Software Engineering Innovative Risk Analysis in Matrix Tool

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Abstract: The purpose of the research is to propose a framework for quantitative risk analysis for more optimal solutions by analyzing risk duringnecessities engineering segment of SDLC. The following two cases are consider for my research proposed work

I. RISK IDENTIFICATION

Here result analysis is done considering two cases

- **Case 1:** Here the candidate solutions are directly applied to probability –Matrix tool to find out the advantages of applying Genetic algorithm to candidate solutions.
- **Case 2:** Here the genetic Algorithm is applied to Candidate solution and then its output is applied to probability–Matrix tool to find visibility of risk. The Sample values taken for Probability and Collision are shown in form of table

Probability Category	Probability number
Very High	9
High	7
Medium	5
Low	3
Very Low	1

Table 1.1Sample Probability Test

Project Objective	Very Low 1	Low 2	Medium 5	High 7	Very High 9
Cost					

Table 1.2 Sample Collision Test

The probability values are decided on the basis of Den and Likelihood values as shown in below table.

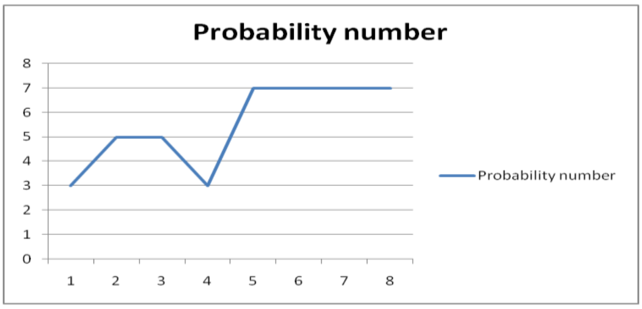
SAT()	DEN()	Likelihood	Probability	Probability number
Full	Null	Likely	Low	3
Partial	Null	Occasional	Medium	5
Full	Partial	Occasional	Medium	5
Full	Partial	Occasional	Low	3
Partial	Full	Rare	High	7
Null	Partial	Unlikely	High	7
Partial	Partial	Rare	High	7
Partial	Partial	R are	High	7

Table1. 3 Calculation of Probability

Case 1: Here Genetic Algorithm is not applied to candidate solutions.

Candidate solutions	SAT()	DEN()	Likelihood	Probability	Probability number	Collision	Collision number	Risk Factor
S1	Full	Null	Likely	Low	3	Low	2	6
S2	Partial	Null	Occasional	Medium	5	Medium	5	25
S3	Full	Partial	Occasional	Medium	5	Medium	5	25
S4	Full	Partial	Occasional	Low	3	Low	2	6
S5	Partial	Full	Rare	High	7	Mow	5	35
S6	Null	Full	Unlikely	High	7	High	7	49
S7	Partial	Partial	Rare	High	7	Medium	5	35
S8	Partial	Partial	Rare	High	7	High	7	49

Table 1.4 Probability and collision matrix table without using GA



Graph1.1 Graph of Probability

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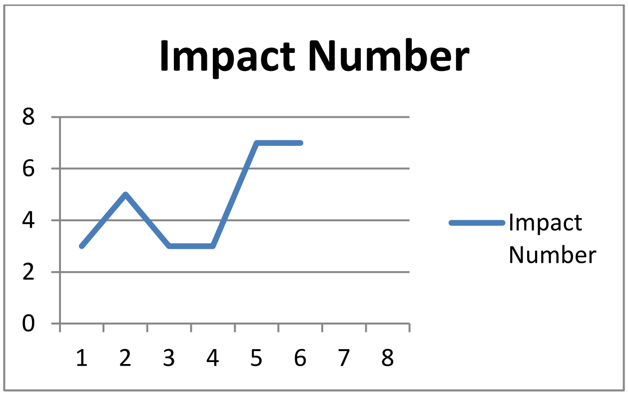
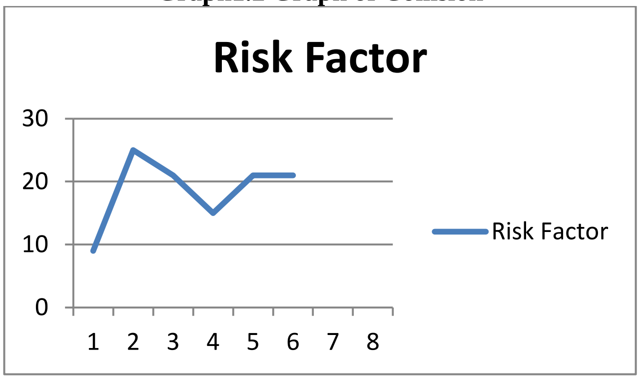


Graph1.2 Graph of Collision



Graph1.3 Graph of Risk Factor

The graph shown above does not throw much light on intensity of risk. So is the case with Risk factor formula which is

Risk score / Risk Factor = Probability * Collision

Illustration:If the risk has lowprospect and is allocated a score of 1

If the collision is momentous and is dispensed an collisioncost of 9

Risk score / Risk Factor = Probability * Collision = 1 * 9 = 9

In some cases, it becomes very difficult to detect risk so we can include difficulty of Detection value also in the formula which is optional

1. Probability-Collision Matrix Tool

Risk investigation is an imperative task of all software industries herein world. In today world all organizations execute high end, Complex and expensive projects which necessity be successfully accomplishwithinundecidedas well as always uncertainatmosphere. As a project leader, Team leader, Manager or as a software engineer, it is the duty of all team members to be aware of risks and have visibility of risk and this can best be done by probability collision matrix tool. This tool helps to prioritize risk. If this tool is used effectively it helps us to focus our efforts on most important risks.It's a qualitative risk investigationdevice.It is evaluates

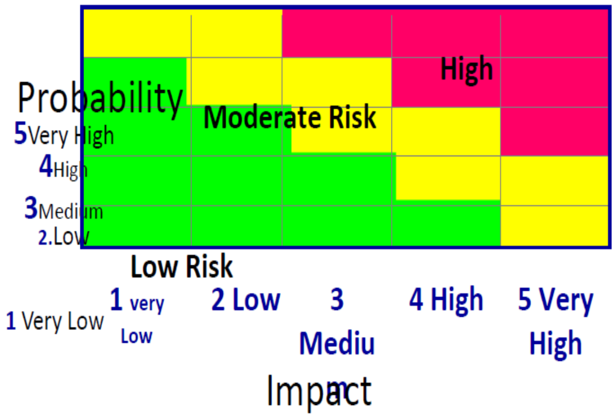
----- Likelihood (prospect) that a finicky risk determination arises

----- Probablecollision (Consequences) on apurpose if it occurs

Every risk is question for prospect and collision

How to use probability collision matrix tool

A sample version of the tool is shown below



Graph1.4 Sample Tool

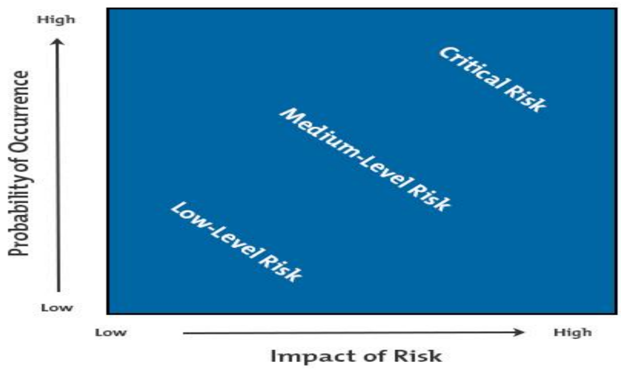
The Risk probability collision matrix tool is stand on the principal so as to a risk has 2mainproportions. They are

1) **Probability-**A risk is an occurrence so as to couldarise. The possibility of its happening presser veassortmentwhereveras ofimmediately 0 percent to immediately 100 percent.

Note-it cannot be precisely 100 percent sinceafter that it would be a conviction, not a risk. And it cannot be accurately 0 percent, since it cannot be a risk.

2) **Collision-** A risk by its sceneryforever has a pessimisticcollision. Though, the dimension of the collision fluctuates in stipulations of rate etc.

The tool tolerates us to speedpossiblerisk on these two extents. The prospect that a riskdeterminationarise is characterize on Y axis and the collision of the risk if it arise is represented on X axis. The essentialstructure of the risk Probability/collision is revealed below



Graph1.5 Basic chart

The corners of the chart have these characteristics-

1. **Low Probability/Low Collision** -Risks in the bottom level corner are low level, and it can be ignored.
2. **High Probability/Low Collision**-Risks in the top left corner are of moderate importance.

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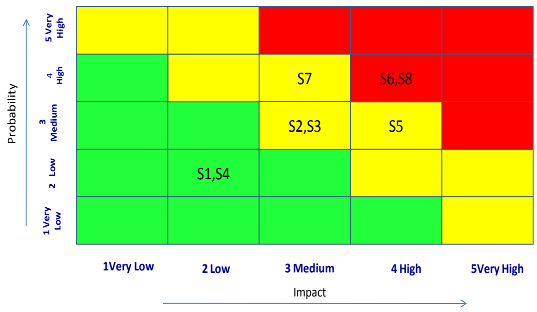
If such risks occur then it is necessary to cope with them and move on. However it is necessary to reduce the likelihood that they will occur.

3. **Low Probability/High Collision**-Risks in the bottom right corner are of high importance. If these risks occur then contingency plans should be ready and it should take care of risk.
2. **High Probability/High Collision**-Risks towards the top right corner are of critical importance. These risks should be of top priority and must pay close attention.



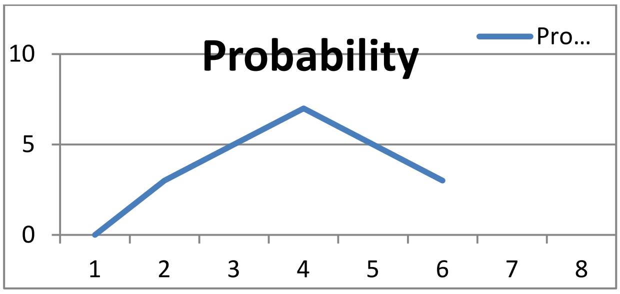
Graph1.6 Outputs without Using GA

From the tool we conclude that S6, S8 candidate solution have High Probability and High collision which is to be avoided. Here the candidate solutions obtained in Graph1.9 are applied to probability-collision matrix tool. Here Candidate solutions are obtained without applying Genetic Algorithm and only cost attribute is used to obtain candidate solutions.

	Candidate solutions	Cost	Collision	Collision Number	Risk	Probability	Probability Number	Risk Factor
S11	[G4, G7, G8, G9, G10]	18	Low	3	3	Low	3	9
S22	[G4, G6, G7, G8, G9]	23	Medium	5	6	Medium	5	25
S33	[G2, G7, G8, G9, G10]	19	Low	3	8	High	7	21
S44	[G3, G4, G5, G6, G7]	19	Low	3	5	Medium	5	15
S55	[G2, G3, G4, G5, G6, G7, G8]	31	High	7	4	Low	3	21
S66	[G2, G4, G5, G6, G7, G8, G9, G10]	31	High	7	3	Low	3	21

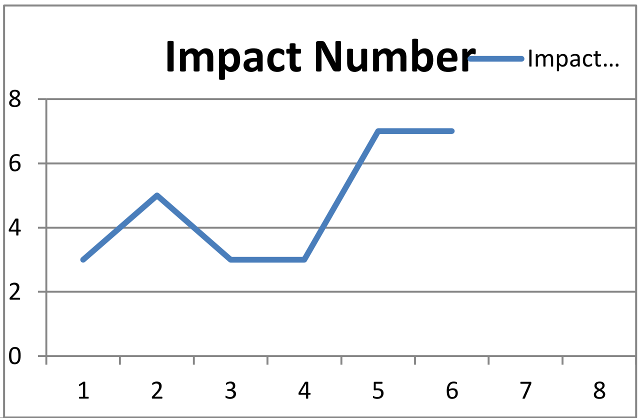
Table 1.5 Probability and Collision matrix table Output using GA

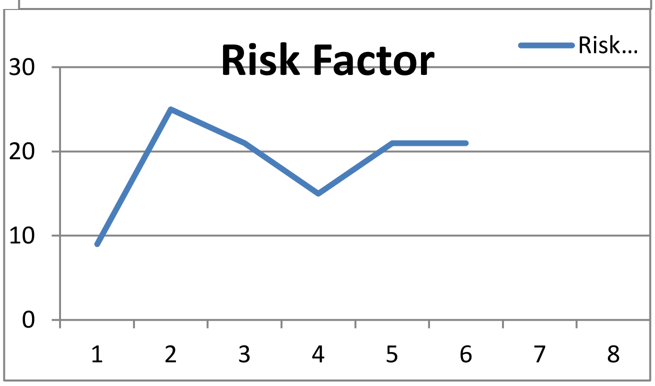
All risks do not have same collision on software project. Some risk has more collision, while some have intermediate collision and the rest may have less collision. Also is the same case with Probability. Some risk has high probability, while some risk has intermediate probability and the rest may have less probability of occurrence. So we need to understand risk so that software engineer in the project can take note of it and avoid high collision, high probability risks first which are very dangerous. This is the reason to use 3x3 matrixes as shown in Graph1.11.The probability and collision matrix tool helps in detection, estimationas well as prioritization of risks pursueviacorresponding and economical submission of propertytowarddiminish, observe and organize the possibility and collision of adversemeasures.



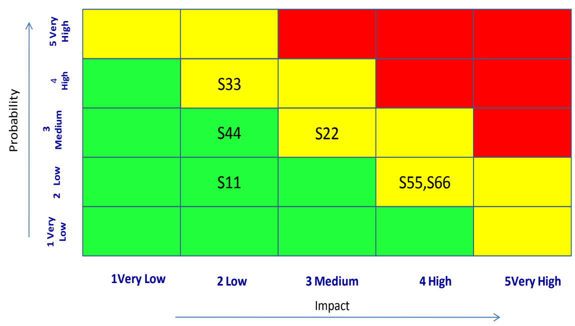
Graph1.7 Graph of Probability using GA

Graph1.8 Graph of Collision using GA





Graph1.9 Graph of Risk Factor with GA



Graph1.10 Output Using GA

Analysis of Probability and collision Matrix

From Probability Matrix tool it can be observed that no candidate solution obtained is having High probability and high Collision. We have some candidate solutions like S55,

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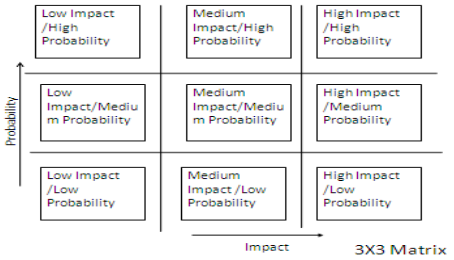
S66 which have low probability but high collision. These candidate solutions can also be avoided since collision is high. From Graph1.11, we can observe that that S22 have intermediate probability and intermediate collision .So we can select it and reduce the likelihood when they occur. We have some candidate solutions in the range of intermediate and low probability, and low collision .Such candidate solutions are in safe zone.



Graph1.11 3 x 3 Matrixes

Magnitude of Collision	Collision definition	Score	Rating
High Probability/High Collision	Very High collision. They are the principalrisk that organization mustrecompenseconsideration .	**5**	**A**
Intermediate Probability/High collision Or High probability/ Intermediate Collision	High collision This riskencompasswhichever a high possibility of incidence or a considerablecollision	**4**	**B**
Intermediate Probability/Intermediate collision	Intermediate collision here is a intermediate probability that the risks materializeconspicuouscollision	**3**	**C**
Intermediate probability/low collision Or Low Probability/intermediate collision	Low Collision These Risks can occur in some situations and have a low to intermediate collision.	**2**	**D**
Low probability/Low collision	inconsequentialCollision This isrisks through low possibility of incidence and low collision. Therefore can be abandoned.	**1**	**E**

Table 1.6 Risk Exposures

Required Steps to find the risk status

1)The initialpace was towarddescribe the probability of risk incidence from Table 1.1

2)The 2nd pace was to situate the collisionscheduled a degree of 1 to 5 from Table 1.2

3)Then the 3rd pace was to establish the risk revelationconsequentialstandardsspecified in Table 1.6

So applying all the above three steps on candidate solutions obtained from genetic Algorithm, the Output is

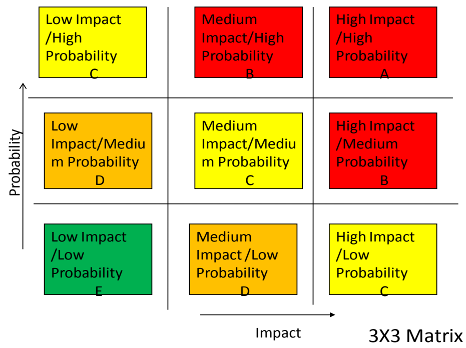
S55- S66-high collision/low probability-Grade/Rating C

S22-Intermediate Probability/Intermediate Collision-Grade/Rating C

S33-Low Collision/High Probability-Grade/Rating C

S11-Low probability/Low Collision-Grade/Rating E

S44-Low Collision/ intermediate Probability-Grade/Rating D



Graph1.12 Probability –Collision Grades

The final case study obtained after genetic algorithm is shown in below graph6. The combination of goals of the candidate solutions obtained above can be used for success. After obtaining the results it is necessary to respond to the risk. This is done by reducing the probability of negative risk by proper planning and to increase positive risk. Risk planning can be done by using any of the following methods

Negative Risks can be dealt with by:

1)**Risk Acceptance:** This step can be taken if Risk is of low collision and low probability as shown in above fig

2)**Risk Avoidance:** This step can be taken if Risk is of High collision and high Probability. Here Plan is changed to avoid the risk. Also using a proven approach instead of new approach. Also it is necessary to increase team communication to tackle such situations.

3)**Risk Reduction:** This step can be taken when we obtain result which is Intermediate collision and intermediate possibility or Low collision and high probability.

4)**Risk Transfer:** bestand easy way to tackle risk is to transfer risk to third parties like Insurance, using Performance Warranty. But this incurs additional budget.

5)**Risk Mitigation/contingency measures;**condense the possibility and/or collision of the risk by Simplifying the processes, develop Prototype and by additional inspection.

Positive Risk can be increased by

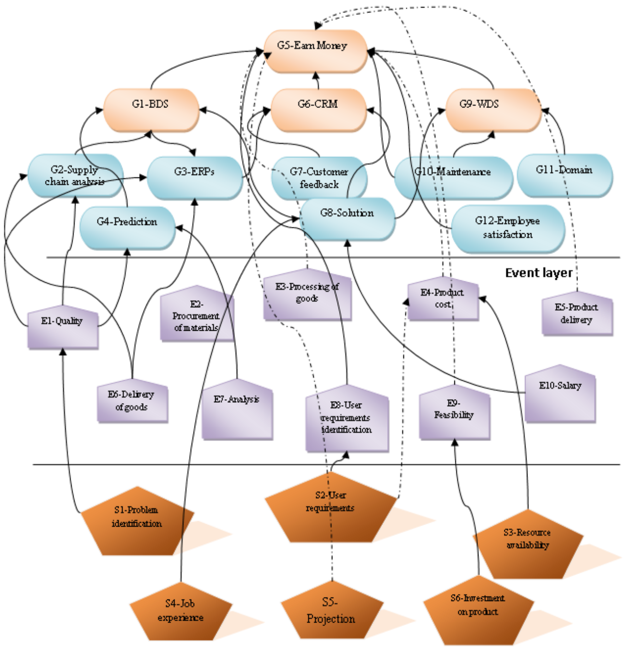
1)**Exploit:**ensureso as to positive Risk ensue and formulategreatestutilize of the prospect provided.

2)**Enhance:**augment the possibility and/or collision of the risk

3)**Share:** The opportunity is shared with a third party to make obtain additional revenue.

4)**Accept:** Kindly accept the opportunity when it happens but not actively pursuing it

3. Final Case Study



Graph1.13 Final case study GR model

Final Case Study obtained at the end of Risk Analysis is shown in Graph1.13 and Final case study table is shown below

Final Case Study Table obtained at the end of Risk Analysis

Goal Layer	Event Layer	Support Layer
G1 Business Development Software	E1 Quality	S1 Problem identification
G2 Supply Chain Management	E2 Procurement of material	S2 user Requirement
G3 Enterprise Resource Planning	E3 Processing of goods	S3 Resource availability
G4 Prediction	E4Product Cost	S4 Job Experience
G5 Earn Money	E5 Product Delivery	S5 projection
G6 customer relationship management	E6 Delivery of Goods	S6 Investment on product
G7 Customer Feedback	E7 Analysis	
G8 Solution	E8 User Requirement Specification	
G9 Web Development Software	E9 Feasibility	
G10 maintenance	E10 Salary	
G11 Domain		
G12Employee satisfaction		

Table 1.7 Final Case Study

The candidate solutions obtained from Genetic Algorithm consists of Goals shown in above shown table. The events associated with these goals generate minimum risk as shown in probability collision matrix tool.

4. Important Finding

1) Risk is part of any software development.
2) Risk identification, analysis and management are the foundation of successful software product development.
3) If Risk multiplies overtime, then Risk analysis is not done correctly. When Risk analysis is correct, no of Risk reduces as process progresses
4) superior decision-making during a good considerate of risks and their probablecollision
5) Fever Surprises.
6) There is always innovative and efficient use of resources.
7) Reassuring stakeholders

Summary

The output obtained by genetic Algorithm is a set of candidate solutions. Each Candidate solution is a collection of goals .First the goals are identified in Goal Risk model .In the next step the refined Goals are obtained after passing the test conducted by Extraction Tree and Approximation Algorithm model. Then the output is subjected to Genetic Algorithm. Genetic algorithm has three steps whose intension is to provide optimum candidate solutions. These candidate solutions are used to calculate probability of occurrence and collision of risk. This is illustrated in Graph1.7and 1.8. When these two factors are multiplied then collision factor is obtained which is illustrated in graph1.9.

The calculation of risk factor is illustrated in table 1.5.The collision factor is not providing sufficient information for us to detect risk. So to have more visibility and clarity about risk we use probability collision matrix tool. This tool clearly exposes risk. This tool does not provide place for risk to hide. The tool is systematic and structured and it divides the risk into many types. They are

1. High possibility and High collision risk
2. Intermediate Probability and Intermediate collision risk.

1)3 Low probability and low collision risk.

It clearly highlight risk as shown in graph1.10.To analyze the risk we use 3x3 Matrix as shown in graph1.12.This matrix helps in decision making process.

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