Modified W Model for Handheld Application Development

Sanjana Tiwari, Shrish Bajpai, M. Arshad

Abstract— **With the growing demand of different handheld devices, a large number of software applications have been develop for these with the use of reusable components or code of the existing applications, have become increasingly imperative. Application development cost, time to hit in market and quality product are the three most important factors affecting any handheld application. To enhance the reusability features of the handheld applications, a new process model is required and in the light of that, Modified W Model is proposed for the development of handheld application which lays emphasis on domain engineering, cost estimation & risk analysis in every major phase to improve the quality and to reduce the cost & time. We can schedule test activities as close as practicable to the development activity that guaranteed the products to be tested. This Modified W model provides guidance for the all present phases to be followed under its umbrella.**

Index Terms— **Software development model, handheld application & component based development.**

I. INTRODUCTION

Rapid development of smartphones & professional pocket PCs have spread innovations in electronics in recent couple of decade[1]. It has been realized that handheld companies have developing the devices rapidly & launching it after a short span of time with replacing the older one. Any handheld device know for it's hardware configuration & loaded applications. But most applications are almost similar but a little change as they have different hardware configuration or different operating system , handheld application should be compatible to their respective hardware configuration. Many applications are based on open source technology, so their code is also available. It has been realized that component base software development promotes code reusability, software quality & increase software engineer productivity. In proposed model, each development phase from requirement to operational system is mirrored by the dedicated testing activity. The main aim of the test activity specifically is to determine whether the objectives of a development activity have been met and the deliverable meets its requirements.

Shrish Bajpai, Assistant Professor Deptt of ECE, Integral University Lucknow.

M.Arshad, Assistant Professor Deptt of ECE, Integral University Lucknow.

Modified W Model address the short coming of the other software development model such that Waterfall Model, V Model, Spiral Model, Increment Model, Y Model, X Model, W Model etc [2-6] and it covers all the required functional & non functional requirements (performance, load & stress issues of the handheld with respect to the it's hardware configuration) for development & testing team of the application under the dedicated phases with short span of time with less number of manual hours or recourse persons. It has advantages with respect to the other models such that back to back testing process with development process, which takes the minimum time for development of a new application & reusable code can be integrate at the appropriate phase of the proposed model. Modified W Model is made of two V model which represents validation & verification process in this proposed model. This Modified W-Model of testing focuses specifically on the product risks of concern at the point where testing can be most effective. In this proposed Modified W Model number of stage counts are reduces with the other existing W model.

II. MODIFIED W MODEL

Since the market of handheld devices are changing very fast now a days, development or extension or enhancement of any existing application with the component base development is advisable [7]. Present model is useful for both, a new application development as well as modification or enhancement or designing a new add on feature of any existing handheld application. Modification or any change in the high level documentation software requirement specification (srs) & test strategy document at any stage but not at the end stages of the proposed Modified W Model. Proposed Modified W Model has seven stages in which each development activity is monitor by a dedicated testing activity as shown in Fig 1.

Application development process start from the requirement phase which is followed by system specification, component selection & development outline, code development, module development, system development & get completed at operational system phase. Requirement phase of the development process, issues related to resource planning including team size, software & hardware needed for the development & in how many platforms (different hardware configuration) this develop application have to deploy is discuss in this current phase. In this initial phase, it is also considered that any add on item(s) have to develop with this application & which technology (programming environment) will be used in the development of the application from development end.
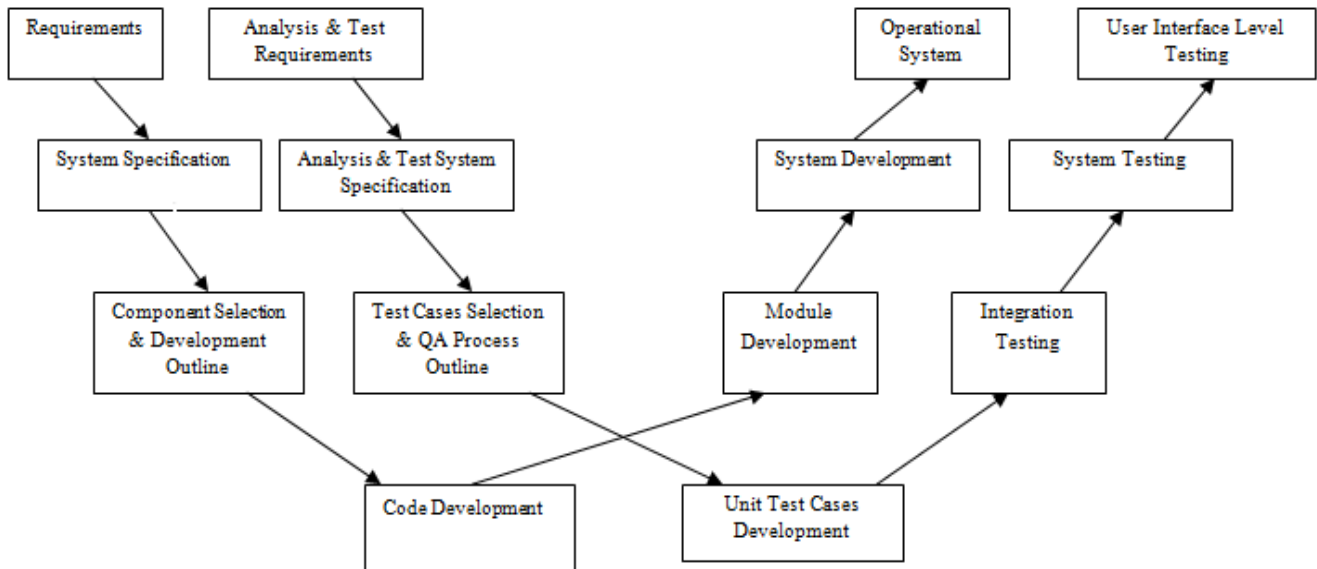
FIG 1 : Modified W Model for Software Development

Analysis & test requirement phase check that weather requirements meets & QA team make it's own strategy how to do the QA process with the development team for this application. Time related, number of releases of the application, functional & non functional testing process and regression testing issues is also covered and discuss in this stage. This opening phase of both, development team & QA team is generally handle by the high level team members & major outcomes will discuss by higher official to the other teams members in the later stages. Systems specification phase is generally handle by the software architecture who is the domain expert. The system requirement phase demands the software architecture to study the whole application and its constraints, understand the major features of the application, understand the requirements expected to be satisfied by the software system (operating system & hardware configuration of device), how much reusable features or component can be develop & generate an abstract model of the application in which these requirements are met. The major outcome of this phase is a graphical or textual description of a abstract model of the application under development. At this phase, the services delivered by a software system help figure out its subsystems and major components. Analysis & test system specification phase is handle by the test lead to study the application & it's QA requirements for testing of function & non functional testing including any tool is needed for testing process. QA team design it's test strategy & test plan for the testing of application. Test strategy is a document which should be design for one time but get updated if any changes occur during the developing of the application in later phases. Test plan may be made for each general or regression release. Component selection & development outline phase is connected with last corresponding phase as outcome of last phase is implemented here.

Reusable components or any feature or module of the application which develop from the existing code should be define in this phase by the development team. QA team can use existing test cases for corresponding feature whose code

is available to the but they have to check that these test cases covers all the features for black box testing and a good code coverage for the white box testing. QA team needs to modify the existing test cases and test scenario if there is any change in implemented hardware configuration or operating systems where the existing feature was deployed. In this phase a framework could be viewed as a generic structure that provides a skeleton for development of application. Frameworking attempts to identify components and establish interrelationships perceived important within the application domain. While performing frameworking, software engineer might have a idea about target components or feature or module for reuse from existing database. After identification of the reusable code, features, test case & test scripts, code development phase get started with development of unit level test cases. In code development process, code should be less complex and effective so that less amount of time is needed for processing the application. Unit implementation , exception handling, dynamic resource usage related, memory leakage, basic performance, local data structure error, synchronization with other application or feature or network & graphical user interface formatting related issues are cover in the unit level test cases. With this for highly critical applications such that banking application or security applications, code coverage & statement coverage are also done by the QA team in white box testing process. Module development is the development of independent features of the application which is use code which is develop and tested by QA team in the last phase, integrates with the given interface & other feature of the application. Interface integrity, data sharing error, data loss, exception handling, resource hogging, build & functional issues with network associated issues (if any) are covered in the integration testing. Integration testing have mainly two objective that detect the defect those occur at the interface of the units or module & assemble the individual module into working subsystems and finally a complete system that is ready for the system test. Major outcome in this phase is that functionality of the individual feature of application should be develop & tested before moving to the next phase of the proposed model. In system development phase, all modules or features

are get integrated, creates a system or application. This system (application) should be compatible with the operating system & other application present (install) in the handheld. Functional & non functional issues which includes performance, load, stress, reliability, usability, security, configuration, compatibility & recovery issues are covered in the system testing. QA team have to perform black box testing to test the application in the system testing. Now the last & final phase in modified W model is operational system in which development team have to develop the application for different. QA team which is separate from the other teams have to test application on the shoe of the end users or customers. If the application is associated with the network end then field testing is necessary which test network related issues such that network coverage, mobility, signal strength etc issues.

III. AN EXAMPLE

A handheld application "Phone Health Checker" have to develop with under the guidance of proposed Modified W Model which is accountable for the health of whole handheld, checks all major features present in handheld, prepare the report & sends the report back to operator or manufacture through network. Phone Health Checker is application which has major features such that battery life cycle checker, signal strength, processing speed of application install in handheld etc.

For development of this application "Phone Health Checker", first all requirement have to gather for development of the application such as programming environment use to develop application, in which hardware configuration & operating system it has to be install with the size of the development & it is need to check that this application should be compatible with the other applications or features going to present in handheld. Parallel to this activity, it's corresponding mirror activity, analysis & test requirement get started with the analysis of the requirements which is develop in the corresponding left hand side activity. After requirement, system specification activity start in which abstract model of whole development process of application is designed. Working scenario of Phone Health Checker or it's features, dependence on other feature or application or network or manual interaction has to be discuss in this phase. Component selection & development outline is the most important phase in which reusable component or existing component has been picked & some outline regarding that has been sketched out. Code development process started with designing of code & picking the reusable component from the database. It's corresponding mirror activity is unit test case development phase in which test case are unit level which is a white box testing. Individual feature or module is develop in the module development phase. If feature or some component of feature is present in database for reusable then it should be used. It's corresponding mirror activity is integration testing in which testing process has been more focused on one feature.

All features or module of the Phone Health Checker get integrated in the system development phase. In this phase application is ready with solving all the underline compactable issues with the hardware, operating system & other present application in the handheld. It's corresponding mirror activity is system testing in which whole application is tested & test cases are more related to the use cases with two or more then two features. Localization & internationalization issues which is more related to the language with the network related issues if any, are the major focus in operational system phase. It's corresponding mirror activity is user interface level testing, α & β level testing has been done with the field testing for network related test case execution.

IV. CONCLUSION

Present modified W model can be use for the all type of handheld applications and also development of any other product which is developing with the component bases development. Modified W model has a clear requirement specification, understanding requirement, low cost, effective recourse utilization & no overlapping in different phases. This model has many advantages over the other existing model including basic W model such as all stages have dedicated targets, increase productivity of the software engineer, less complexity, cost control, risk analysis, less time needed for the completion of the project & useful for both small size as well as big size teams. It has some shortcoming such that domain knowledge person is needed, code should be available for the modification of existing application & it is useful for that type for application development where work on the existing code is needed.

During the test phase, the developer or development team is responsible for the removal of defects and the correction of the implementation to move the lifecycle ahead. The early collaboration and the tight co-operation between the development & testing team can often in practice avoid conflict meetings. Proposed model does not clarify the expenditure needed for resources that need to be assigned to the individual activities. In application development the most important aspects may vary and so therefore the resource allocation is unlikely to be equal across all activity. For highly critical applications such that banking application or security application, the test activities certainly have higher weighting or at least equal weighting with other activities.

REFERENCES

[1] Jon Peddie, "Handheld Market Enters a New Phase: Multimedia", "https://www.khronos.org/assets/uploads/developers/library//whitepaper_handheld_market_enters_new_phase.pdf", accessed on May 05, 2014.

[2] Roger S. Pressman, "Software Engineering : A Practitioner's Approach", Fifth Edition, McGraw Hill Publication, India

[3] Luiz Fernando Capretz, " Y: A new Component-Based Software Life Cycle Model ", Journals of Computer Science1 (1) : pp.76-82.

[4] Kung-Kiu Lau, Faris M. Taweel and Cuong M. Tran, "The W Model for Component-based Software Development", Software Engineering and Advanced Applications (SEAA), 2011.

[5] Littlewood, B., "Forecasting Software Reliability," in Software Reliability: Modeling and Identification, (S. Bittanti, ed.), Springer-Verlag, 1989, pp. 141–209

[6] Somerville, I., Software Engineering, 5th ed., Addison-Wesley, 1996.

[7] Bryan Patten, Inmaculada Arnedillo Sanchez, Brendan Tangney, "Designing collaborative, constructionist and contextual applications for handheld devices", Computers & Education 46 (2006) 294–308