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Blended Agile Approach: A Mobile Application Approach

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ABSTRACT

Consumers' demand for mobile applications has significantly contributed most software-solution companies and individuals to continuously develop applications that will understand the domain needed by the market. These applications provide mobile users with rich applications and services to support our activities for entertainment, productivity, lifestyle, communication, games and many more. In order to meet these demands, high-quality software must be produced and delivered with the help of various application frameworks that have been constructed to test which among the selections fit best. Consequently, due to the emerging technologies, developers need to strictly follow a development cycle that will be beneficial for them in terms of time delivery, features complexity, platform compatibility and target market. Hence, the software engineering approach is undeniably an important phase in mobile application development. With this study, the researchers proposed an Agile Approach fused with Scrum Methodology, Extreme Programming and Feature-driven Development. The framework was evaluated and classified according to characteristic categories and has defined as a tool for fast-paced mobile application development.

Key words: Agile, scrum, fdd, extreme programming, mobile application, framework

1. INTRODUCTION

With the fast-paced emerging technologies, developers need to be rigorously follows effective frameworks that will guide in completing the projects on time and meet the clients' requirements. In most mobile applications, developers are using Agile approach. Agile is considered as a methodology that is naturally fitted with the needs to develop an application [1].

Agile is better for developing mobile application such as: Agile makes the development faster than the traditional approaches; it recommends clients participation; and developers can determine problems at early stage of the project development [2]. Under Agile there are several methodologies: Agile Modeling (AM), ASD, Crystal Clear, Dynamic Design Method Systems (DSDM), Extreme Programming (XP), Feature Driven Development (FDD), and Scrum. Similarly, some mixed agile approaches were developed;[3] one is called Mobile-D, a mixture of Extreme Programming (development practices), Crystal methodologies (scalability of methods) and Logical and Coherent Process (life-cycle coverage).

In this study, researchers focused in combining three Agile methodologies, the Scrum XP and FDD. Scrum is considered as the most used methodology that enable the developers to work as a team in a more convenient and efficient way [4]. Scrum is composed of several iterations that known as sprint that required the developers to conduct shorts meetings every day to determine the status of the project. Agile Alliance defines XP as the most precise among the Agile framework in terms of suitable way in software development. While FDD allows the developers to rapidly recognize the problems in the project and revise it frequently. The study was influenced by the research made about theoretical framework in agile process [4] wherein the authors used the same methodologies the Scrum, XP and FDD.

Several mobile application developers evaluated the proposed framework to determine its effectiveness; the researchers used Weka Random Tree to analyze the responses. Random Tree uses a bagging idea to produce a random set of data to create a decision tree.

2. REVIEW OF RELATED WORK

2.1 Development of Mobile Application

With the increasing number of mobile users and innovation to its hardware features, there is a demand in developing mobile applications and updating what is existing. The development of mobile application started way back 1993 having calculator, calendar and contacts as first set of app for smartphones. Nowadays, apps are became part of our daily activities; checking for traffic situation, locating a place and even looking for a dish for dinner.

There are several challenges in developing a mobile app like developing same mobile application across multiple platform, developers need to consider the capabilities and limitations of the platforms to be used, and determining if it will work properly on each [5]. Aside from what was mentioned consider hardware specifications of the smartphone to be used, estimation of the requirements, money and time involvement, considering front-end design, the convenience of using the app and the difficulty of accessing data that is needed in the development [6].

2.2 Agile Framework

Agile has been used since 1990's for developing software and now for mobile applications this is because it is having a short life cycle than the traditional framework [7]. Agile Manifesto was formulated in 2001 by 17 people and provide the 12 principles that will be used by the developers as their guide for Agile projects:

1. Our highest priority is to satisfy the customer through early
   and continues delivery of valuable software.
2. Welcome changing requirements.
3. Deliver working software frequently.
4. Businesspeople and developers must work together daily.
5. Build projects around motivated individuals.
6. The most efficient and effective method of conveying information to and within a development team is face-to-face conversion.
7. Working software is the primary measure of progress.
8. Agile processes promote sustainable development.
9. Continuous attention to technical excellence and good design enhances agility.
10. Simplicity
11. The best architectures, requirements and design from to have self-organizing teams
12. Team reflects on hoe to become more effective then tunes ad adjustment in behaviour accordingly

The twelve principles were also cited in several researches of Cho [9], Conboy [7], Kirmani[2] and Merzouk[10].

Agile is considered as the method that give more customer satisfaction, that can shorten the length of development life cycle, it also can lessen bug rates and at the same time can accommodate changing business requirements. This is the result of a research that compares Agile from the traditional software development method in terms of customer requirements, size of the project, time of development, number of developers, customer engagement, planning and control, its architecture, refactoring and risks [9].

A comparative analysis between various Agile methodologies. Scrum, XP, DSDM, FDD, LSD, Kanban, and Crystal Family and ASD were assessed using various parameters including team size, project duration, iteration length, roles and responsibilities, centric process and participants, virtual team support, documentation, risk reduction and meeting. The study found out that XP, Scrum and ASD are more centered on people while Scrum and ASD have a long time of release of iterations [10].

The use of Agile methodology has several advantages like:

- it works well with highly unstable requirements of
  mobile apps
- it promotes customer involvement,
- it enhances reliability of mobile apps, and
- it is appropriate for fast-faced development of mobile apps [2].

Features, advantages and the gaps of different Agile methodologies were cited in another study of Kimani [11]. The study shows the different aspects of the SDLC among Agile methodologies, and DSDM can bear with the entire life cycle than the rest, while AM can only for requirements specifications and design.

2.3 Scrum Methodology

Scrum is a progressive and iterative process whose aim is to help development teams to focus on goals and reduce the work done on less important tasks that is more suitable for mobile application development. There are five benefits in using Scrum [12]:

- improve time management. Scrum uses a framework
  known as a Sprint (using one to four weeks) will be presented to see the progress of the project..
- increase adaptability. Uses user stories to check what is in the system.
- every step control.
- promoting teamwork. Each member of the team needs to understand what are their roles.
- multitude of efficient scrum tools

Scrum is a light method and most commonly used methodology [13].

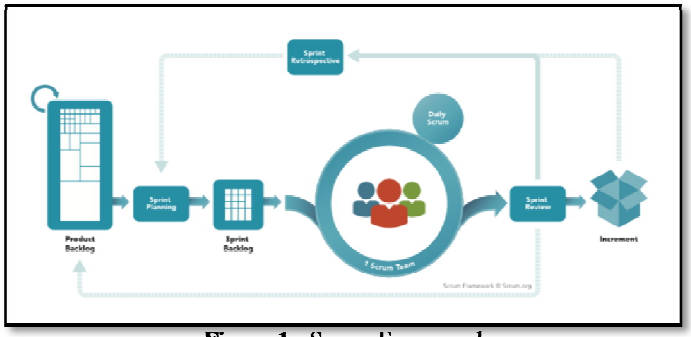

Figure 1: Scrum Framework

2.4 Xtreme Programming Methodology

According to Kamthan [14], XP methodology is a systematic approach in developing mobile applications and considered as a lightweight methodology for small development teams. This methodology was made to discuss uncertainties in the

development. The same author also mentions the 12 practices in Agile. These are the following:

1. Planning game
2. Small releases
3. Metaphor Guide
4. Simple Design
5. Testing
6. Refactoring
7. Pair Programming
8. Collective Ownership
9. Continuous Integration
10. 40-Hour Week,
11. On-Site Customer
12. Coding Standards

Table 1: XP practices corresponding to process workflows in a mobile application [14]

Process Workflow	XP Practices
Planning	40-Hour Week, The Planning Game (Project Velocity)
Analysis (Domain Modeling, Requirements)	On-Site Customer, The Planning Game (User Stories)
Design	Metaphor Guide (Natural Naming), Simple Design, Refactoring
Implementation	Collective Ownership, On Site Customer, Metaphor Guide, Coding Standards, Pair Programming, Continuous Integration
Verification and Validation	On Site Customer, Testing (Unit Tests, Acceptance Tests)
Delivery	Small Releases

The principles of XP which are the communication, simplicity, feedback, courage and respect [15]. Following also the same phases as other framework were in need to start by gathering the data and ends with user testing.

2.5 Feature-Driven Development Methodology

This methodology was developed by Jeff De Luca and Peter F. Coad. This methodology is more focused on designing and building phases[15]. Moreover, the developers need to provide list of features and possible design of the project. There are five steps involved in this methodology:

1. develop an overall model
2. build a features lists
3. plan by feature
4. design by feature
5. build by feature

2.6 Blended Framework

Blended framework is being used in developing a system. An agile can be blended with other traditional methodology or different blended of two or more methodologies under Agile. Below are some researched that combined several methodologies under Agile to design a new framework.

The framework SCXTREME that has the combination of Scrum and XP since this two is the most commonly used in Pakistan. The framework provides customized approach that enhance the processes involved in Agile methodology.

A theoretical Agile process framework for mobile application development that has the concepts of Scrum, XP and FDD, however the proposed framework was never implemented nor evaluated to test its validity [4].

A model named APL-mobile, an Agile and Lean process that has the concepts of Scrum, Kanban, and XP methodologies [16]. The researchers' goal is to determine the gaps between the lean and agile methodologies. This proposed model was presented in different companies in Austria providing mobile apps. The research was very appreciated by the Austrian experts because they notice the flexibility that the model can provide.

3. METHODOLOGY

Design Science Research (DSR) has been introduced and is commonly used in research into information systems to solve complex problems. The proposed framework was devised using the following DSR steps (Figure 3).

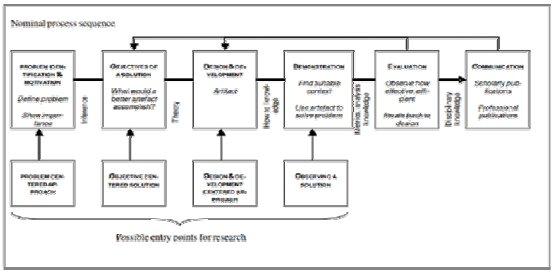

Figure 2: Design Science Research Process

The following are the phases involved in Design Science Research where the researchers will base their new framework design.:

Step 1: Problem Identification. Upon reviews of literature, it has been found out that there are several framework combining different methods however there is no framework that has been evaluated having Scrum, FDD and XP as combined Agile methodologies in a framework

Step 2: Objectives of the Solution. Propose an appropriate model that can be adopted by software practitioners

Step 3: Design and Development. Develop a model through critical review of literature on Agile Methods applied software development. Identify the gaps of previous research on Agile Methods in Mobile Application

Step 4: Demonstration. Introduce the develop framework with the software development practitioners involved in mobile application development

Step 5: Evaluation. Evaluating the framework by observing its success through surveys, and interviews software practitioners

4. PROPOSED FRAMEWORK AND DISCUSSION

The model proposed shows the integration of an agile methodology to recreate a process framework such as: Agile Methodology Approach, Development Process, Critical Success Factors and Evaluation Criteria for Mobile Application development.

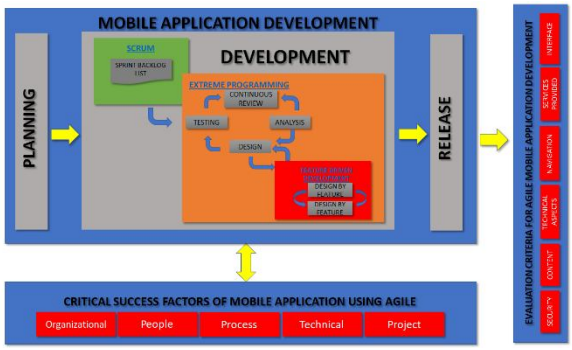

Figure 3: Blended Agile Model for Mobile Application Development

As shown on the most significant component of the model, the applicable and acceptable agile methodology approach can be selected among SCRUM, Extreme Programming and Feature Driven Development.

SCRUM is a progressive and iterative process which aims to aid development teams focus on purpose and reduce the work done on less important tasks that is more suitable for mobile application advancement.

On the other hand, one of the lightweight and constant informal mobile application software development methodologies is Extreme Programming or XP. Apparently, this is quite useful because it helps the team to launch the project and then incorporate the necessary changes as per the requirement in a more efficient manner.
Furthermore, Feature-Driven Diagram or FDD is a model-driven and design-oriented agile methodology that focuses on the design and execution to administer first-rate modules and deliverables.

The different Agile Methodology indicated were all merged to establish a composite approach for mobile application development process which can sum up into three development stages. This includes **A)** Planning **B)** Development and **C)** Release. Planning is the phase wherein the requirements and priorities were discussed. Next is the development phase which incorporates the phases of SCRUM, Extreme Programming and Feature-Driven Diagram mentioned above. Release is the last phase of the mobile application development in which the initial release for the ratification of the client is executed; and for the maintenance phase, the updated release took place until the final release reached

The critical success factors in mobile application development represents the bottom side of the model. The factors that may have an impact on the success or failure of an Agile Software project are as follows: Organizational factors which serves as the management commitment and organizational environment; erson factors that function as team ability and customer involvement; process factors include the process of project management and project identification as well as technical factors for implementation strategies and delivery strategy.

On all counts, agile is the most appropriate software development process. In addition, Scrum, Extreme Programming and Feature-Driven Diagram are the models that correlate with the development technique. Therefore, a blended agile framework consolidating the three models in mobile application development with the critical success factors and evaluation criteria is greatly suggested.

The proposed framework was evaluated by five mobile app developers. System evaluators may or may not recommend the proposed framework based on the assessment evaluation they answered. However, the result concluded that the proposed blended agile approach in a mobile application framework is highly recommended in integrating to the actual system development. This is because the new framework enhances the workflow and improves the selection of relevant modules, and it adheres relevant methodology to address deficiencies.

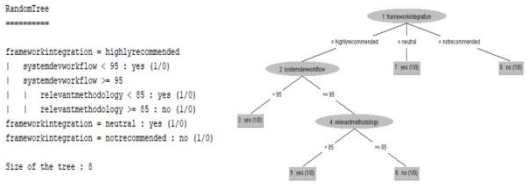

Figure 4: Random Tree Model

The system was classified using Random Tree and discusses the attributes relevance using Ranker Method and Correlation Attribute Evaluator. The result is that it is highly recommended to integrate the blended agile approach to mobile application development because of the following reasons: **a)** Enhancement to the system development workflow; **b)** Selection of relevant application modules; and **c)** Methodology integration with other methodologies to understand and address deficiencies.

5. CONCLUSION

Since then, Agile has been used for mobile app development, and developers are merging the concepts its variations. A number of studies were conducted to determine the advantages and disadvantages, similarities and differences between the methodologies under Agile presenting that blending methodologies is attainable.

Evaluators may or may not recommend the proposed framework in the evaluation made for this framework. However, the outcome concluded that the proposed blended agile approach in a mobile application framework is highly suggested in consolidating to the actual mobile application development.

This is because the new framework enhances the workflow and improves the selection of relevant modules, and it adheres admissible methodology to address inadequacies.

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