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Exploring Requirement Risk Analysis Through a Qualitative Lens: Application of the Lean Canvas Model

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Abstract

Many software development organizations face risk of software failure due to maximizing cost and time. In this situation, several techniques were utilized to identify and control the risk factors, improving the product quality. For this purpose, the selection of best approach to cope this challenge is a great achievement of the developers. Therefore, lean canvas model was introduced in this study on the basis of time saving and low cost features. Furthermore, this technique takes minimum steps to understand the problem by providing better solution. The focus of this qualitative study is to estimate the percentage working of this tool rather than the percentage model value. In this research, we analyze the requirement risk analysis by using lean canvas model. This model will enable the developers to eliminate the risk for gaining the maximum profit in the business to take favorable results in future. In the light of this research, the products shall be available on short notice within short time span.

Keywords: Software Development, Risk Analysis, Qualitative Approach, Lane Canvas Model

1. Introduction

In this era, various industries, institutions and organization are managed by utilizing PC applications (Khalid, N., 2025). However, many Software development organizations suffer issues like cost overruns, planning phases and project delay. In the light of these issues, the struggle of replacing the outdated technology with latest technique has been taken by consistent review of PC systems. These latest improvements have prompted software development complexity by taking new risks to the software projects (Schulte, 2025). In various projects of software engineering procedures and necessities progress additional because of the complex nature of products and there exists high level of possible aspect of risk that happens in numerous different controls (Peralta et al., 2020). This is mostly because of the inherent nature of the various products of software on a fundamental level; all projects are more unique than those of different orders developing user desires diminish the reliability on the various products of software, again opening a way for potential risks.

Risk plays a vital role in software project failures and every project faces several types of risks during the project development phase. Risk defines as “Basically threat is describe as a possible potential happening that poses threats to the success of a project it mostly occur, direct an unwanted conclusion” (Wiegers, 2007). Therefore, predictable and unpredictable factors contribute the risk element in the software project and also indicate the minor role of managers to control them. The problems occur not only during development of the project but also in new projects, occurring in the improvement of existing software projects. This may impact our budget, resources, deliverables, costs, quality, scope, and performance. The addition of risk may have various effects on any project’s risk profile. Such risk requirements open up much kind of risks as unforeseen expenses that may cause of any project failure. These requirement may have positive or negative; positive risk is described as opportunities for instance your task is changing the inside scene of the association, on the other hand, the negative risk is like stakeholders that are not involved in sufficiently early (Rispianda et al., 2025).

The purpose of identification of various risks is not a point away from rejection up till now in order to preserve a planned by the space from the conflicting catch in order to focus on the main functions that are not destroyed by the effects. By the treatment of various symptoms, rather than the main causes, that shows the importance of functions. By the inappropriate effects is far away simpler than the root causes. Project administrators should be warranty that the recognition of various risk. As external detached analyst play an important role in the associated segment depict strategy is very helpful in order to use by project faculty to distinguish risk and their cause.

For a great extent since of reservations concerning a variety of works which can be separately slight threat up till now with the intention of in the sum can add together to enormous hazards. They join worries regarding the actual operating expense of effort and resources steel, the actual period of actions delivery of tools, productivity of the labor force, change because of sketch growth or the owner inclination, and dissimilar reservations that are commonly measured to survive in the trait variation of product preparation plan, growth and establish. One of problems in use on your own have less impact on the final product. By this way it might in use jointly in at hand it is likelihood that enormous information of the appraisal of these mechanism can be helpful in order produce the particularly confident making it impractical to mutual impact.

According to description elevated control low-likelihood occasion are unusual proceedings, along these lines it is tremendously tough to deal out probability in view of historical reports. In sequence don't continue therefore personal evaluation of probability is essential By this way ay, the objective is not the rational strength of mind of correct probability of extraordinary occasion though the purpose of the administration move should to be complete to examine, moderate, and transaction with the threat. For example, if a precise threat is recognized and administration verify that some meticulous alleviate move should to be complete if the risk has a likelihood of more than hundred occasions at that point a precise classification of the probability is needless the main issue.

1.1 Objective of Research.

The main purpose of this study is as follows:

1. To view various practice of requirement risk analysis in software projects
2. To examine the approaches and techniques to assess the requirement risks in software projects by software project manager.
3. To design the requirement risk analysis model based on the study finding.

1.2 Research Questions

1. Do the software project management practice requirement risk assessment in software projects?
2. Which approaches and techniques do SPMs use in requirement risk?
3. What kind of tool is appropriate for requirement risk analysis in software project environment?

In this research, lean canvas model is used to reduce risk and focus on the solution of the problems, key metrics, and competitive advantages. The concept of lean canvas begins with an idea, with plan of meeting that is predictable to construct the artifact and the subsequently state to work out the special features one time the artifact is organized (Zorzetti et al., 2022). The essential parameter is to recognize the various phases of arrangement such as completion plan documentation, classification of misuse plan procedures and recurrence of plan cycle (Nidagundia, Novickisa ICTE 2016). Basically, the cycle of lean canvas starts up with thoughts, construct, invention, calculate, facts, find out. Lean Canvas utilizes a similar 9 squares idea aside it has been altered somewhat to go with the purpose/necessities of the set-up of Canvas model (Blank & Eckhardt 2024). It provide the ideal situation for brainstorm of potential model of business, the pieces direct you to performs the part base on specific logic beginning from the client issues directly through to come out of line benefit. The researcher plays an important role in going to use questionnaire or minor survey because this research is qualitative in its nature.

This paper is organized into five sections. The section two highlights the literature review and 3rd section comprises of methodology. After this section, results and conclusion of this study are present in section 4 & 5 respectively.

2. Literature Review

In the software development, risk is the main issue of threat to secure (Risk, 2008). Therefore, the risk assessment is concerned with estimating the risk of a task towards the acceptance criteria set for this activity (Hevia et al., 2024). Multi-attribute risk assessments give a helpful structure to methodically developing quantitative risk assessment that the security instructor can use to organize security requirements (Hosseinpour et al., 2021). This research reveals a multi-quality risk assessment process and effects from two industry case study that utilized the procedure to recognize and organize their risk. Despite different strategies that exist in software risk factor managing, then rate of software failure high. If risk factor high in project, then rate of failure of the project will be high so firstly minimize the risk factors for avoiding the failure. In this situation, if the project size stretched then management of the software development becomes more complex (Dantas et al., 2022). In this kind of projects, the need for new investigation and risk control is important. In this type of situation, the relation between these situations risk utilize two structure are shown. Analysis and study of the threats are finished by developing probabilistic designs.

Requirement engineering is considered as a main discipline for developing business software. The aim of this research is to recommend a model that acquaintances the existing techniques to the condition in which practitioners find themselves. In the end, review of software development and requirement engineering added for the understanding of risk that describe in requirement engineering condition, just to organize these assessable techniques to eliminate the risk, and to recognized the basic rules by which the techniques can be applied to remove requirement risk. The research produced the result from the analysis into an eventuality model in order to manage the requirement engineering risk (Laplante & Kassab, 2022).

By using the software engineering practices risk can be reduce and quality can be improve such as these mostly used prototypes or models can minimize the risk factors. We select a process for COTS software components and apply the recently used model on it according to selection and then started (Hasan et al., 2021). To support this process need a tool, some tool already exist or some not. The large amount of these software components available in the outdoors can select the best for the software project. Unluckily, possibility of high risk can be occurring and can affect the quality of the project. Failures can be remove by using different models like Scrum. For avoiding the failures factors have to minimize the risk factors, than many SE models can follow.

Reservation of resources by project manager are recognized and this is very critical step for success factor in a project development environment that is difficult and complex. Yet, it is a big challenge for the need of the project reservation (Khan et al., 2022). Still, it is incontrollable and tough. As development is the uncertainties can minimize the available resources. This paper can present the multiple models and can design models to support the reserve resources and can minimize the risk factors by using models of the software engineering, including technical and non-technical budget scheduling or f meeting budget etc. In development phase uncertainties greater and value of information can also increase.

In this paper, we study the situation of threat and risk administration in the greatest well-known software growth method representations (i.e. waterfall, v-model, incremental development, spiral, and agile model). We have travelled the highest software growth development copies and observed the disorder of risk organization in every one of these copies. Consequently, we originate that some produce development methods fundamentally comprise risk organization. For every style, this needs confident situations to happen. This risk are obvious in maximum software increase procedure, and that all software change organization, counting the danger focused ones, want that risk organization be improved in it (Khan et al.,2022)

To place the hint of lean software increase in environment, it's cooperative to carry up likenesses and differences with software improvement increase. Agile enlargement methods have predictable building and communication project to happen external the growth group, or to happen in little raise private the collection. Along these appearances, agile performs often turn out to be short in lecturing matters of result project, consumer communication summary, and complex public building. Gradually, agile improvement performs are existence believed of as countless methods to comprise software improvement, but absent methods to report plan. Since plan is fundamentally iterative and change is on a very simple level iterative, the two switches correction smarts they are not wisely unified in last. Then lean improvement sets out a usual of guidelines that wish an whole invention, whole life-cycle, cross-functional method, it's the new possible to achieve the mixture of project, progress, group, and support into a only response round strong on the unearthing and supply of charge (Poppendieck & Cusumano , 2012)

The ending up this paper by examining we can see the development of risk in data system that caused by user requirements process. From those actualities we can presume that there are still a great deal of issues we should learn and manage in user requirements process. The risk caused by client requirements process can be classified in three major classifications: knowledge risk, the volatility risk, and documentations risk. This classification depends on key problems found in user requirements process (Adikara & Sitohan, 2013).

3. Methodology

Software development life cycle (SDLC) plays a role that is vital any software development activity. It provides phases that are different from analysis, design, detail design, implementation, and maintenance (Olorunshola & Ogwueleka 2021). The validation and verification are connected with every phase of SDLC. Using Intelligence that is artificial in engineering provides new means of software development. There are particular factors that impact the project scope, planning objectives, scheduling, budget and implementation. These factors are referred to as risks. Risks are basic factors that are negative create hurdles through the execution of software project or risks are even those events that will threaten the application success. Risks may be handled or managed however it is essential to analyze and identify the risks that are hypothetical. You can find possible risk factors which can be certain or uncertain and mitigation that risk the literature. Software project failure causes might lead the project to an end that is closed on a street. Internal risks are those that can come in the organization and threaten it.

3.1 Lean Canvas Model

Lean Canvas, created by Ash Maurya, is a single-page business plan template that will help to break your idea down into its basic assumptions to really make it more readable and simply editable. It was adapted from Alex Osterwalder’s business structure Canvas and replaces complex business plans in a concise and portable page document that is single.

The business enterprise Model Canvas applies the strategy and techniques employed by Skype and Apple to reach product success available in the market whereas the canvas that is lean more target-specific and integrates both small and enormous businesses effectively. Lean Canvas is made designed for startups; it pivots on addressing wider customer problems and solutions and through a value that is unique, it delivers them to customer segments.

3.2 Components of Lean Canvas Model

3.2.1 Problem

In this box, researcher tries to list out the only top 3 priorities of the problem that are fixed through this technique.

3.2.2 Customer segment

Its difficulty and customer segments can intrinsically be viewed as connected? Without a CS at heart, you can’t think about the problems and the other way around.

3.2.3 Unique Value Proposition (UVP)

In the exact middle of the canvas could be the UVP. A value proposition is a promise of value to be delivered. A prospect should buy from you as the primary reason. An approach to ensure you get your head surrounding this will be thinking why you may be different and exactly why you’re CS can buy invest that is in you.

3.2.4 Result

Finding a remedy into the issue is the egg that is golden you’re not planning to fully grasp this next to the initial bat? It is 0K, as that is what Lean is focused on. What you should do to move out the Building? A phrase coined by the godfather of Lean Startup, Steve Blanks. And what Blank’s listed here is that the clear answer is certainly not in your working environment, it is available to you when you look at the streets. So go 1ntervoew your customer segment, ask those relevant questions, and take those learnings. Recall the Lean Startup is validated learning through a Build that is continual.

3.2.5 Channel

Channel is a way so that you could reach finally your CS. And don't forget that when you look at the stages that are initial’s important not to ever think of scale but to concentrate on learning. Understanding that you will need to think which channels wi1l provide you enough usage of your CS. In the time that is same you enough learning. Channels may be email, social, CPC ads, blogs, articles, trade events, radio & TV, webinars etc. and BTW you don’t need to be on them all, just where your CS is.

3.2.6 Flow of Income

It is, however, it’s quite common for startups to lower their cost, even offer it for free to gain traction, however, this can pose a few problems how you price your business will depend on the type of model. One of the keys being it really delays avoids that are. Getting visitors to subscribe to something 100% free is a complete lot different than asking them to cover. Additionally, there is the basic notion of perceived value.

3.2.7 Cost Structure

Here, you should list most of the costs that are operational taking this business to advertise. Exactly how much can it cost to create a landing page that is? What exactly 1s your burn rate? Your total running that is monthly? Exactly how much can it cost to interview your customer segment? How much general market trends do papers cost etc.? Then you can make use of these costs and potential revenue streams to calculate a point that is rough break-even.

3.2.8 Key Metr1cs

Every bus1ness, it doesn't matter what industry or size, could have some metrics that are key are used to monitor performance. The way that is best to support it is to visualize a funnel top down that flows through the large open top, through multiple stages into the narrow end. A model that is good assistance with it is Dave McClure’s ARRRR (aka Pirate Metrics).

3.2.9 Unfa1r Advantages

This is basically the most challenging to block to resolve. However, do you will need to look at this as having an advantage that is unfair help in regard to seeking partners & investors? Listed here is a good concept of unfair advantage: “The only real advantage that is competitive that which is not copied and should not be bought.” Jason Cohen. Unfair advantage may be one sider information, a dream team, getting endorsements that are expert existing customers etc. So, as opposed to thinking of adding something such as “commitment and passion” as an unfair advantage (you have that no one else can buy because it is not), think about what?

3.3 Risk Identification, Analysis and Management Techniques Comparisons

There are some methods that can be used for identifying and analyzing risks. In this deliberations I will discuss techniques that can be functional to managing risks in software industries as follows.

- Delphi Technique
- Risk Probability and Impact assessment
- Apollo Root Cause Analysis methodology

3.3.1 Delphi Technique

Delphi is a popular, long-range, qualitative projecting technique that has been widely applied to an inclusive variety of problems in unlike domains. Since the technique was regarded in the early 1950s at the Rand Corporation, different deviations of Delphi have developed in an effort to meet the unique estimating needs of different decision makers. A total of 463 papers were recognized out of which 254 papers give Delphi as a primary subject though the remaining 209 papers delicacy Delphi as a secondary subject. The study achieves with a fleeting commentary on the Delphi technique that may be valuable for researchers and experts in qualitative forecasting.

The Delphi technique is a multipurpose research tool that researchers can employment at various points in their research. Use of the Delphi method for predicting and issue identification/prioritization can be appreciated in the early stages, mostly in selecting the topic and defining the research question(s).

3.3.2 Risk Probability and Impact assessment

An effective software development procedure contains the facts of each and every step of the process which are called as phases of development process. In general, these stages can be defined as requirement phase being the first one, where the customer prospects are transformed into business goals that are in chance definite in terms of project goals. Design phase being the next, the designer/developer resolves on the topology of the architecture of the project. In the successive phase, this topology is coded by creating use of the software qualifications. Subsequently, in the Testing phase, developer will be gifted to prove or confirm the code beside with the data against the business requirements. In this total procedure, there will be some challenges that the developer has to overwhelm to reach the final finishing point stage followed with the transport of the project.

3.3.2 (a) Analysis of RPI

Risk in software industries is measured to be a casual of occurrence of failure or probable failure. In the face of the quality standards like SEI-CMMi or PCMMi or Six Sigma being observed as some of the worldwide standards, there will be many loop holes in the software development that needs to be recognized and committed. Witlessness of these risks can be a countless loss for the organization depending on the nature and the bearing of precious area / resources.

3.3.2 (b) Risk Probability Index (RPI) outlines the possibility of occurrence, type of existence and number of frequencies of these risks in projects.

3.3.3 Apollo Root Cause Analysis methodology

The Apollo Root Cause Analysis methodology is a 4-stage procedure that delivers a new way of intellectual thinking and goes faraway outside the traditional root basis analysis problem solving processes. It enables the formation of a mutual reality, using input from all stakeholders to yield an evidence-based considerate of the problem and guarantees your solutions address established causes and averts reappearance. Its style is problem solving easy and gives those who have been accomplished the skills to resolve real world problems quicker, more professionally and effectively at any time.

4. Results

4.1 Lean Canvas Model Sketch

Lean Canvas Model is used to understand and minimize risks factors in software development. From several approaches, a customer-centric approach was used to fill out canvas.

Fig 4.1: Lean Canvas Model Sketch

<table>
<tr><td rowspan="2">Problems
Top 3 Problems</td><td>Solutions
Top 3 Features</td><td rowspan="2">Unique Value Prepositions
Single, clear, compelling messages that states why you are different and worth buying</td><td>Unfair Advantages
Can’t be easily copied</td><td rowspan="2">Customer Segments
Target customers</td></tr>
<tr><td>Key metrics
Key activities you measures</td><td>Channels
Path to customers</td></tr>
<tr><td colspan="3">Cost Structures
Customer Acquisitions Costs
Distribution Costs
Hosting
People etc.</td><td colspan="2">Revenue Streams
Revenue Model, Life time value
Revenue, Gross Margin</td></tr>
</table>

4.1.1 Problem and Customer Segments: According to customers-centric approach “Problem and Customer Segments” are tackle together. In this pair, I will fill following values in my case study (Software Engineering).

4.1.1(a) Top 3 problems

In this research, three risk factors were analyzed of software development in Software industry and Lean Canvas Model was designed for these three factors.

Problem 1: Unrealistic deadlines

Mostly software project fails when deadlines are not properly set before and during planning and development of software.

Problem 2: Improper budget

Low cost with proper expectations of large projects actually cause of project failure.

Problem 3: Lack of resources

Hardware and software resources are main cause of software development and is a big risk factor.

Actually, above-mentioned factors occur due to lack of expertise and wrong way of software development. In second problem, there is no chance except a suitable budget for a quality based software project development and third problem is about inadequate use of resources.

4.1.1(b) Customers Segment

Following are the customer segments used in this case study:

1. Project sponsor
2. Program Management
3. Business Analyst
4. Internal stakeholders

5. External stakeholders
6. Regulators
7. Local communities

4.1.2 Unique Value Prepositions

A single, clear compelling message that states why you are different and worth buying. It is too hard to write about unique value prepositions (UVPs) of any kind of business and this section can't fill at this stage. After thorough investigation, this section can be filled.

4.1.3 Solutions

Finally, we complete the solution segment in Lean Canvas Model, it's hard to conclude exact solutions of our problems. Some suitable solutions of these problems are discussed here through LCM which are given below:

Sr. No	Problem	Solution
1	Unrealistic deadlines	Lean Methodologies, Agile Methodologies
2	Improper budget	Estimated and suitable budget
3	Lack of resources	Expert judgment, Alternative analysis, Published estimating data, Project management software, Bottom-up estimating

4.1.4 Channel

It is a good thing that resulting a "Customer Finding/Interview" is a procedure to customers early.

It is very necessary thing to build a right product, it's hard to start findings and feedbacks. While there are a plethora of channel options available, some channels may be outright inapplicable to your startup, while others may be more viable during later stages of your startup. While there are lot of effective channel options available, I am going to share some sort of channels which belong to my research factors.

- **User Actions**
- **Content Marketing**
- **Advertising**
- **Events**
- Value Added Resellers (VARs)
- Independent Software Vendors (ISVs)

4.1.5 Revenue Streams and Cost Structure

Now, segments five shows a pair of "Revenue Streams and Cost Structure". Some sort of costs are led to those three problems, which are under-researched in this study.

- Hardware and software costs including maintenance
- Travel and training costs
- Effort costs of paying software developers

Mostly software companies design and develop hybrid mix of revenue streams to attain market needs. But according to domain of this research, there are following different possible revenue streams, which can be mix and use to obtain gaining users and revenues.

- Paid apps and license
- Free, with in-app advertising
- Free, with in-app purchases
- Subscriptions
- Usage-based license
- Extra charge for enterprise services, support, and consulting

4.1.6 Key Metrics

In this research which problems are discussing here, those all problems are major problems in software development industry? I think all kind of problems occur due to main three basic problems, that problems are using in sketching of Lean Canvas Model. So we should keep in mind that all key metrics which are useful for these three problems also can be consider for others problems.

There are following key metrics for this case study

- Quality assurance
- Capabilities of Companies
- Price against value
- Communications
- Release of unverified software

4.1.7 Unfair advantages

A real unfair advantage is something that cannot be easily copied or bought. It's so hard to write about unfair advantages of any kind of business. So in this case I can't fill this section because this sections required research process to find unfair advantages.

This research has been approved with Lean Canvas Model, How software risk factors can be reduced. Why these factors occurs in software development industry. Three major but basic risk factors are discussed and proved in this study by using Lean Canvas Model that can become failures in software development industry. But the solution segments of this LMC can cope these risk factors. A complete LMC information is highlighted in Fig 4.2.

Fig 4.2: Complete Lean Canvas Model

<table>
<tr><th>Problems</th><th>Solutions</th><th>Unique Value Prepositions</th><th>Unfair Advantages</th><th>Customer Segments</th></tr>
<tr><td rowspan="3">Unrealistic deadlines
Improper budget
Lack of resources

Existing Alternatives:

Non-Negotiable deadlines
Lack of budget
Inadequate use of resources</td><td>Lean Methodologies
Agile Methodologies
Estimated and suitable budget
Expert judgment
Alternative analysis
Published estimating data
Project management software
Bottom-up estimating</td><td rowspan="3">This sections required more research process to find proper Unique Value Prepositions. This sections also not relevant with this research.</td><td>This sections required more another research process to find proper Unfair Advantages. This sections also not relevant with this research.</td><td rowspan="3">Project sponsor
Program Management
Business Analyst
Internal stakeholders
External stakeholders
Regulators
Local communities</td></tr>
<tr><th>Key metrics</th><th>Channels</th></tr>
<tr><td>Quality assurance
Capabilities of Companies
Price against value
Communications
Release of unverified software</td><td>User Actions
Content Marketing
Advertising
Events
Value added Resellers (VARs)
Independent Software Vendors (ISVs)</td></tr>
</table>

Cost Structures	Revenue Streams
Hardware and software costs including maintenance Travel and training costs Effort costs of paying software developers	Paid apps and license, Free, with in-app advertising Free, with in-app purchases, Subscriptions Usage-based license, Extra charge for enterprise services, support, and consulting

4.2 Risk Identification, Analysis and Management Techniques Comparisons

There are several techniques that can be used for identifying and analyzing risks. In this discussions, I discuss techniques that can be applied to managing risks in software industries as follows:

- **Delphi Technique**
- **Risk Probability and Impact assessment**
- Apollo Root Cause Analysis methodology

4.2.1 Delphi Technique

Delphi technique was developed by the Rand Corporation in the 1940s as a tool for questioning judgment from a group of experts. It is used to analyze the association expert opinion in order to reach at an informed group agreement on a complex problem. Landeta reports that the Delphi is a sincere and appreciated contributor to progress on complex social difficulties and issues, while de Meyrick reports that the technique has a long tradition as a valid research method - especially in the health science field. Numerous studies in health education have used the customary Delphi technique exclusively to determine compromise in a number of important essential areas, such as matching manuscript submissions with appropriate health education journals, developing research questions and determining specific topics for inclusion in environmental health curricula. It is also use in software development for risk assessment.

4.2.1(a) Comparison of Delphi Technique and Lean Canvas Model

Factors	**Delphi Technique**	**Lean Canvas Model**
Customers	**Respondents which are experts of their fields**	**Customer segments like Owners, Stakeholders and Developers**
Channels	**Interviews/ Questionnaires**	**Events, User actions, Content management tools etc.**
Cost	**More than Lean Canvas model**	**Less than Delphi Technique**
Key Metrics	**Not available**	**Available**
Solutions	**Finalized after all rounds**	**At number 3 option in model**
Returns	**More than One**	**One**
Time Require	**Depend on iterations**	**Depends on research work**
Efficiency	**Good**	**Better**
Model type	Risk Identification, Analysis and Management technique	**Business Risk Analysis model**
Limitations	**Lack of reliabilities and clear methodologies, No elaboration**	**Minimum number of iterations**
Use for	Risk Identification, Analysis and Management in different studies	**Risk Analysis in Business**

Number of iteration	**Infinity**	**One**
Number of problems	**More than three**	**Three**

4.2.2 Risk Probability and Impact assessment

Probability and Impact Matrix may be a tool for the project team to help in prioritize ing risks. As you recognize, there is also many risks in any project. Counting on the scale and complexness of the project in hand, the risks could vary somewhere from double digits to triple digits. But, will we have the time and cash to seem into of these risks, in addition to the response action. The solution is NO; we have a tendency to don't have such luxury of your time. So, it's necessary to seek out the way to spot those vital risks that wants the foremost attention from the project team.

4.2.2(b) Comparison of Risk Probability and Impact assessment and Lean Canvas Model

Factors	**Risk Probability and Impact assessment**	**Lean Canvas Model**
Customers	**Team of expert**	**Customer segments like Owners, Stake holders and Developers**
Channels	**Assessments**	**Events, User actions, Content management tools etc.**
Cost	**Less than Lean Canvas model**	**More than Risk Probability and impact**
Key Metrics	**Not available**	**Available**
Solutions	**Just prioritize the risks**	**At number 3 option**
Returns	**More than One**	**One**
Time Require	**Depend on iterations**	**Depends on research work for one iteration**
Efficiency	**Better**	**Better**
Model type	Risk Identification, Analysis and Management technique	**Business Risk Analysis model**
Limitations	**Strictness is in the eye of the beholder**	**Minimum number of iterations**
Use for	Risk priority	**Risk Analysis in Business**
Number of iteration	**Infinity**	**One**
Number of problems	**More than three**	**Three**

4.2.3 Apollo Root Cause Analysis methodology (Apollo RCA)

The Apollo Root Cause Analysis methodology is a 4-stage procedure that affords a new way of thinking and goes far outside the traditional root cause analysis problem solving methods. Lean Canvas capacities an actionable and entrepreneur-focused business plan. It emphases on problems, solutions, key metrics and competitive advantages.

4.2.3(a) Comparison of Apollo Root Cause Analysis methodology and Lean Canvas Model

Factors	**Apollo Root Cause Analysis**	**Lean Canvas Model**
Customers	Stakeholders	**Customer segments like Owners, Stake holders and Developers**
Channels	**Charts and questions**	**Events, User actions, Content management tools etc.**
Cost	**Less**	**Less**
Key Metrics	**Available**	**Available**
Solutions	**All problems**	**At number 3 option**

Returns	**More than One**	**One**
Time Require	**Till best solution**	**Depends on research work for one iteration**
Efficiency	**Better**	**Better**
Model type	Root Cause Analysis	**Business Risk Analysis model**
Limitations	**Unlimited causes, limited solutions**	**Minimum number of iterations**
Use for	Actions and conditions of	**Risk Analysis in Business**
Model Routes	**Chain**	**Segments**
Number of problems	**More than three**	**Three**
Number of steps		

After this comparison we can see lot of differences between Lean Canvas model and Apollo Root Cause Analysis methodology. First of all there are only 4 steps in Apollo Root Cause Analysis methodology and there are 7 different segments in Lean Canvas model. Some steps have further steps in Apollo Root Cause Analysis methodology like in first step "Define the Problem". Lean canvas have no more segments within any segment. Apollo Root Cause Analysis methodology uses chains to find out the solutions by using "Why". Time factor is almost common in this comparison. I have compares three different types of methods with Lean Canvas model individually, now this time I will compare all these methods in one table. By getting some results from this main comparion table, we can calnclude lot of things and results about time and cost of these techniques and tools. Time and cast are two major factors which is actually depend on performance of these techniques and tools. I am trying here to draw some graphs as a result.

5. Conclusion

Requirement analysis in software engineering is an important stage, mostly software fails because of software requirement risks. So it is necessary to deep understand and look the requirements. But how much and how a requirement is a risk? How we can remove this with best solutions? For all of this procedures we need a best and effective tool or technique, there are lot of techniques to measure these factors. Is a business can work and can assess requirements risks, in this research I have concluded that Lean Canvas model can help us which or more effective and affordable model to do all measures of software risks. I have drawn a Lean Canvas model and then compare other techniques of software risk assessments. But I have concluded that Lean Canvas model is best for this one important factor is time, it is quickly work and require low cost. Others techniques have lot of steps and iterations therefore they require much time and cost. Lean canvas deeply understand the problems then help to solve these problems step by step just in seven segments. Because this research is qualitative so we can say how many percent this tool work, another reason there are minimum cases of software requirements engineering for risk analysis in which using Lean Canvas model. So it is hard to say what percent value of this model in market is. But according to research I can say that this is a good idea and option to use Lean Canvas model in risk analysis. Another important point which I can say in this conclusion that a business model has proven that How much it is important to analyze requirements risks, and How a business model can help us to do this job.

References

Adikara, F. and Sitohan, B. (2013). The emergence of user requirements risk in information system development for industry needs. International Seminar on Industrial Engineering and Management. 89(19).

Blank, S., & Eckhardt, J. T. (2024). The lean startup as an actionable theory of entrepreneurship. Journal of Management, 50(8), 3012-3034.

Dantas, E., Neto, A. S., Valadares, D., Perkusich, M., Ramos, F., Almeida, H., & Perkusich, A. (2022). Investigating technological risks and mitigation strategies in software projects.

In Proceedings of the 37th ACM/SIGAPP Symposium on Applied Computing (pp. 1527-1535).

Khalid, N. (2025). Scrum-Driven Quality Improvement: Mitigating Software Failures Effectively. Spectrum of engineering sciences, 3(3), 61-84.

Khan, A. W., Zaib, S., Khan, F., Tarimer, I., Seo, J. T., & Shin, J. (2022). Analyzing and evaluating critical cyber security challenges faced by vendor organizations in software development: SLR based approach. IEEE access, 10, 65044-65054.

Khan, R. A., Khan, S. U., Khan, H. U., & Ilyas, M. (2022). Systematic literature review on security risks and its practices in secure software development. ieee Access, 10, 5456-5481.

Hasan, M., Cruz, J., Chakraborty, P., Bhunia, S., & Hoque, T. (2021). Software variants for hardware trojan detection and resilience in COTS processors. arXiv preprint arXiv:2112.00304.

Hevia, J. L., Peterssen, G., & Piattini, M. (2024). Quantum software development risks. Quantum Information and Computation, 24(5&6), 0455-0467.

Hosseinpour, V., Saeidi, A., Nollet, M. J., & Nastev, M. (2021). Seismic loss estimation software: A comprehensive review of risk assessment steps, software development and limitations. Engineering structures, 232, 111866.

Laplante, P. A., & Kassab, M. (2022). Requirements engineering for software and systems. Auerbach Publications.

Olorunshola, O. E., & Ogwueleka, F. N. (2021). Review of system development life cycle (SDLC) models for effective application delivery. In Information and Communication Technology for Competitive Strategies (ICTCS 2020) ICT: Applications and Social Interfaces (pp. 281-289). Singapore: Springer Singapore.

Peralta, C. B. D. L., Echeveste, M. E., Lermen, F. H., Marcon, A., & Tortorella, G. (2020). A framework proposition to identify customer value through lean practices. Journal of Manufacturing Technology Management, 31(4), 725-747.

Poppendieck, M. & Cusumano, M.(2012). Lean software development: A tutorial. IEEE software, 29(5), 26-32.

Rispianda, R., Subagyo, & Darmawan, A. (2025). Optimising the business model canvas to determine time to market through concurrent product development. Production Engineering, 1-23.

Schulte, R. (2025). New venture risk management: Theoretical framework and research perspectives. Journal of the International Council for Small Business, 1-20.

Zorzetti, M., Signoretti, I., Salerno, L., Marczak, S., & Bastos, R. (2022). Improving agile software development using user-centered design and lean startup. Information and Software Technology, 141, 106718.