Chapter 48
Appliance of Agile Methodology at Software Industry in Developing Countries: Perspective in Bangladesh

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1 Introduction

Improvement in the software industry in Bangladesh has become a critical factor as it makes the business' advertising and marketing obligations simpler to fulfill. In different phrases, software development is used and accomplished so that it will offer growth and value to the requirement of the consumer. The challenges for software companies are to choose the accurate methods for development and to accomplish the company's improvement goals. The achievement pace of development works can be improved through the consumption of a methodology which is acceptable for the precise features of these software projects. For the last few years, a huge variety of software design model has been elaborated, consequently, and agile method can be considered an efficient one [1, 2].

Agile in essence is an iterative, lightweight, software design, and development methodology. Agile methodology splits a total project into tiny size iterations which consumes the similar interval length. Unlike other methods, the agile method is supported by consuming feedback that guarantees the better users requirement fulfilment [3]. However, this method has some limitations too such as quality measurement, user feedback, user adaptability, etc. ICTization is an important management level framework [4] and merging these two methodologies can lessen these shortcomings

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to some great extent and can be very effective form the developing countries like Bangladesh viewpoint.

The primary goal of this study is to discover and explore the major issues which manipulate the decision to choose the most widespread software development model for a specific project. The four research objectives are:

1. Adopting the agile method as one of the services in Bangladesh and receive maximum benefits.
2. To find out the adoption rate of agile methods in Bangladesh and compare with other methods.
3. To find out the main benefits derived from agile methods in Bangladesh to increase popularity.
4. To address the challenges in adopting the agile method and procedure to lessen them.

To choose an appropriate methodology is one of the primary concerns for those countries where the ICT industry will play a leading role in the near future. Besides, the challenges need to be addressed and solved. Therefore, this paper is systematized in the following approach: Sect. 2 depicts the cases studied in developing nations; Sect. 3 describes the hypothesis along with the motivations behind; Sect. 4 defines the data collection methodology; Sect. 5 presents the achieved result and conclusions are drawn in Sect. 6 with some ideas for future research.

2 Agile Method in Developing Countries

Agile methodology has already received enough interest in developed nations. However, deficiencies of experimental studies have been observed in developing countries. These issues are required to be addressed properly since developing nations are currently playing the lead role in software outsourcing. In developing countries, the business enhancement provides an opportunity to make competitive in global market and dramatic improvements in economic growth. Since agile methods help to increase customer satisfaction though the requirements are continuously updated [2]. In addition, it provides an effective management, quality assurance, and productivity and maintenance practices to develop quality products.

Consumption and contribution of agile methodology in four different developing countries were studied to ensure its prospect in Bangladesh.

2.1 Case Study 1

Based on the study [5], it can be found that the agile design model is efficient in Philippine to solve the customers' necessities, develop knowledge sharing, and build better teamwork. It is also observed that the software developers have generously

adopted the agile design model to solve their assigned project-oriented tasks. Some key issues can be noted:

- Agile methodology can play an important role in outsourcing overcoming the cultural divergence between both clients and developers.
- The enhanced alliance which is developed through agile design can become more imperative in comparison to our expectations especially in societies where communism is followed.

2.2 Case Study 2

It can be found that [6] the software organizations provided remarkable elasticity in the GDP of Croatia on the same era while the reduction in GDP was observed. The paper has also observed that most of the software firms, large to small, have previously implemented agile design methodology. Main findings mentioned from this research are given below:

- 33% of revenues are received from the development firms and these organizations offer software outsourcing services in North America and Europe.
- Mostly small to medium size development firms are found to utilize agile development model nationwide.
- Primarily medium to small size development firms are found to practice agile design model both in locally and internationally.
- The local policies, official provision are presently assisting them to operate internationally and helping to achieve more profits in Croatia for longer period.

2.3 Case Study 3

A quantitative study was used in this paper [7] to analyze the accomplishment of information management task in their companies. Their paper has claimed to use the valid sample and survey constraints.

It is observed that 53% of the software organizations are presently operating agile model in Jamaica. Several benefits were also found from the survey like user fulfilment, enhanced team efficiency, and speedy growth rate. The standard approval rate of agile model active in Jamaican software organizations would aid the opportunity for a long-term scrutiny to track the recognition inclination.

2.4 Case Study 4

Several issues related to achievement and failure possibilities of agile methods in Zambia are studied. Several challenges are addressed and solutions are also proposed [8]:

- Project management can be considered as one of the vital tasks that are not exceptional to agile model in software companies.
- Dearth of resources can be considered important challenges. Therefore it is suggested that open source and cloud platform can be used to curtail the budget of execution.
- An obligatory financial allocation is not appropriate for instigating the agile supported projects. But it can be solved using strong interpersonal skill among the parties.
- Cordial working relationship can be considered as one of the most challenging issues for agile methods. Frustration might develop among developers when they are not satisfied and it is necessary to develop a good relation with developing team.

In addition, this method is currently contributing to software industries of India, Pakistan, Malaysia, Thailand, etc., to some great extent.

3 Motivation and Hypothesis

Agile method can improve the rate of success and solve problems of heavyweight methods. On the contrary, problem might arise for longer period project works which can affect the decision development procedure. So, some other factors are observed to coexist with agile methodology and plan-driven development in many organizations [9]. However, in all cases, the primary challenge is the collaboration among various approaches that might affect the larger companies [10]. Therefore, the project team needs to apply the most suitable agile method for the development but the present model cannot always fulfill the customer requirements and fail to address the challenges.

We have proposed a managerial framework, 'ICTization' which aims to develop strategy and assess the success possibility, harmonization and regulate the managerial accomplishments, dissemination, and allocation of services among the eligible users. Moreover, it is also responsible for taking decisions and examines the success probabilities of the allocated assignments along with possibilities of mistakes, merges the vital services with viable explanations and service consumption becomes easier.

This framework is a managerial tool which is used to synchronize the several e-services. The user adaptability and efficiency of any e-services can be measured through user feedback, KPI index, etc. Our idea is to consider this agile methodology as one of the services and receive maximum benefits out of it.

- The framework will help to find out the breakdown factors and challenges faced by the developers in Bangladesh.
- This framework can help to distribute and share the Knowledge of Agile method's tools and technique in Bangladesh.
- This framework can promote and increase the success probability of agile implementation in Bangladesh.
- This framework will help to evaluate the technical and non-technical factors which manipulate the success and failure of agile implementation in Bangladesh.
- This framework will provide better service in terms of sending, receiving and synchronizing information to the deserving and will reduce the gap between the sectors like human resources and information system.
- This framework will be user-friendly, less complicated, and will allow knowledge sharing through socialization.
- This system will measure the service feasibility and capability along with the popularity and users' adaptability before launching the services.

This study is based on several hypotheses and can be outlined as follows:

- Cultural infrastructures in organizations have positive impact that facilitates a learning environment.
- Facilitator and coach approach adopted by the IT project managers have positive impact on software development projects.
- Room for self-organization within development teams has positive impact on software development projects.
- Ability to customize the working methodology has positive impact on to balance between customer requirements and the development team's needs as the product evolves.
- Extreme chaos (i.e., undisciplined agility) has negative impact on extreme predictive planning.
- The values of the project as set by the customer at every stage have positive impact on project's development.
- flexible enough to deliver necessary documentation when asked to do so by the customer without drawing heavily on the project's budgetary constraints have positive impact on project's development.
- Courage to tackle the next project probably using a similar methodology has positive impact on project's development.

4 Survey and Data Collection Procedure

Structured groups of research goals are the most vital parts for the survey as it can simplify many decisions comprised in survey procedure. Every part on the questionnaire was included Research Questions and Survey Questions. All questions are not needed for the purposes of the research. But, to ensure selected questions in the questionnaire for the survey can meet the research goals properly (Table 1).

Table 1 Correspondence between research questions and survey questions

Part of questionnaire	1st	2nd	3rd	4th	5th
Survey question	7	4	6	3	3
Research question	5	3	6	2	3

Table 2 "Profile" of the software industry in Bangladesh

SL. no.	Company name	Address	Established year		CMMI level	BASIS certified
			Before 2000	2000–2017		
1.	ERAIT Ltd.	Dhaka		✓	Level-1	✓
2.	IPCP Services	Dhaka	✓		Level-2	✓
3.	MKB technologies	Rangpur		✓	Level-3	✓
4.	ZSI Bd.	Rangpur		✓	Level-4	✓
5.	PCN (Pvt) Ltd.	Dhaka	✓		Level-5	✓

4.1 The Target Population

In Bangladesh, maximum IT companies are established after 2000–2017. Besides, a lower amount IT companies are established before 2000. The main industrial section is IT Consultancy, Financial sector, Game, e-commerce, and others. A tiny amount of IT companies are not certified from BASIS, remaining all companies are certified. Not only certified BASIS but also they follow CMMI maturity level (Table 2).

4.2 The Mode of Administration

To develop the survey, two types of interviews were conducted.

- *Face-to-face Interview Survey*: This technique implies the paper questionnaire and the presence of the interviewer. Totally, 25 software companies were initially selected for the survey where 16 companies responded.
- *Online Survey (Mail & Telephone)*: surveys paper questionnaires were sent to the respondents by mail, totally 10 software companies were initially selected for the survey where 4 companies responded.

4.3 Developing the Questionnaire

A questionnaire was designed with 25 questions on Agile Methods (Scrum, XP, and DSDM) and 9 questions on Company Demography. There are two blocks of total of 34 questions.

- *Block 1. On the Agile Methods*: It includes 24 multiple-choice questions and 1 open question. The title of the questionnaire was 1. Requirements Analysis 2. Planning/Design 3. Development/Coding 4. Testing 5. Miscellaneous. All questions were based on Roles and Responsibilities, Artifacts of Agile Method specially Scrum, XP and DSDM.
- *Block 2. On the Company*: The questionnaire contained 9 questions. It includes 7 multiple-choice questions and 2 open questions. All questions were based on: 1. Information of the company/organization 2. City where the company is located 3. Some information (Membership of BASIS, CMMI level).

4.4 Developing Data Collection and Data Processing Plans

When the preliminary design strategy gets completed, collection and processing of data need to be initiated. Our sample consisted of 3 large firms with over 50 employees, 8 medium firms with over 21–50 employees, and 9 small firms with below 20 employees. All the firms had business focus on IT and IT consulting. Later, face-to-face interview and Online Survey (Mail & Telephone) data were combined.

5 Results and Analysis

5.1 Adoption of SDM

The respondents were asked whether or not they were following a Software Development Method. As displayed in Fig. 1. 65% of the respondents are currently using and involved with agile methodologies in their developing process. These shows that almost 3/5 of the companies are adopting agile methodologies as a working practice. However, 10% has responded that agile methodologies are not being used in their development process. And 25% companies are used their own techniques and tools.

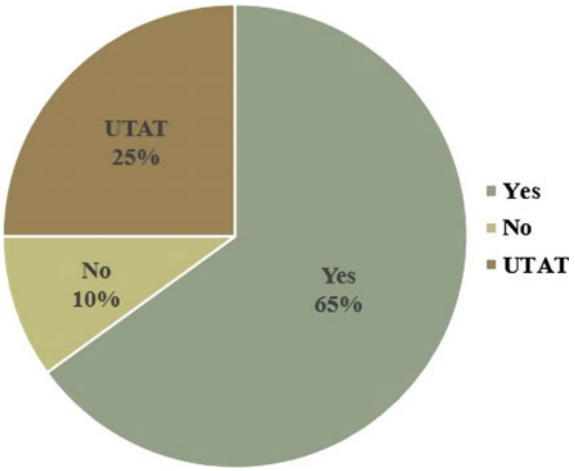

Fig. 1 Percentage of SDM (UTAT = use techniques and tools)

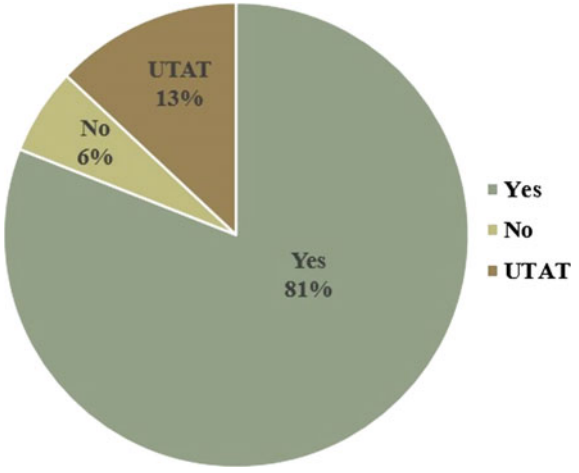

Fig. 2 Percentage of SDM with ICTization framework

5.2 Adoption of SDM and ICTization Framework

See Fig. 2.

5.3 Adoption of Scrum

See Table 3.

Table 3 Adoption of Scrum

Scrum activities	No. of responses	Percent (%)
Role of product owner	15	23
Customer involvement	12	19
Role of design team	8	13
Team size of SW developers	13	20
Significance of framework	16	25
Total	64	100

Table 4 Adoption of XP

XP activities	No. of responses	Percent
Role of tracker	1	4
Customer involvement	3	11
Role of programmer	7	26
Team size of SW developers	3	11
Significance of method	13	48
Total	27	100

Table 5 Adoption of DSDM

DSDM activities		No. of responses	Percent
Delivery Time	Fixed	3	15
Resource	Fixed	3	15
Functionality	Changeable	14	70
Total		20	100

5.4 Adoption of XP

See Tables 4 and 5.

5.5 Adoption of DSDM

The survey has come up with a decision that different types of agile methods are used in Bangladeshi IT Companies. It was found that “Scrum” was leading the way at 58%, followed by “XP” at 24% and “DSDM” at 18% as shown in Fig. 3.

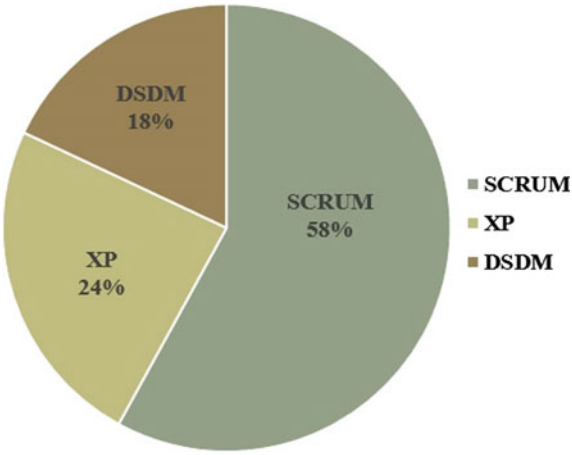

Fig. 3 The percentages of different agile methods used by the respondents

6 Discussion and Future Work

A method choice for development is most important because implementing an incorrect methodology could result in slippages, lack of communication and administrative overheads and quality of a develop software, leading to customer dissatisfaction. Within the beyond decades, fast-paced evolution of software development methodologies improvement methodologies has affected substantial upgrades in software quality. On the other hand, agile methodologies became general to deal with a few shortcomings of conventional methodologies like heavy documentation, loss of productivity, reliability, and ease. Nowadays developers have been developing different methods which simplify the way of software development and some of the methods can be combined.

Agile contains different approaches, however, Scrum (58%), XP (24%), and DSDM (18%) are found to be the most popular software design and development methods in Bangladesh. The software industry in Bangladesh is methodological and technological and our study adds evidence in support of it.

Results were achieved in different categories like the percentage of respondents who follow software development method, adoption of Scrum, adoption of XP, adoption of DSDM, and the percentages of different agile methods used by the respondents. Based on the result, it can be stated that the agile method is the most popular software design and development methodologies and its popularity can be enhanced by 81% through merging with ICTization framework.

In short, this paper has worked with three issues that meet our research objectives. First, case studies were used to find out the contribution of agile method in software firms in different developing countries. Second, the survey was done to find out the present utilization of this method in software industry in Bangladesh. Lastly, it was tried to increase the popularity of this method in Bangladesh though lessening the challenges and merging with other frameworks. The results achieved from this paper

are anticipated to notify the software developers on the utilization and practice of software development model from the context of Bangladesh.

Future research will focus on the framework refinement by way of relating it with some other agile methods if possible supported by pragmatic feedback gained from real project observations, and quantitative data. This work can get enhanced in order to achieve methodological engineering especially through combining CEFAM with situational method engineering (SME) procedure.

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