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Avoidance of Risk Factors in Software Development Optimization of Requirements Engineering Analysis Leading to Substitute sets of Functional necessities

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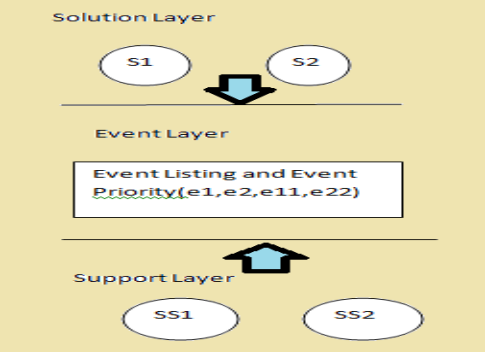
Abstract

The requirement engineering in a software engineering, in which software are modeled according to the requirements of the user. The system software developed under requirement engineering will satisfy the users mostly on their perspective. So, recent researches are concentrating on the software development and analysis based on requirement engineering. The requirement engineering processes are also challenged by the Risks in developing the software. So an efficient risk analysis system and risk management system is inevitable for the software development process under requirement engineering. In the proposed approach, a modified Risks Solution model for tackling the risk associated facors with the software development life cycle is considered. The Risks Solution model is four layer Solution models, the top layer is the solution layer, the issue layer in the middle(consists of event listing and event prioritys listing layer and event listing and event prioritys priority layer) and support layer in the bottom. The proposed approach defines a method to analyze the association between the nodes of each layer to evaluate their chances of evaluating the Risks . The evaluations are assessed based on the nodes in the solution layer. On thorough analysis on the associations and impacts of issue layers and support layer nodes to the solution layer nodes, the chances of evaluating risk can be calculated. The proposed approach explores the relative parameter like satisfaction parameter and denial parameter to efficient analysis of the risk factor. The experiments are conducted on java programming under JDK 1.7.0 platform and detailed analysis section is provided to find the cost to risk measure.

Keywords: *Requirement Engineering, Risks Solution model, Candidate solutions, solution layer, issue layer.*

1.introduction

Generally risk analysis is used for studying all the considerations, which lead to the failuer of the program. It is a methods and techniques for documenting the impact of extenuation strategies [1] and for judging system criticality [2]. Risk analysis is also shown important in the software design phase to assess criticality of the system [3] where Risks are examined and necessary steps are introduced.



However, it may happen that the risk analysis results in the modification of the entire system design and possibly of the formal requirements, introducing thus extra costs terms for the project [4]. Requirements engineering is a process based method for defining, realizing, modeling, relating, documenting and maintaining software requirements in software life cycle that help to understand the problem better [5]. It has been shown that a large proportion of the publications in software development can be related back to requirements engineering (RE) [6]. RE is the process of discovering the purpose in the software development life cycle, by identifying initial stakeholders and their conditions, and listing these in a form that is collected to analysis, corelate and further implementation [7]. Failures during the RE procedure have a significant negative impact on the overall development process [8]. Reframing requirements failures may take 40% of the total project cost. If the requirements errors are found late in the development process, e.g. during maintenance, their modification can cost up to 100 times as much as modifiying them during the inital stages of the software development process [9]. Adequate necessities are therefore essential to ensure that the system the user requirements is reached and that unwanted criterias are not listed.

Solution-Oriented Requirements Engineering, analysis of users Solutions leads to substitute sets of functional requirements that can each accomplish these Solutions. These alternatives can be evaluated with respect to non functional necessities posed by the users. In the previous paper, they propose a Solution-oriented approach for analyzing Risks during the requirements analysis phase. Risks are analyzed along with stakeholder interests, and then countermeasures are identified and introduced as part of the system's requirements. This work extends the Risks Solution modeling formal framework suggesting new concepts, reuirement and quality defined techniques, and functional procedures. The approach is based on a conceptual framework composed of four primary layers: assets, event listing and event prioritys, and treatments. In the field of software engineering, the requirement engineering is getting special attention as it is based on the stakeholder's interests. The main factors that a requirement engineering process considers are business requirements and user requirements. The requirements are used to enhance the development of the software product with low cost and the time it should satisfy all the requirements. One of the sensitive areas, which every software development process concentrate is the risk involved with the process. So, particular assessment measures have to be taken in order to minimize the Risks in software development process. YudistiraAsnar and Paolo Giorgini [13] have proposed a method for risk analysis in requirement engineering. The method deals with a software development method called, Risks Solution Model and with a Software Risk Analysis (SRA). Inspired from their work, we are planning to propose an approach on extending the Risks model with risk analysis feature. Risks Solution model consists of four layers, mainly solution Layer (SL), Event listing and event priority layers (EL1 and EL2) and support layer (SSL). The SL consists of set of Solutions that has to fulfill by the process and EL1 and EL2 contains the constructs which helps to achieve the Solutions. The SSL is working as the input, which helps in achieving the Solutions.

2. literature Review

The following section describes review about some recent works regarding the requirement engineering and risk analysis related to it. Software Security risk assessment in the software requirements phase is challenging because probability and damage of attacks are not always numerically measurable or available in the early phases of development. measures or deal with a mixture of statistical and qualitative data. GolnazElahietal[14] propose a risk analysis process which intertwines security requirements engineering with a vulnerability-centric and qualitative

risk analysis method. The method is qualitative and vulnerability-centric, in the sense that by identifying and analyzing common vulnerabilities the probability and damage of Risks are evaluated qualitatively. They also provided an algorithmic decision analysis method that considers risk factors and alternative security solutions, and helps analysts select the most cost-effective solution. The risk analysis method enables making a conclusion when some of the available data is qualitative.JacKyAng*et al* [10] has developed an expert system that has least focus on requirement engineering. In facts,requirement engineering is important to get all the requirements needed for an expert system. If the requirements do not meet the clients' needs, the expert system is considered fail although it works perfectly. Currently, there are a lot of studies proposing and describing the development of expert systems. However, they are focusing in a specific and narrow domain of problems. Also, the major concern of most researchers is the design issues of the expert system.

Therefore, we emphasize on the very first step of efficient risk analysis development – requirement engineering. Hence, we are focusing in the requirement engineering techniques in order to present the most practical way to facilitate software requirement engineering processes. we have analyzed expert system attributes, requirement engineering processes in expert system developments and the possible techniques that can be applied to expert system developments.Lukas Pilat*et al* [11] have proposed an approach for problem in requirements engineering is the communication between stakeholders with different background. This corelation problem is mostly attributed to the different language terms used by users or spoken by these users

The present synopsis experienced a related problem involved with transferring and sharing such knowledge, when stakeholders are reluctant to do this. So, they take a knowledge management perspective of requirements engineering and carry over ideas for the sharing of knowledge about requirements and the domain. We cast requirements engineering as a knowledge management process and adopt the concept of the spiral of knowledge involving transformations from tacit to explicit knowledge, and vice versa. In the context of a real world problem, we found the concept of "knowledge holders" and their relations to categories of requirements and domain knowledge both useful and important. This project was close to become a failure until knowledge transfer has been intensified. The knowledge management perspective provided insights for explaining improved knowledge exchange.

Mina Attarha and Nasser Modiri [12] have adopted a critical and specific software systems last longer and they are ought to work for an organization for many years, maintenance and supporting costs of them will grow to high amounts in the upcoming years. In order to develop and produce special aimed software, we should piece, classify, combine, and prioritize different requirements, pre-requisites, co-requisites, functional and non functional requirements (by using requirements engineering process, they can classify the requirements). Development and production of special software requires different requirements to be categorized (different requirements can be categorized using software requirements engineering). In other words, we have to see all requirements during the software's life cycle, whether they are important and necessary for our software at present time or they are not important currently but will become important in future. Requirements engineering aim is to recognize the stockholder' requirements and their verifications then gaining agreement on system requirements, is not just a phase completed at the beginning of system development not required any more, but includes parts of next phases of software engineering as well. To achieve this purpose, we acquired a comprehensive knowledge about requirements engineering. First, they defined requirements engineering and explained its aim in the software production life cycle. The main activities and purpose of each requirements engineering activity is described. Moreover, the techniques used in each activity are described for a better comprehension of the subject.

3. Problem Description

The requirement engineering is a field, in which software are modeled according to the requirements of the user. The software developed under requirement engineering will satisfy the users mostly on their perspective. So, recent researches are concentrating on the software development and analysis based on requirement engineering. The requirement engineering processes are also challenged by the Risks in developing the software. So an efficient risk analysis system and risk management system is inevitable for the software development process under requirement engineering. In the approach, a modified Risks Solution model for tackling the risk associated with the software development cycle is proposed. The Risks Solution model is four layer Solution models, the top layer is the solution layer, the event listing and event priority layers (event listing and event prioritys listing and event listing and event prioritys priority) in the middle and support layer in the bottom. The proposed approach defines a method to analyze the association between the nodes of each layer to evaluate their chances of raising the Risks . The evaluations are assessed based on the nodes in the Solution layer. On thorough analysis on the associations and impacts of event listing and event priority layer and support layer nodes to the solution layer nodes, the chances of analysing risk can be calculated. The proposed approach explores the relative parameter like satisfaction parameter and denial parameter to efficient analysis of the risk factor. The important factor about the proposed approach is that, it gives preference to the relationships between the different layers of the Risks Solution model

3.1 Risks Solution model

Risks Solution model is a software development model, which is characterized by concepts of agent Solution, task, and resource and uses them throughout the development process from initial requirements analysis to implementation. Early requirements analysis model provides the organizational settings, where the system-to- be will event listing and event priorityually operate. The Risks model is extended by adding constraints and relation in order to assess the risk factor.

Each layer functionality:

1. Solution Layer: consists of solutions which are the user requirements and risk analysis to be considered.
2. Event priority layers consists of event listing and event priority nodes, which serves to achieve the Solutions
3. Bottom layer, the support layer, which contains the node which support either the event listing and event priority nodes or Solution nodes.

Conditions are as follows:

1. Each of the four constraints is characterized by severity value and the severity is marked with four measure strong positive (++), positive (+), negative (-) and strong negative (--).
2. The constructs possess two attributes, satisfaction and denial, represented by SAT (c) and DEN (c), where c is the construct either Solutions, event listing and event prioritys and supports
3. The evidence of construct c will be satisfied for SAT(s) and denied DEN(c).
4. In probability theory, if Prob(A) = 0.1 then we can infer that probability of ¬A is 0.9. Conversely, based on the idea of Dumpster-Shafer theory [1], the evidence of a Solution being denied (DEN) cannot be inferred from evidence on the satisfaction of the Solution (SAT), and vice versa.

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Solution.:

The success rate is projected based on the cost to which the main Solution is achieved with an acceptable risk. The usual costs to risk analysis are based on the SAT value and DEN value of the associated Solutions. In the proposed approach, we define a methodology, which give priority to the associate Solutions to minimize the cost and tolerate the error to a certain limit. The proposed approach describes the cost to risk analysis through a case study based on the software development company. Solution model. illustration of the proposed software development company in the model of Risks Solution model. In the figure, it is shown that the top layer of model contains the target Solutions and associate Solutions. The event listing and event priority layer contains the associated event listing and event priorities, which are needed for the projection of the Solutions. The supporting event listing and event priorities are listed in the support layer as support values. Now a cost to risk estimation is conducted to find the best cost efficient way to calculate the target Solution or achieve the Solution. The proposed approach describes the methodological process and qualitative risk reasoning techniques used to analyze and evaluate alternatives in a GR model. Particularly, we focus on finding and evaluating all possible ways (called strategies) for satisfying top Solutions with an acceptable level of risk. In other words, given a GR model, each OR-decomposition introduces alternative modalities for top Solution satisfaction, namely different sets of leaf Solutions that can satisfy top Solutions. Each of these alternative solutions may have a different cost and may introduce a different level of risk. Risk can be mitigated with appropriate countermeasures, which, however, may introduce additional costs and further complications. In the proposed risk analysis approach, two strategies are used for evaluating the different risk caused by different event listing and event priorities. Based on the responses from the above listed analyses, the Risks are mitigated to an accepting level with feasible cost for development. The analyses are detailed in the following sections..

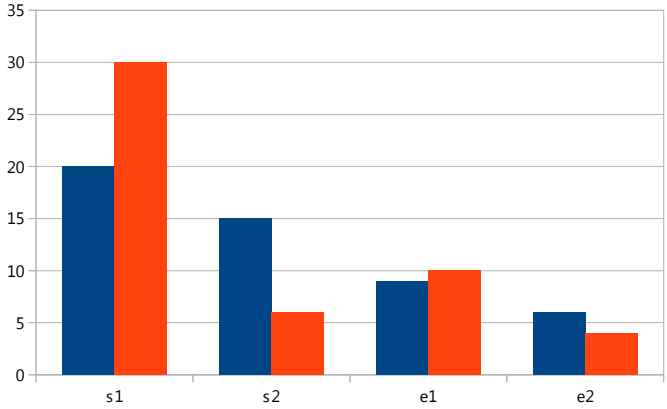

Fig:Candidate generated graph(s1,s2,e1,e2)

The above listed are the candidate solution generated graph for the proposed software development model. These solutions are generated according to the SAT values and DEN values defined by the Risks Solution model. The solutions generated are only considered the parameters likelihood and accepting factors like SAT and DEN, now the proposed approach initiates an optimization phase to extract the most optimized solutions among the generated candidate solutions.

4. Risk Analysis

1. Risk prioritization

The cost analysis of the Risks Solution model specifies the cost required for achieving the Solutions with the association from the event listing and event priority layer and the support layer. The Solutions are not only associated with cost but also the risk associated with it. The identification of risk is quite a tedious task in the Risks Solution model, because a same element can provide a plus and a negative impact in achieving the Solution. So selection of risk should be so specific to achieve the Solution with minimum cost and acceptable risk. In the proposed approach, we incorporate a risk prioritization process to analyze the Risks . Considering the SAT

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level and DEN level, the objects in each layer can be grouped to set of Risks . But, the level of the risk cannot be identified from those two parameters alone, so the risk prioritization plays the role here. The risk prioritization can be calculated by probability method. The probability of an event listing and event priority to become a risk is calculated by the number of instances of risk elements in user requirements and to the ratio of total risk analysis.

So according to the situations, the risk prioritizing factor confirms the elements with most risk for the Risks Solution model. The risk prioritizing process helps to differentiate high risk and low risk elements. The elements with higher risk can affect seriously on the cost of the Solution, while elements with lower risk level can be mitigated. Thus therisk prioritization helps in reducing the total number of elements, which is considered as risk and that interns speed up the cost analysis phase. Based on the risk values derived from the above expression, we create risk priority list.

$$R_{priority\_list}\ [R(e1), R(e2), \ldots, R(e_n)]$$

The $R_{priority\_list}$ is used in the cost to risk analysis phase in order to find the relevant risk to reach the target Solutions

5.Experimental Results

The experiment is conducted in Java runtime environment in system configured to a processor of 2.1 GHz, 2 GB RAM and 500 GB hard disk. The experimental evaluations are provided in the following section. The proposed Solution risk model is based on two analyses and those analyses are used to judge the relevant candidate solutions. The experiment uses the input data from a manually generated source as the Solution model of Software Development Company.

5.1 Case study description and input

The proposed Solution risk model uses a case study of a software development company, which is targeted to a prime Solution. The prime Solution is assigned as "Earn money

(G1)" and a number of Solutions are associated with G1 to make G1 achievable by the SDC. Thus a Risks Solution model is defined over the SDC and by considering the SAT and DEN values a set of candidate solutions are generated. The figure 7(Not Shown) represents the candidate solution generated after the Risks Solution model. We have considered solutions of length 6 to 8 for the efficient evaluation of the cost and risk of the SDC. The associated Solutions are assigned cost values by randomly generated program and the cost values are associated with the event listing and event prioritys and supports defined in the Risks Solution model of the SDC. The association list and cost values of different parameters are listed below.

Event listing and event prioritys	values	Solutions	costs
E1	7	G1	4
E2	7	G2	5
E3	4	G3	4
E4	7	G4	6
E5	5	G5	1

Table.1. value table

Thus, based on the values of the tables, the costs of the generated candidate solutions are calculated. Now, the genetic algorithm is applied to the generated candidate solutions. So, according to the genetic algorithm a number of solutions are extracted from the initial population as the cost effective solutions of the SDC.

6. Conclusion

The proposed requirement engineering model is based on the Risks Solution model. A modified Risks Solution model is used in the proposed Solution risk model. The Solution risk model consists of four layers, and in the top level Solutions to be achieved by the process is plotted and in the second level, the event listing and event priorityes that triggers the Solutions and in the bottom level, the supporting parameters for the Solution and event listing and event priorityes are plotted. The proposed approach also adds an optimization technique with the proposed approach. A genetic algorithm driven candidate solution is incorporated with the Solution model to get efficient candidate solutions. The risk analysis of the proposed GR model is conducted based on two analyses, the cost analysis, risk priority calculation and the cost to risk analysis. The experimental evaluation is carried out on a case study considering a software development company. The results showed that the proposed Solution risk model has attained solution with acceptable cost and risk

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