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System Development Methodology for ProTect Company : A Study

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ABSTRACT

System development is the process of analyze, design and implement the project based on various possible dimensions.Various types of methodologies involved in software development in order to create new project.Nowadays in the software development life cycle one of the most important way to develop systems by using agile methodologyis to bring good quality of project development. This paper described about a detailed survey about the system development methodology for ProTectcompany. Also here explained about security and deployment in software development.

Keywords:Analysis, Coding, Design, Implementation, Testing, Maintenance

I.INTRODUCTION

ProTect is a software company that consists of three departments that is linked together by a central management team consisting of mobile, web, and games applications. Each department is responsible to produce several projects for various clients. Specific skills are desired in order to employ developers with their respective department. The central management system is required upon collaboration with the departments with regards to projects that are based on the client's requirements.

Customers may assign projects to the firm according to their requirement specification and their needs. In addition, customers tend to see the logical design first before the actual project starts to develop. Subsequently after the completion of the project, the client is able to attend the briefing session to understand the various functionalities of the final project. Customers will be given a complete user manual for their own references.

Additionally, the central management team is responsible to assign the respective tasks based on the client's requirements. These requirements are sent to its respective departments in which software developers will discuss the appropriate budget, timeframe, and application type. Furthermore, customers may request to make changes to the project during the first stage of the project development. The central management team will analyze the project with the departments that are involved in the project's lifecycle. During this stage, these changes will be carried out if it does not affect the other requirements of the project. In addition, cost will be applied to the changes depending on how urgent or challenging it is to apply the change as it may affect the time constraint of the project. The central management team may request an extension of the project time as the changes that are requested can affect the progress of the project.

1. 1 AGILE PRINCIPLES

ProTect is a huge system that is divided into three departments. To produce a high-quality application in a short development time, each department is broken into small and manageable components to monitor the development closely and to focus and analyze the key functions of each department. In addition to producing a high-quality product, the respective members are responsible to maintain a good design that is simple and easy to use whilst adopting the latest technologies. Throughout the lifecycle of a system, changes that the client requires should be clearly understood to develop solutions to manage the change. A key agile principle is to manage these changes even during the later stages of the development. Due to managing these changes, the working software is delivered frequently to reassure that it meets the client's requirements. Furthermore, changes that are made in one department should not affect the functions and requirements of the other two departments. Reliable communication amongst members builds trust and motivates members to develop solutions to counter-act upon possible risks. Producing a successful system includes good communication with the members that are involved during the development process. This prevents errors that may occur in the later stages and finding methods to reduce the risk of these errors from occurring. Departments that undergo an agile methodology must abide by these key principles in order to develop a successful application. New features of an application are delivered to the stakeholders frequently to analyze the progress of the application, this allows the developers to carry out the necessary changes continuously throughout the application's lifecycle.

II.METHODOLOGIES

A development team is able to focus and improve on the product quality by adopting an appropriate methodology for each application. An agile method encourages user involvement in the entire development process to adapt to any changes that are based on the user requirements. The product is developed and presented to the users to receive their feedback to further enhance the quality of the product, this is carried out throughout the development stage.

2.1 GAMES APPLICATION

RAD best suits the department of game application as it requires thorough planning to ensure that the application runs on multiple platforms. Emphasis should be put into the first stage of the RAD methodology, planning requirements, as it is vital for the developers to ensure that they fully understand what the users want. Unlike other applications, several game applications have a sense of unity for each game. Each game consists of its own storyline and gameplay which makes some stand out more than others. Additionally, each user has different requirements which makes most of the projects appear complex; therefore, it requires experienced developers to ensure a fast delivery.

2.2 MOBILE

Mobile applications require partial documentation to ensure that the updated versions of the application are better than the previous. Therefore, DSDM is the best suited methodology for this department. Furthermore, basic functionalities of the application are delivered at frequent intervals in order to gain the user's satisfaction

and to ensure that errors with a function is eliminated as soon as it has been identified. As several mobile applications are similar in terms of purpose, it is vital that each stage of the methodology is conducted in order to avoid any high risks that may occur.

2.3 WEB-BASED

The best suited method for this department is SCRUM as web-based applications consist of small scale projects that require minimal documentation. This is ideal for start-up businesses that require a platform to advertise their business at a low cost and a fast manner. The primary users for this application will be the business' customer therefore web-based applications that utilizes this methodology emphasizes on the user's involvement throughout the development cycle.

III. SYSTEM ANALYSIS

Data is gathered using various elicitation methods such as interviews, observation, surveys, etc. Prior to selecting the appropriate system analysis techniques to apply for the given department, it is a key fundamental to assess the data that has been gathered. The importance of gathering data is to support decision-making, suggest conclusions, and identify any useful data. The recommended requirements gathering technique for web-based applications is observation as it produces qualitative data that is strong on validity and detail [1]. Document review is the suggested approach for mobile applications as it delivers qualitive data that is unobtrusive and provides a valid source of background information that cannot be accumulated from other approaches. Additionally, it is prevalent in marketing in a manner that eliminates any big data that could possibly be biased which is vital for ProTect to outsource their services [2]. Surveys should be utilized for the games application department as the applications should be based on its users' interest with regards to the gaming category. Additionally, surveys encourage closed-ended responses which enables the developers to analyze and process the data with ease. Big data that is gathered through observation and document review undergoes a qualitative data analysis as the data will be transformed into a detailed explanation, understanding or interpretation of the web-based application department and how they are integrated in order to produce subjective conclusions [3].

Data is gathered iteratively for surveys as it undergoes a quantitative analysis; additionally, data that is required to carry out the necessary functions has to be up-to-date and valid. Quantitative analysis processes structured data in order to produce objective conclusions. Data mining is the process of analyzing data from different perspectives and summarizing it into useful information in order to allow developers to analyze the data to recognize further business opportunities [3]. Through a qualitative and quantitative data analysis, developers are able to gain a clearer understanding of what the stages the application should undergo with regards to the target market and the necessary requirements to be implemented [4].

Data should subsequently be associated with each other in order to understand the connections between each data and how they are related. The fishbone analysis is the most suited approach for business intelligence such as data mining for the department of web-based application as the data is dependent on an aggregation as per focusing fully on the business information. Very minimum quantitative data is available for analysis; therefore, the fishbone analysis assists in visualizing potential solutions for the given project. The fishbone analysis

involves a number of brainstorming techniques to develop procedures that will overcome problems in the system and the possible effects from these procedures. Conclusions are easier to be developed as this analysis is able to produce clearer information to develop business decisions. Mobile and game applications are too complex for the fishbone analysis as the respective applications contain several components that are integrated with each other at the same time to satisfy the user's requirements.

SWOT analysis should be utilized to associate the data in the mobile application department in order to identify its strengths, weaknesses, external opportunities and threats. Additionally, this analysis allows the department to create unique strategies to differentiate themselves from their competitors [5]. Most mobile applications are created to expand the mode of services for a business opportunity. Therefore, it is a key fundamental to analyze the strengths available in the current system in order to relate to an organization's competitor and develop opportunities that would allow the system to be unique and up-to-date in terms of technology and social patterns. Likewise, the weaknesses that the current system consists of and the threats it may face should be pointed out to allow developers to progress from the weaknesses and produce a reliable system. SWOT analysis allows developers to identify issues that affects the current system in order to develop solutions to better the system. Games and web-based applications do not benefit from a SWOT analysis for the reason of ambiguity amongst the data collected through surveys and observation; developers are not able to associate the data with each other as each attribute from the data is identified to have only one influence on the problem affecting the current system [5].

Analytical analysis is used to resolve a specific issue with regards to the current system; therefore, it is task-limited. This is beneficial for the games application department as it helps developers to better each version of the game with a specific focus such as; better graphics, storyline, gameplay, etc. Based on the data that has been gathered through the survey, developers may analyze the majority a user's preference in order to direct the focus for an analytical analysis. Mobile and web-based applications have several focuses that may or may not affect each other if it has been enhanced; therefore, each issue of the application will have to be resolved together. For this reason, analytical analysis is not the most data aggregation method for mobile and web-based applications. Data that has been compiled and associated with each other in the web-based application should be presented in a line graph respective of each website's usage; this enables developers to develop a conclusion with regards to the data that has been thoroughly analyzed in order to produce a system specification. A line graph allows developers to produce reliable data that gives an estimate in the case of missing data with some degree of certainty. This mode of visualization allows developers to understand the relationship between the different components of the web-based application in order to demonstrate any trends and changes within the application.

Data should be presented in a Venn Diagram for mobile applications for the reason that data was associated with the use of a SWOT analysis. A Venn Diagram allows better comparison in terms of the current system's strengths and weaknesses. Therefore, this presentation method will allow developers to grasp a better understanding of which part of the system they should focus on. Furthermore, a Venn Diagram is versatile as it can be used to allow developers to identify any connections, proportions, and relations with the data that has been compiled [6]. A bar chart is most suitable to present the data that has been compiled and associated with

each other for games application. This allows a better comparison with regards to the users' preferences. In addition to displaying each data category in a frequency distribution, bar charts summarize a large data set into a visual form [7].

A conclusion will be based on the analysis of the entire system in order to produce a System Requirements Specification (SRS). This SRS contains various requirements that serves as the framework of the system, it will be delivered to the design and implementation phase prior to introducing the application to the public. Analysis tools are used to aid the stages of system analysis. These tools are used to collect, store, inspect, and present the data in an efficient manner that will be fast and reliable in addition to bettering the product or service for users. The most suitable analysis tool that should be utilized for this each department is Statistical Analysis System (SAS) for the reason that it provides advance data analysis, business intelligence, data management, and predictive data analysis. Additionally, SAS is extremely adaptable to the various analysis techniques as it fully utilizes its in-built algorithms to produce reliable results that is easily documents and verified to meet the user's requirements [8]. Due to its high adaptability, SAS helps to cut cost at ProTect as all the departments may employ its features.

IV.SYSTEM DESIGN

System design consists of translating the data that has been accumulated and associated into models that defines the application's architecture and components. This phase consists of three main design concepts that are applied to each application; conceptual, logical, and physical design.

4.1CONCEPTUAL DESIGN

A Massive Multiplayer Online Role-Playing Game (MMORPG) application will provide adolescent users a gaming platform to socialize and attain a passion for the game. As RAD is the proposed methodology for this application; user involvement is high, a storyboard should be employed to illustrate the storyline of the game and be approved by the users. Storyboards allow developers to associate links between screens and make the necessary adjustments based on the user's feedback. Furthermore, a storyboard will demonstrate how each interface of the application integrates its course elements such as the content, graphics, and animation that is tailored with the user requirements [2].

Similarly, DSDM has high user involvement as mobile applications are developed to assist a business functions. A storyboard is able to translate each flow of these functions to the users. Mobile applications are bound to multimedia that emphasizes on graphics to create a mobile application that is easy-to-use and efficient [9]. Additionally, story boards allow developers to situate the user interfaces in the real-world context [10]. Correspondingly, business functions are assisted by the use of web-based applications. The SCRUM methodology emphasizes on user involvement; therefore, a context diagram will be able to show the concept and scope of the system to be validated by the users. This diagram consists of the system's major processes, interaction of the system with external entities, data stores and the flow of data with the system. Users without technical knowledge is able understand how the application operates through a context diagram [11].

4.2 LOGICAL DESIGN

A class diagram allows the developers to associate the dependencies between the classes, this is important for the game application as the components are classified with each other to share common characteristics. Developers are able to understand how the application should operate and what each outcome is to be expected, this will result in an easier and more productive testing phase. An activity diagram is utilized to design the internal processes of a web-based application as it describes the flow of each activity in the application. Additionally, business and operational processes that the application should attain must be comprehensible to the stakeholders and developers. It's simple and clear design allows developers to understand the actual work flow of the application [12]. In order to ensure that all requirements are informatively written to prevent project development failure with regards to mobile applications, a use case diagram is developed to demonstrate who the system interacts with and the business functions that the system must partake. Both the user and development team are able to discuss how the application flows in the case that a change is required as use case diagrams are used to identify, clarify, and organize the application's requirements fairly accurately [13].

4.3 PHYSICAL DESIGN

Animation should be applied for game applications as the characters during gameplay should create an illusion of motion. Users are able to provide practical feedback based on the appearance of the application. Furthermore, animation will allow the gaming application to stand out amongst its competitors. Prototyping is employed for web-based applications in order to illustrate the physical appearance of the system. The graphical user interface of the system must be designed to satisfy the user's needs with regards to the ease of use with the application. This design method is suitable for the reason that changes with reference to the interface of the application can be carried out with ease. Additionally, users are able to grasp an insight on how the application will function. Unclear functions can be identified easily and any errors or misjudged design may be detected in the early stage hence cutting cost [14]. Furthermore, a majority of web-based applications are developed to solve a business problem; a prototype may be utilized to train the employees whilst the real application is in the progress of being developed. Likewise, creating a prototype for mobile applications allow developers to identify any misunderstandings with reference to the user's requirements. Prototypes may act as an experiment to observe how the users utilize the mobile application. Furthermore, this method results in an enhancement design quality that is user friendly.

A good design is based on the creativity and innovation as well as its ability to adapt to the market demand and environment. Therefore, a system's design is dependent on the purpose of the system and the target audience; the user's requirements is based on, a conceptual, logical, and physical design to assist the development process.

V.IMPLEMENTATION AND DEPLOYMENT

Object-oriented programming is a vital technique that should be practiced among each application as it allows better control of modifications made on the codes and it will be able to backup and restore the data that has been accumulated [15]. Objects that are created in the application may be reused in the future for its upgrades. Additionally, applications will be implemented in Visual Studio, a coding platform that enables a direct link

with MS SQL Server to store the necessary data for the application. Furthermore, Visual Studio will be able to maximize the development team's productivity by providing a set of agile tools such as gross-platform tools that enable the developers to implement their solutions [15].

5.1 CONSTRUCTION

Game applications should be implemented using C# as the programming language as it produces a flexible application that may run on several platforms such as Xbox or PlayStation. Additionally, it contains a vast library of classes that allow functions to be easily implemented. HTML5 enables web-based applications to adopt a neater set of code which allows developers to trace errors more efficiently. This programming language produces an offline application cache that allow users to enter previous visited pages while they are temporarily offline [16]. Object-Oriented programming with Java should be implemented into the mobile application as it allows the application to be utilized in several platforms such as Android and iOS. Java is platform-independent; therefore, it contributes to being able to run the application in multiple platforms without modifying the lines of code.

5.2 SECURITY AND COPYRIGHT

Game applications are protected by the intellectual property rights; this law enforces legal rights to inventions, designs, and the artistic works that were undertaken prior to releasing the application. Furthermore, it ensures that the developers can profit from their work without the fear of misappropriation by others [16]. Trademarks are utilized to prevent misleading advertising and assist users with distinguishing the application amongst others [16]. License agreement is a legal contract between the website's publisher and the end user of the website. This document contains the rules and regulation of the web-based application which the user is required to agree whilst signing-up to utilize the services provided within the website. The content of license agreement includes license granting, restriction on use, infringement information, termination of licensing, limitation of warranties, and limitation of liability. Peer-to-Peer(P2P) File Sharing and Copyright Law should be applied to mobile applications as it allows users to share files within the application. Users that install the application shall automatically agree to the Copyright Law which provides their authorization for other users to receive and share their files. However, there are security risks that involve this file sharing protocol as the mobile device is vulnerable to malicious software and viruses.

5.3 TESTING

Mobile, web-based, and game applications will carry out two different testing; dynamic and static. Static testing involves creating a test plan in order to find and eliminate any errors without executing the application [2]. This allows developers to receive early feedback with regards to the quality and any errors that may be present within the application. Whereas, dynamic testing executes the application to test the memory usage, CPU usage in the appliance, response time, and the overall performance [2]. This mode of testing assists in improving the quality of the application and identifying any errors that a static testing may have missed as a single unit is tested individually prior to testing the unit with other units and later testing the entire system. Testing the application

will ensure that the application does not exit unexpectedly when other components are integrated. User acceptance test is vital as each application applies agile methods where user involvement is high. The user will execute the application to provide any necessary feedback with regards to any changes they would like to implement into the application. Additionally, an installation and compatibility testing should be performed to ensure that the application has been successfully installed without affecting other existing applications in the respective appliance.

Game applications undergo several quality assurance tests to ensure that the application is error-free; however, existing errors are repaired as soon as its identified. A compatibility test certifies that a mobile application may be installed in Android and iOS devices without affecting the quality and functionality of the application. Web-based applications are required to undergo a speed test using several web browsers in order to improve the application for a better performance and optimization. Bench marking and profiling tools shall be utilized during the testing stage of each application. This assists in highlighting the application's usage and storage allocation in the respective appliance installed in. Additionally, the application's performance is compared with other applications in order to better the throughput and response times during the comparison.

5.4 SYSTEM DEPLOYMENT

With comparison to several applications, the system change-over method that should be applied to the game, mobile, and web-based application is direct cutover. The old application is deleted in order to be over written by a new and updated application. A direct cutover operation is necessary when quick delivers are critical as the usage of the old application from the users is decreasing. Applications are able to remain popular as a decrease in usage of the application is overcome by implementing updates. This is the least expensive method; however, it involves high risk of data loss as the application may not revert to the old application as a backup option [10]. Furthermore, it takes time for the users to get used to the added functions of the updated application.

Game updates and new features should be installed immediately to enhance a user's experience in the game; Neverwinter and World of Warcraft practices this method. WhatsApp is a popular mobile application that applies this method; a new story feature that was derived from another application has been implemented into the updated application. E-commerce, such as Lazada and eBay, is a major component in web-based applications; therefore, users require immediate changes with regards to a variety of products. Further implementation should be undertaken to better the results that were accumulated from the testing phase. This will allow the developers to evaluate the reliability and efficiency of the application. Implementation and evaluation tools such as the Continuous Quality Improvement (CQI Tool) is utilized to assist this phase of an application's lifecycle. This tool summarizes the results accumulated in order to perform changes to the application's implementation.

VI.CONCLUSION

Game, mobile, and web-based applications should undergo an agile methodology in order to abide by a flexible and collaborative framework. This methodology enforces testing throughout the application's lifecycle in order to ensure than an application is error-free. Additionally, agile methods practice various risk management

techniques that will allow the development team to identify any faults within the application in order to eliminate it or respond to a sudden change. In order to produce successful applications for ProTect's clients, collaboration is vital between the developers and stakeholders to ensure that the application meets the requirements and is delivered within the allocated time. Additionally, collaboration between the three departments should be partaken as clients are able to request for an application that may be integrated with other applications such as gaming applications on the mobile or expanding a business' website into a device to increase the users' productivity.

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