Analysis of Spiral Model in Software Projects for the Software Houses of Pakistan

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Abstract— The Primary goal of this research was to identify and explore the particular risks at each phase of software development, and it also describes the activities performed during software development processes of preferred model and mitigation plan to minimize the risk factors. In every phase of Software development risk is involved. On the later stages of software development the influence of these risks are shown, sometimes causes of schedule slip, or bad management or sometimes direct effect on the cost of the project. Risk analysis is categorized into two stages. One is qualitative analysis and second is quantitative analysis. A lot of research and study is being conducted in risk analysis, and it is still in development process. The objective of the research is to explore or identify the different risks that are involved in different phases of Developed Model. A risk development model is introduced in this research study. The model to be implemented and for testing purpose of spiral model was used and then a model Risk Covered Spiral Model is introduce (RCSM),in which different steps for different types of risks are proposed that affect the cost, time and performance of software model. This research concluded that The Earlier software development model has some deficiencies like exploring risk was not properly handled in their phases, so the developers and users don't have suitable outcome from previous Spiral model.

Index Terms— Risk Mitigation, Risk Analysis, COTS, DDP, SPLE, Quality Assurance, Flexibility and Scalability

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1 INTRODUCTION

THE Information Technology covers a variety of hardware and software solutions that permit the organizations to meet, arrange, and evaluate data that will helps to achieve the goals. With growing applications of IT software industry has grown quickly. Something "macho" in relation to activity high hazard projects "not including the net" and this recognized risk administration is actually assign associated with weakness. Failure and ambiguity are two basic attributes involves with risk [1].

Different software development process models are used in software houses i.e. Waterfall, V-Shaped, Incremental, Rapid prototyping spiral etc. In waterfall model some difficulties are high amount of risk and also uncertainty. It is just a poor type for complicated and item oriented projects. In V-shaped type some negative factors are less versatility and modifying scope is usually difficult as well as expensive. There are no earlier prototypes produced in it. In Incremental model some iteration is rigid and problems may arise pertaining to system architecture. In spiral model high level expertise is required for risk analysis.

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Projects success ratio depend upon risk analysis phase and do not work well for small projects. SRE is a process in which different plans are identify and develop for risk in a software intensive system in its development phase. These risks and uncertainties should be overcome to keep our project successful [2].

The researcher said that systematic risk management was one of the most important management. It has great importance in the interest of the enterprise which is increasing day by day. With the time of fast development enterprise were faced more and more challenges and hard type of risks. Although for enterprise system it is necessary and essential to have a good and latest system of risk management. In the discussed study we have an analysis of the risk management with the respect of enterprise. This analysis was based in the methodologies and theories of spiral model and waterfall model. This analysis also proposed that spiral model can also improve and make better the risk management in the field of enterprise [3].

The proposed model will be developed for better risk analysis and to describe the impact of risk on the different phases or different steps and after it several mitigation steps were identified. For implementation and testing purpose spiral model was used and then new Risk handler spiral model is introduced. The new proposed model will

be recovered the all types of risks involved in different phases. Each phase of this model will define the objectives and deliverables, the completion from the phase is actually marked by the completion associated with assigned deliverables. Risks are concerned in each Stage of Software Application development. The impacts of such risks are showed on the later phases of software development. These risks can affect parameters like budget, and schedule. In Several cases it can also cause the failure of the project. In this research the activities during different phase of software development of some model will be defined. After definition of risks in each phase will be defined and then control the risks by defining the some mitigation steps.

2 RELATED WORK

The researcher described that there are different main points of an organization management. Risk Management is one of them. Risk target are always profitable in all assortment. Risk is always transported for the accomplishment of the different activities. In the organization it references to the all activities. To find a risk and its solution is the main benefit of risk management. The organization value can be maximizing by the good management of the risk. This good management can also improve the success ration then its failure, when the risk is access. A new strategic risk reduction technique was introduced for reducing the income which is expected by giving the permission of per step measure to per risk. Another method in the form of tools called DDP (defect detection and prevention), for selecting the different risk. These risks have a deep impact and requirements [4].

The researcher quantified that the Line Engineering of the software product was a special case in software development process. This case qualifies that the development of new products and news applications is very important. The aim of less impression of the problems that usually occur during the development is to be affianced. Basically the SPLE is demanding the outspoken investments to deliver the best quality and best assurance benefits that the user can take. It also includes a managed process that is not much costly and a sequence program. This program leads us to need and scope of risk management. Risk manager is the basic and appropriate role when the success of a project is discussed. The execution if a process has many chances. If we have a problem as we want to avoid solve or ignore the problem the execution of a project has more chances. The execution is also important for the schedule which is achieved by the results. The results should be positive [5].

The researcher explained that to reduce the risk is an important part of your project if you want to complete your project on selected schedule. So the project management is an important part. So in project management we manage our all factors which can affect by the risk. To solve any problem we need some resources which support the problem solving issues. The discussed model proposes a new method which uses these given and upcoming resources to solve a problem. It also manages and estimates these reserves of new project in modern age in the field of IT [6].

The researcher stated that there were two main steps of customizable risk driven model; from the work distribution its analysis with respect to project risk suggests as set task allocation which based on site-specific characteristics and project. A model of risk driven is proposed which support the decisions of work allocation in software projects. Study and research analyze the current practices of distributed software development, mostly practices defines risks and problems of related work to overcome these problems [7].

The researcher described risk management can be defined as an action that it helps a software team to manage and uncertainty. It also partially means reducing or avoiding uncertainty. A Risk is a potential problem it might happen or it might not; but it's a really good idea to identify the risk, Regardless of outcomes, estimate its impact and asses its probability of occurrence. In the software development projects everyone is involved i.e. Software managers, engineers and other stakeholders in risk analysis and management must participate. But as long as the software industry has been growing software risks have been increasing [8].

The researcher explained that risk management was one of the activities which recognize the risk and then make solutions to solve it. Risk assessment and other strategies also involves in it. Different developing strategies are used to manage it. Risk mitigation is also done. In other permissible causes some of the old and cultural risk management is discussed as natural problems are fire, death or accidents. A few are focused on risks stemming from actual or authorized causes. On other hand the management of the risk is focused by financial management of the risk. These risks can be solving by using merchandized instruments of finance. In the discussed model different phases of process of risk management are described. At the last different tools of management of risk is given and suggested [9].

The researcher defined that software engineering theory has many parts. So the process of software develop-

ment were one its important parts. The task in development of software always provides a specific work. This task contains on the specific steps. The method is reflected and different tools are adopted for this purpose. These tools were used for development of software. A framework of entire process session is explained by the SDP model. SDP stands for software development process model. High quality of the software and its solutions are obtained. If we need a success of software and its project than it is necessary that as software development process model must be correctly selected. Various software development models have been presented at the beginning of waterfall model. A Simple example is fast model of prototype, formal and informal model and at the last COTS based model, model of agile etc. The progress of the development is still in working condition. In theory of software engineering an important step is enjoyed by the development process of software. There were some important issues as the advancement of development of the software project. Even in past these issues did not have any importance. This is not any good research work on it [10].

The researcher stated that for the best development of the project risk management was very important. It is a practice through which the risk can be access. This risk can disturb the software projects, software products and at the last software development process. Most challenges of software development have great risk. This risk can also occur in development process. This paper explains the many risk and different types of risk in different phases of software development process. This process explains many qualifications after risk study. The major purpose of the research is to build a new instrument or tool. This tool visualized for assessment of risk for all the steps of software development. In this research future work also give and water fall model is discussed which is an old and traditional software process model. This model has a clear concept. It shows that each process is related to its previous step and phase. Few risks are considered that can may be arises in any phase of software development process. On the project parameter its impact was also discussed. Finally at the end a tool is introduced. This tool was based on old model as traditional SDLC [11]

3 MATERIAL AND METHOD.

The presented model is "Analysis of Spiral Model in Software Projects for the Software Houses of Pakistan". The identification, exploring of risk at each phase of software development, impact of risk on different phases or different steps and several mitigation are identified in developed

model which were not mentioned in previous model. In this developed model authors made some variation regarding risk analysis, impact of risk, exploring of risk on different phases of software development model. The developed model is very helpful for using in testing purpose. The developed model is iterative and incremental based.
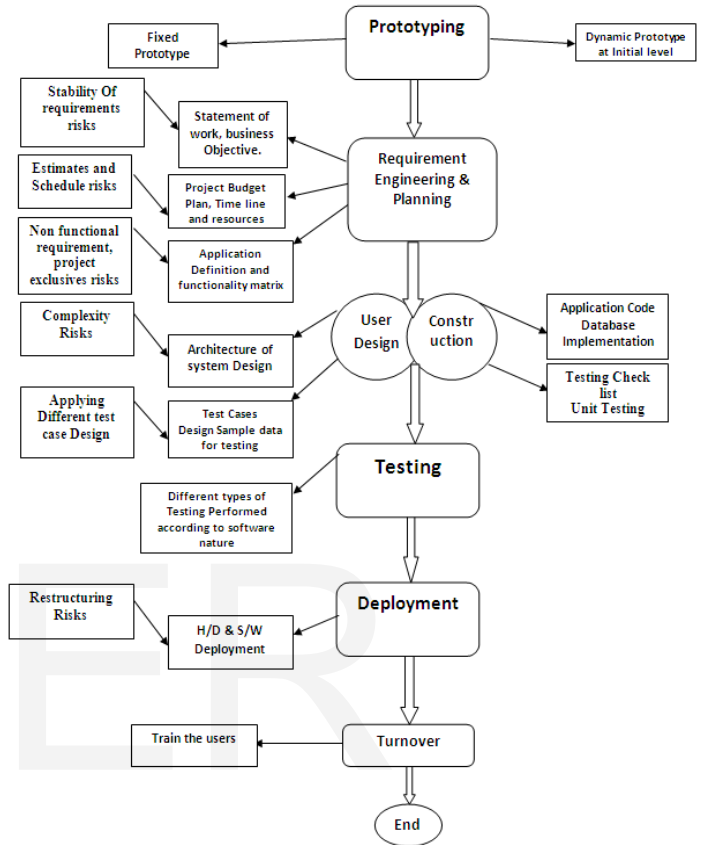

Fig. 1. Analysis of Spiral Model in Software Projects for the Software Houses of Pakistan.

In the Prototyping Phase focuses on communicating with the customer in setting where the players can works together to define the goals of application and its success criteria. Typically, the Business analyst, the Tech Lead, The GUI expert, and the project manager spend a week with customer during whom the initial draft of requirements is created and results in a static prototype or Dynamic prototype at initial level.In Requirement engineering and planning phase it covers the degree of skill competency which is concern software development faces the major risk when the development team has not enough or competency to develop the software. The Third step in requirement engineering and planning phase is working team harmony which is concern with Team member's attitude is a thing to be considered in the team formation. Unreal estimate can be a risk in the software development. Sometimes customers forced on early delivery of the software which

causes make the realistic project schedules. These risks can affect the cost as well the repute of the organization. In this phase also covers Targets/Client Environment risks which concern with number of different stakeholders and level of clients. The requirements engineering and planning phase also deals with estimated and schedules risks which is furthers categories into The development estimated time frame of the project, schedules, whether fixed or flexible and project financial justification. At the last step of requirement engineering and planning phase covers stability of requirement Non-functional Requirements and performance requirements which deals with ambiguous performance requirements can be a risk for projects. The Design phase risk covers complexity of risk which undergoes the function and algorithm complexity. The construction phase risks follow the use of reusable components, expertise of resource person on reusable components and command on programming language and tools. At the deployment phase risks which deals with physical restructuring of sites where software is to be installed covered the system having requirement of special hardware to be installed sometimes need for physical restructuring of the offices and development of the new sites. There can be risk involved while installation of new sites, because the structure of the office or site is very important. The testing and quality assurance phase it is assumed that all code has been unit tested. And basic integration testing has been completed. The testing phase focuses on rigorous scripted testing of every functional requirement in the application as listed in the functionality matrix.

The turnover phase of developed model covers once the application is running on the production server and has been stabilized, the users can be trained to use it properly and efficiency and the administrator for the application can be trained on the various maintenance aspects. This can be done in a week or so of organized classes.

Data analysis is done by undertaking some consideration about variables. Normal curves are being used to examine the normality of data and on the others hand relationships among dependent variable i.e., Quality of Product and independent variables i.e., Time Consuming, Limitations and Reliability, Resources & Unawareness are examined through Graph and results are explained in graphical and tabular forms both.

Variables	Minimum	Maximum	Mean	Standard Deviation
Quality of Product	2	5	4.1447	.51859
Validation	2	5	4.0677	.63219
Limitations& Time Consuming	2	5	4.2523	.48400
Reliability, Resources & Unawareness	2	5	4.2383	.49340

Table.1. Descriptive Statistics

An appropriate look upon the data in above descriptive statistics table we get graphs which shows that data are normally distributed and bell shaped.
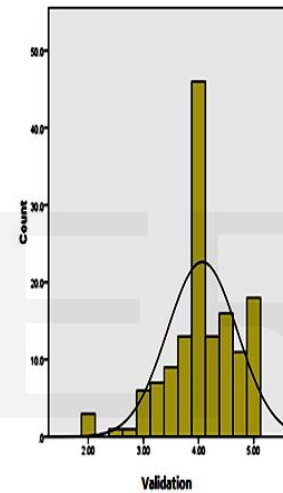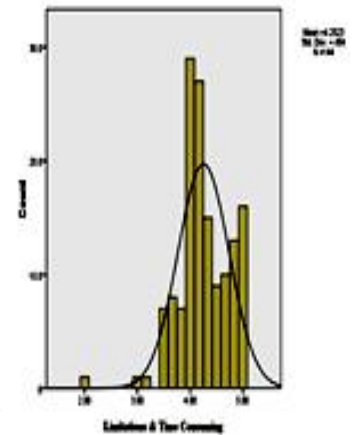

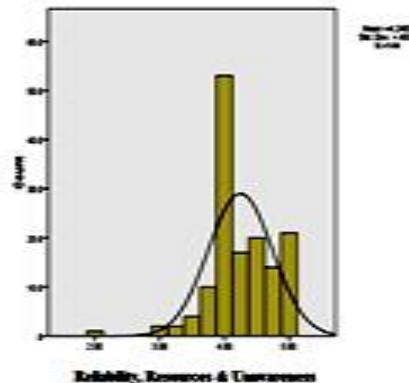**Fig. 2.** Validation   **Fig. 3.** Limitation & Time Consuming

Fig.4. Reliability, Resources & Unawareness

4 BENEFITS OF DEVELOPED MODEL

There can be many benefits of developed model for stakeholders. However, there are some important benefits of proposed model are given below.

4.1 Increased Speed

As the name suggest Spiral model primary advantage lies in an application increased development speed and decreased time to delivery. The goal of delivering applications quickly is addressed through the use of Computer Aided Software Engineering or CASE tools.

4.2 Increased Quality

Increased Quality is a primary focus of Spiral model methodology. According to Spiral model quality is defined as both degrees to which delivered application meets the needs of user as well as the degree to which a delivered system has low maintenance costs.

4.3 Reduced Scalability

Spiral model focuses on development of prototype that is iteratively developed into a full system, the delivered solution may lack the scalability of a solution that was designed a full application from the start. At Automated Architecture our Just-In-Time application generation methodology provides the benefits of spiral model while minimizing many disadvantages, such as reduced scalability, through the generation of an enterprise level "prototype" that provides as a starting point a scalable, efficient, and well-designed application.

4.4 Support Projects Management in efficient way

The projects with larger scale having lots of functionalities are sometimes difficult to manage. But by using this model large scale projects will be handled easily by dividing the work into small teams. The dedicated team members working under the supervision of a specialist leader should be able to perform quickly and efficiently.

4.5 Reduced Features

Due to time boxing where features are pushed off to later versions in favor of delivering an application in a short time frame, Spiral model may produce applications that are less full featured than traditionally developed applications. This concern should be addressed as soon as possible through clear communication with client as to what will be delivered.

4.6 Flexibility

The Spiral model is first model which is most flexible among Software Development Life Cycle models in position. Project manager can be determined the development phase according to complexity of project.

4.7 Efficiency

The Proposed Spiral model is so much clear in its different phases and hence it is expected that it will provide efficient output, because efficiency plays a most important role in the development as well as in testing stage of software product.

4.8 Project Estimation in More Realistic Way

In the Developed model Project estimation in provisions of schedule, cost etc become more realistic as the project moves promote and loops in spiral get completed.

4.9 Better approach for testing and development

The Spiral model provides top approach for testing and development for the projects which are most complex and large one.

4.10 Support Business Objectives

The Developed Spiral model helps towards the stability of requirements regarding risk in requirement engineering phase. The changing requirements can affect the overall system. It can also affect schedule as well as cost of the development.

5 CONCLUSION AND DISCUSSION

The key objective of this research was to introduce the analysis of spiral model in software projects. The main objective of this research is to identify and explore the risk at each phase of software development and it also describes the activities performed during software development processes of preferred model. These risks can also affect the cost, time and performance of software model etc. This research is probable to be useful for analysis of various software development processes models regarding risk issues, so users can take benefit from this model and research, which are in software development field.

An important factor in research with regard to the results drawn from the data to check the reliability of the data collection instrument. It's important to check whether the data we have collected through an instrument are reliable for our research or not. As quantitative research majorly depends upon the accuracy of data and of course a reliable data, so reliability must be checked for which we have calculated Cronbach's Alpha value. For a reliable instrument of data collection, the value of Chronbach's Alpha must be equal to or greater than 0.7 and here it is clear in Table 2 that the value of Chronbach's Alpha for the variable of "Quality of Product" is 0.678, for "Validation", the value is 0.794, for the variable "Limitation & Time Consuming", the value is 0.629 and for the variable " Reliability, Resources & Unawareness", the value is .704 which shows that the instrument was reliable and data that was collected to complete the research is reliable and

through this data reliable results can be obtained upon which the author can make significant suggestions and recommendations that are applicable in real world.

Constructs	Number of Items	Cronbach's Alpha
Quality of Product	6	.678
Validation	6	.794
Limitation & Time Consuming	4	.629
Reliability, Resources & Unawareness	4	.704

Table.2. Reliability of Measurements

Afterwards, when data collection is done and the reliability is measured, the scatter plot is drawn which is helpful to check that what kind of correlation must be used among the variables. The following developed scatter plots have shown the positive association between Validations, Limitation & Time Consuming and Reliability, Resources & Unawareness and quality of product as the linear line is moving from left to right which means there is a relationship between the dependent and independent variables.
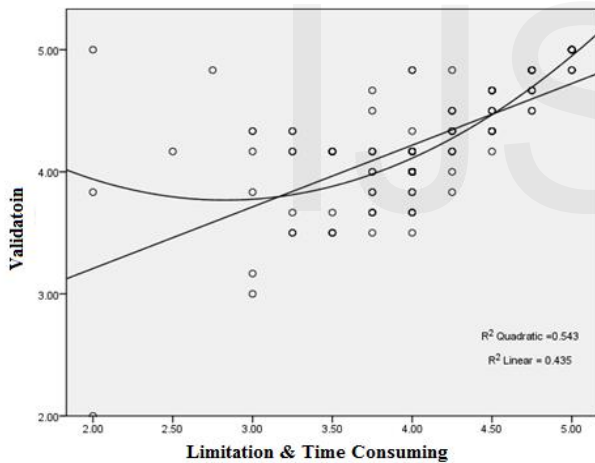

Figure 5 Validations and Limitation & Time Consuming

This research concluded that: The Earlier software model has some deficiencies like exploring analyzing, managing risk and hard types of risks were not properly handle in their phases which are discussed in above. The developers and users don't have suitable outcome from previous Spiral model. So new software development model is proposed whose responses related to risk activities are acceptable. As a future work, the proposed model can be applied to risk related case studies and compared with other processes addressing the issues of risk analysis

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