Generic Synthesis System Based on Agile Methodology for Multimedia Mobile Web Learning Modules

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Abstract—The main idea is to study invest advantage of multimedia elements to producing educational in web mobile platform in efficiency to meet the specific need for student and instructor at less complex for all device. Web Mobile application learning has been recognized a new approach in information teaching, emerged as a new and promising learning modality and providing more interactivity and flexibility to learners, student and instructor in carrying out educational activities and practices. The proposed model is also enriched based on agile (scrum framework) for manage system development. Also, it is iterative and incremental approach, this model consists number of sprints; sprints are series of development phases that finished the subsystem incrementally. The design of the proposed system is performed using object oriented concepts and the implementation is done using Asp.net studio and C# language with SQLServer database to store all required data for the system. Also, using The Planning Poker technique estimated the effort in terms of units of work referred to as 'story points' reflecting the complexity. The quality evaluation of Web Mobile learning environments, has been evaluated based on a set of ISO/IEC standards. The result of this present work is design system with two sprints, the sprint1 and Sprint2 is design and development Web Mobile for lesson and online exam.

I. Introduction

Learning become one of the closely essential activities in the existing knowledge, which is characterized by information age, globalization, knowledge acquisition and transfer, the information and communication technology revolution. [1]. This work has explored the concept and characteristics of web mobile learning, mobile devices and other related issues, which proposed design principles for web mobile learning system. The biggest advantage of using synthesis system for packages to create multimedia educational content is that interactivity can be incorporated into the content. In educational model, has been efficient for several reasons, it associated with constraints that could simplified the learning process, one of this constrain is the time where leaner can take the material at any time, anther constraint is space where leaner can access to material at any space in world [2]. In [3] presented framework for development web methodology based on agile method. Through this work show that this several Web application systems require to change some parts from the analyze beginning due to various reasons. This work suggest that Iterative and incremental development is the best method to settle this common trouble. And through this work Appling ISO - IEC9126 quality model to the framework and improve the efficiency and insure that the quality of Web development [3]. And in [4] introduced a system that design and development of a user interface for instructors to create exam and an interface that students can access via a mobile platform and access the quiz, in this thesis apply one of the agile framework is Rapid Application Development(RAD).

II. Agile Methodology

Classically classification of software development frameworks there have been three forms of methodological frameworks: linear, iterative, and combination of both. The most common linear framework is Waterfall where projects consist of sequential phases with acceptance of some overlap. Every step in a waterfall process must be finished before moving on to the next. Iterative development is quite opposite, it excludes initial planning but focuses on constant changes, and stimulates continuous revision and improvement of software. The work is broken up into small pieces that are developed over some period and finally put together when they are ready, an example of iterative framework is Prototyping, Iterative frameworks can be also used in combination with linear methods, setting up such frameworks as Incremental, Spiral, Rapid application development (RAD), and Extreme Programming. Incremental approach improves development process; iterative approach increases product's quality Agile suitable software process model for Mobile Application development [7].

Agile is emerging Software engineering methodology based on feedback and embracing their changing needs. It is considering flexible approach where system phases are guided by product advantage. There are several agile frameworks like lean development, extreme programming, scrum, and dynamic system development methods which come under the agile methodology [8].

A. Scrum

Scrum is a framework for agile methodology software development that is iterative and incremental. Scrum can concentrate on describe how the team member should function in order the system flexibly. the mainly task of Scrum is to be used for management of software development process, it can be applied to run software maintenance teams, or as a general project management approach [6].

B. Process of Scrum

A Scrum development process as the one in Fig (1) illustrated the general structure of scrum consists of a number of sprints;

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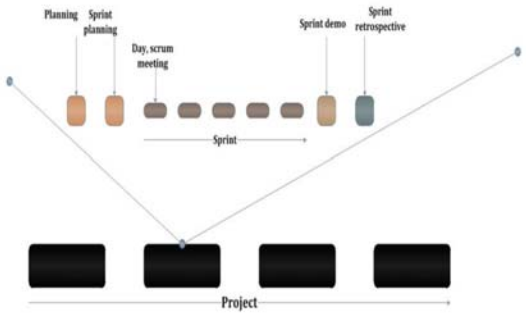

Fig (1): General Structure of the scrum process.

sprints are series of short development phases that delivers the product incrementally [9]. Fig (2) illustrate structure of the scrum process:

1. **Pre –phase: - includes two subs (planning, architecture / high level design).**
2. **Development**
3. **Post –development**

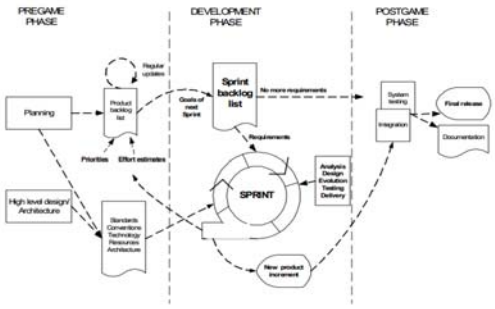

Fig (2): Scrum Process

1. **Pre –phase**: - pre-phase can divided in two sub phases as shown following:

Through Planning involved the definition of the software being developed. A product backlog list is created containing all the requirement that are currently known. the requirement could be produced from software developers. In this phase, the effort necessary for their achievement system is estimated and requirements prioritized for task is determined. the **product backlog** table is constantly updated with new and more detailed items, as well as with more accurate estimations and new priority orders. Planning also contain the definition of the project member, tool and other resource, risk assessment approval. through each iteration, the change in PB is reviewed by the scrum member so as to acquisition their commitment for the new iteration [10].

The product backlog is like a prioritized queue of tasks, its contains a list of the requirement, features and enhancements. PB include a characterization, a priority, and an estimation of the tasks. A Product Backlog (PB) contains customer requirements (including functional and non-functional), as well as technical requirements [12].

In scrum, it used user story, User story reflect quantity that expresses the amount of functionality and the complexity of the tasks. Every member creates their own story point sizing framework based on the type of work they do, the skills and experience of the team member, and what they personally perceive to be a small, medium, or large amount of work [13].
This paradigm of the user story is described in this technique: [As an end user role), I want (the desire) so that (the rationale).
The second level from pre-phase consider high level design of the project include the architecture is planned based on the tasks in the PB. in case of an enhancement to an existing system, the changes needed for achievement the Backlog items are determine along with the problems they may cause.

2. The development phase: - this phase is treated as a "black box" where the unpredictable is expected. the various environmental and technical variables (such as resources, implementation technologies, timeframe, quality, requirements and tools, and even development methods) identified in Scrum, which may change. In this phase, the system is developed in sprint, the sprint with within cycle is shown in Fig (3).

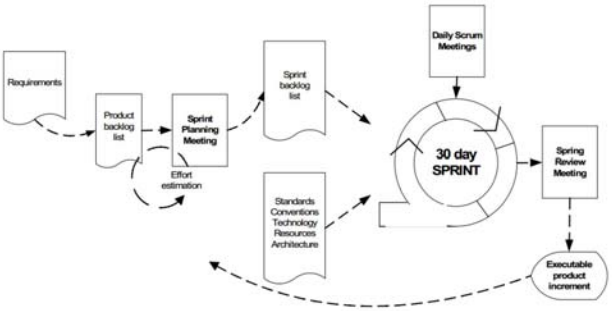

Fig (3): Sprint cycle

Sprints are frequently cycles where the tasks are developed or enhanced to produce new iteration. each Sprint includes the classical phases of software development process: requirements, analysis, design, evolution and delivery phases . Usually Sprint is determined to last from one week to one month. there may be, for example, four to eight Sprints in one project development process before the system is prepared for delivery. In addition, there may be more than one developer building the increment. A sprint is repeated cyclically until the system is finished. as shown in Fig (4).

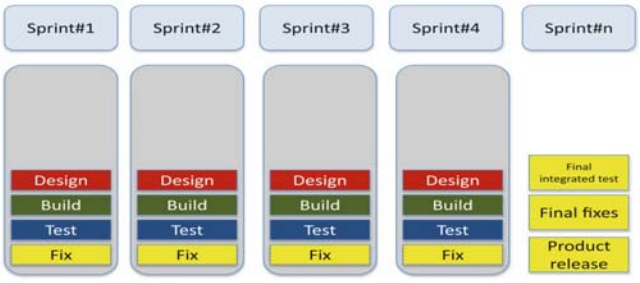

Fig (4): Sprint leading to final product release.

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3. The post phase: - involve the closure of the release. Post phase is entered when an agreement has been made that the environmental variables such as the task are completed. The system is ready preparation for the release. Through this phase, implementation the tasks such as the integration, system testing and evaluation [10].

III. Mobile web Application Development

In mobile web system life cycle are developed using a methodology to make application implementation on many devices with various screen sizes. Mobile web architecture design based on different techniques like CSS, HTML and java script with used C# or visual basic. Through This type of applications attempted to combine the best of both approaches; by utilities the advantage of server computing but don't treat the apparatus only as a front end [14]. One of the most the JavaScript library bootstrap which is designed for modern browsers and smart devices. Bootstrap is the most popular HTML, CSS, and JS framework for developing responsive, mobile first projects on the web. It is an open source library of UI components developed by Twitter. The components are built using the responsive web design principles, which makes this library extremely valuable for web applications that needs to automatically adjust its layout depending on the screen resolution. This library exploited the advancement in HTML5, CSS3 and JavaScript and provide an Application Programming Interface (API) for developer to create web mobile-friendly applications. [15].

IV. Design and Implementation proposed System

In the proposed system is divided into two sprints, through the first sprint provided generic synthesis for lessons (text, video, image), secondly supply generic synthesis for online exam.

A. Planning and Estimation system

This section describes first phase and the initial planning for the system, the product owner in Planning phase determines the user stories for each iteration that fit the estimate of effort as established by the team in scrum. it is important to notice the estimation component and the high level of uncertainty at this point of the project. Table 1 Initial Plan for system represents the product backlog contain list of features or "user stories". Development team divided user stories into tasks through the phase of planning. The main tasks initially planned contain the initial and final date and the estimated effort. The time and effort are calculated using a 9 hours-a-day working calendar for each participant in the project. And then describe the estimation for each story in backlog implementation and desired functionality. when survey the product backlog they are focus on two things mainly. First, make sure that all the require specification are represented in backlogs. Second, verify that all the estimation for developing backlog is as precision as possible. Table (1): product backlog for proposed system**.**

B. Architecture - High Level Design

The backlog through the phase obviously defined is being made. In the next backlog, all the changes are identified in a new iteration. A repeated architecture is start generated to provided new contexts and additional requirements. For the system product backlog was created in Microsoft Excel as in in Table (1). This product backlog contains key activities for the project and will continually be updated once more stories are being produced. From the product backlog, the top stories will then be picked for development in the next sprint. The proposed system has two sprints as shown in Fig (5).

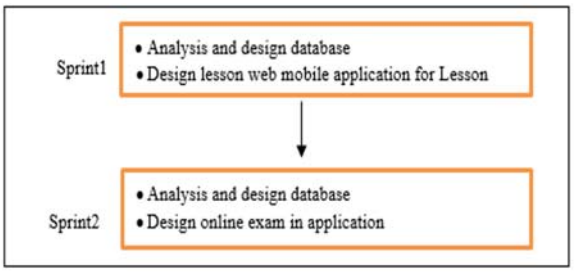

Fig (5): Sprints for system Covering Development from Initiation to a Finished.

C. Sprint 1 and Sprint 2

The general architecture of the system and how work within the whole environment will illustrated in the following Fig (6). This Fig explains that electronic learning services is server based architecture, there are two users in the system, as illustrated in the following: -

1- Instructor tier: runs in any computer or mobile platform that is responsible for upload data to the database.

2- Students tier: In the student side, the user of a web mobile application can view data across the internet and into the mobile application or computer platform.

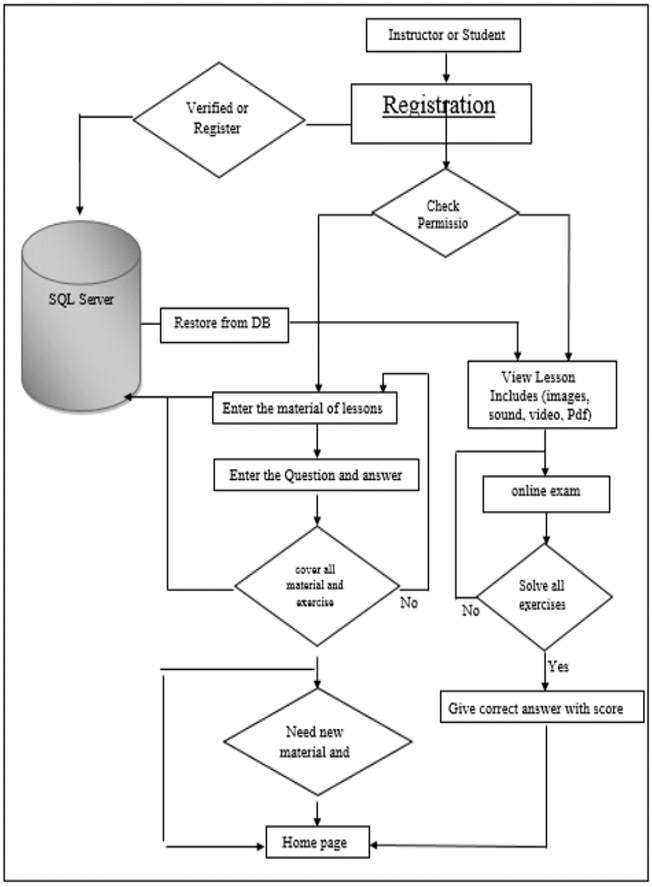

Fig (6): Architecture of proposed system

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Table (1): product backlog for proposed system**.**

NO	User story	iteration	Task	complexity	Estimation (day)	No. of Work (hour)	Effort (h)	Start Date	End Date
1	as an instructor, I want to register to system so I can use system	1	1. Design database in SQL server	Large	5	9	45	1/8/2016	5/8/2016
2		1	2. design tables for USER information.	Large	2	9	18	6/8/2016	7/8/2016
3		1	3.built Sign up and sign in interface.	Medium	3	9	27	8/8/2016	10/8/2016
4	as an instructor, I want to upload Lesson so that student can view lesson.	1	design table for lesson details	Large	3	9	27	11/8/2016	13/8/2016
5		1	built interface in website to submit materials in website	Medium	3	9	27	14/8/2016	16/8/2016
6	as an instructor, I want to upload multimedia element so that lesson can more active.	1	design table for multimedia elements.	Medium	2	9	18	17/8/2016	18/8/2016
7		1	built interface to upload multimedia elements and other resources	Large	4	9	36	19/8/2016	22/8/2016
8	as an instructor, I want to search button in system so that I can access to lesson.	1	design interface for search.	Small	2	9	18	23/8/2016	24/8/2016
9	as an instructor, I want to delete/update/view lesson so that I can manage system	1	design interface for delete, update and view lesson	Small	2	9	18	25/8/2016	26/8/2016
10	as an instructor, I want to create exam online so that student can take test	2	1-design tables for test, subject and question.	Large	5	9	45	5/9/2016	10/9/2016
11		2	2- built interfaces for test, subject and question in website	Large	5	9	45	11/9/2016	15/9/2016
12	as instructor, I want view result and true answer of test in online exam so that can have evaluated student.	2	design tables for result and student.	Medium	3	9	27	16/9/2016	18/9/2016
13		2	design interface for true answer and result report of test in web site	Small	2	9	18	19/9/2016	20/9/2016
					41		369		

D. Analysis and Design of proposed system

In the Fig (5) show that the sprint1 and sprint2 achieve to build design database, built mobile web application, system consists of the following parts:

1. **Web Forms**: Web form can be divided into two **categories**.
   First, Mobile Web Form: The documents that sends output to the user. secondly, **Web services**: The documents that do not send output to the user, only checks the information that are input from user.
2. **Database Server:** The web forms are implemented using the SQL server database.

analysis of learning content and learner by specifying instructional objective, knowledge and skill for collaborative learning. A Use Case is a way to understand and describe the requirements The following section give a brief description of the main use cases of the MMLS system. Fig (7) shows the diagram of the general use cases.

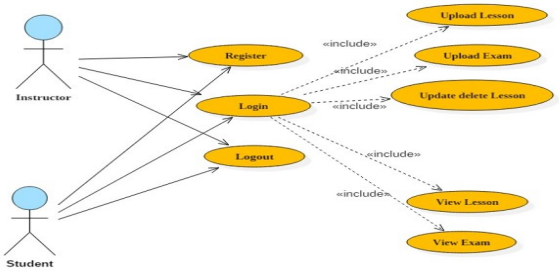

Fig (7): Use case Diagram for proposed system

V. System Implementation and Testing

Choosing the appropriate language for implementation of any system is very critical concept. In the implementation of system, SQL server with Asp.net and c#, html and java script language in mobile web was chosen for the greatest features they provide to develop complex systems perfectly; such as debugging tools, publishing tools and other fascinating features, Fig (8)(9) show some interface for proposed system

Fig (8) interface for upload lesson

Fig (9) interface for Online exam

VI. Different Effort Estamation in Agile Methodology

The differerance between the estamation time in the planning phase in agile development and real effort shown in the Table (2) for system with relative error . for each story of each sprint, the effort estimated with Story Points. The real effort, and the relative error of the Story Points estimates was calculated as follows [59]:-

$$\textit{Relative error: } \mathrm{RE} = \frac{\text{Actual} - \text{Estimate}}{\text{Actual}}$$

The relative error (RE) gives an indication of the divergence between the values estimated by the model and the actual values, expressed as a percentage. This relative error can be either positive or negative, representing either an overestimation or an underestimation Fig (10) Estmation and actual hours for system(N=13 tasks) with story point.

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Table (2): Estmation and actual hours for system(N=13 tasks)

NO	iteration	No of Work(hours)	Effort (estimation) (1)	Effort (actual) (2)	under/over estimation (H) (3) = (2) -(1)	Relative Error (4) = (2) -(1)\(2)
1	1	9	45	40	-5	-13%
2	1	9	18	14	-4	-29%
3	1	9	27	25	-2	-8%
4	1	9	27	25	-2	-8%
5	1	9	27	30	3	10%
6	1	9	18	15	-3	-20%
7	1	9	36	30	-6	-20%
8	1	9	18	15	-3	-20%
9	1	9	18	20	2	10%
10	2	9	45	43	-2	-5%
11	2	9	45	40	-5	-13%
12	2	9	27	25	-2	-8%
13	2	9	18	15	-3	-20%
Total			369	337	-32	

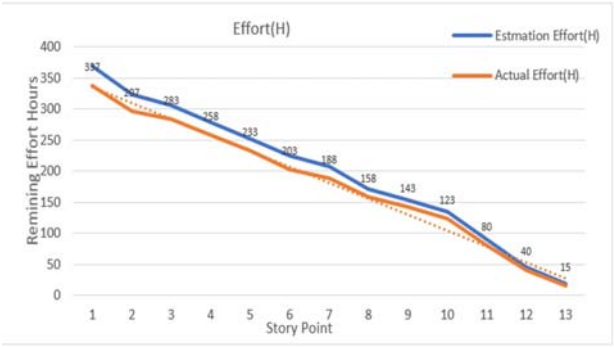

Fig (10): Estmation and actual hours for system.

VII. Quality Evaluation for System

The method of evaluation of system based on method based on a set of ISO - IEC standards [16]. A quality model consists of a group of characteristics that relate to each other and which supply the basis for specifying quality requirements and quality evaluation.

Table (3): Score for each Quilty Criteria for system. And Fig (11) illustrated Score for each Quilty Criteria in sytem.

Question	functionality	Security	performance	Pedagogical	usability	support	communication	portability
1	10	10	0	10	10	10	10	10
2	10	10	7.5	10	10	10	0	0
3	7.5	10	10	10	7.5	10	10	10
4	10	7.5	7.5	10	10	7.5	10	10
5	10	10	7.5	10	7.5	0	7.5	10
6	10	10	10	10	7.5	7.5	7.5	10
7	10	7.5	7.5	7.5	10	10	5	10
7	7.5	7.5	7.5	10	10	7.5	0	10
9	10	7.5	10	0	10	7.5	9	10
10	0	10	10	10	7.5	10	6	10
Score	85	90	77.5	87.5	90	80	65	90

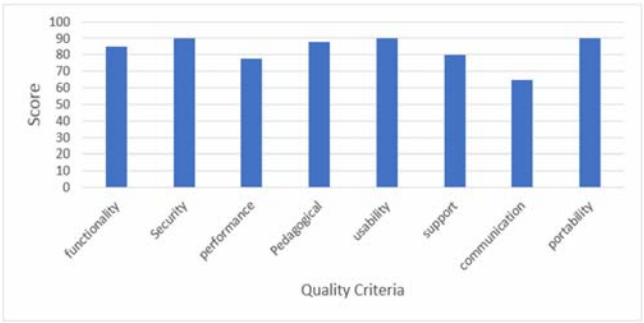

Fig (11): Overall Score for each Quilty Criteria in sytem.

VIII. Conclusion

System is a high-quality Web mobile development method, combined the advantage of Agile Development and reused Web framework. It is an excellent Web development technique for the Web mobile application system which require to quickly service, quick response, and rapidly adapt the change in requirement. Web mobile learning system is important in future learning system, can be easily adopted by institutions to be used as a separate learning system due to use of user friendly menus and easy to access functions and features. Client-Server network architecture provides more control and easy management for the user however at the expense of scalability and congestion problems. quality analysis system based on the quality factors of ISO-IEC9126 quality model. The results show that improve the efficiency of the system.

Acknowledgement

I would like to give special thanks to my supervisor. ***Dr.Karim Qasim*** *for* his valuable advice, guidance during the study research. *My deep thanks also to* ***Dr. Sajida Lafta***, ***Dr. Lamia Lafta*** and Khawlaa Turkey in university of Baghdad for *support during the period of study.*

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