leader and business analysts. However, it is important to note that many respondents played many different roles (positions) in the execution of IS projects in their organizations. The over whelming majority (73.7%) of the software applications were developed for in-house use, with a small amount developed for sale.

4. Analysis and Discussion

The results from Table 1 indicate that a slight majority of respondents (52.6%) were using agile methods in software development, and 47.4% were not. This 52.6% is somewhat surprising because it is higher than the 41% that was found using agile methods in a developed country (Ambler, 2006), even though the survey was conducted in 2006. One possible explanation is the fact that these respondents were young and educated developers who quite possibly were knowledgeable and curious about the latest and various software development methodologies and possibly quite influential in utilizing these methods in their organizations.

What is not surprising is the finding that the over whelming majority (73.7%) of the software applications were developed for in-house use, with a small amount developed for sale. This result was expected because Jamaica might not be ready to penetrate the global software market. This claim is made against the background that Jamaica is ranked at 85th out of 144 countries in the global network readiness index (Bilbao-Osorio, Dutta, and Lanvin, 2013). In addition, 70% of tertiary graduates migrate annually to developed countries (International Monetary Fund, 2006). This trend would negatively affect the availability of highly skilled software developers in Jamaica.

Table 1: Adoption of agile methods in software development

Adoption of agile	Number	Percent (%)
Yes	10	52.6%
No	9	47.4%

The findings in Table 2 are surprising because it was expected that extreme programming (XP) would be ranked as number one, due to its popularity in other jurisdictions (Melnik and Maurer, 2005). Further investigation is needed to unravel the cause of Scrum being ranked as number one.

Table 2: Agile methods used

No.	Method
1	Scrum
2	Extreme Programming (XP)
3	Feature Driven

In reviewing the reasons given in Table 3 for the adoption of agile methods it is shown that reduced development time, user involvement and response to changes are the #1, #2 and #3 reasons respectively. These reasons are consistent with the literature. As a result, there were no surprises with these findings.

Table 3: Reasons to adopt agile methods

No.	Reason
1	Reduced development time
2	User involvement
3	Response to changes in the environment

Although the reasons given in Table 4 for the non-adoption of agile methods are in alignment with the literature in developed countries. It was not expected that ‘suitable for small teams’ would be ranked so highly in a developing country like Jamaica in which most project teams could be classified as small. There is the need for further investigation regarding this finding.

Table 4: Reasons for non-adoption of agile methods

No.	Reason
1	Suitable for small teams
2	Customer collaboration over contract
3	Responding to changes
4	People resource constraints (shortage of developers)
5	Value people over process
6	Working software over document

An analysis of the scaled survey items in Table 5 revealed that the mean scores are above the mid-point on the 1-7 scale. Using the mean scores as the basis for analysis, it shows that the benefits of agile methods in Jamaica are, firstly the ability to improve customer satisfaction, then reduce project cycle time/speed up the development process and thirdly improve the productivity of teams. The lowest mean score (4.36) is above the mid-point and this score is associated with improved software quality. This finding is somewhat surprising because it was claimed that agile methods improved programming code (Melnik and Maurer, 2005).

Table 5: Benefits of agile software development

Factor	Mean (n = 19)	Standard Deviation (n = 19)
The use of agile method improves software quality	4.36	1.55
The use of agile method reduces project cycle time	5.07	1.07
The use of agile method reduces development cost	4.86	1.23
The use of agile method improves the productivity of teams	4.93	1.07
The use of agile method improves customer satisfaction	5.21	1.25
I personally like pair programming	4.57	0.85
I believe pair programming speeds up the development process	5.07	1.07
I believe using agile methods improves the quality of code	4.93	0.83

5. Conclusion

Although these are preliminary indicators, they point to the need for further investigation to explore the underlying causes for the average uptake of agile methods in Jamaica firms. Further study is needed with a larger sample size to make the results more generalizable. In addition, there is the need to conduct interviews with developers in the region to gain deeper insights into the cause of Scrum being ranked as the main agile method, the number one reason for non-adoption being ‘suitable for small teams’ and agile methods improving software quality being ranked as the lowest benefit.

These studies are important in an attempt to develop and deploy more successful systems, as well as assist in the formulation of the national IT policy in Jamaica. These conditions are critical for Jamaica who is seeking to use IS/IT as the main means of economic development.

The limitations of the study are: (1) The utilization of students who are enrolled in an Information Systems Master Program at the University of the West Indies as respondents to the survey, (2) the small sample size did not contain enough data points to allow for effective analysis and thus affect the generalizability of the results. However, this was the first stage of a two-step approach to glean information that would inform the design of the next study.

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