

Risk Management for Software Projects in Banking

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ABSTRACT

The management techniques for projects are critical to the success of large financial software projects. Project management is systematically monitored and controlled by establishing a baseline based on scope, schedule, and cost. In addition, risk management must be managed to identify and respond to risks in advance for the entire project. The study of risk management for most financial software projects is either a theoretical proposal with no empirical assessment or a case study of a similar project. Therefore, in this paper, authors would like to conduct research in real core banking project site in Vietnam which helps to know the method of process improvement, risk management, and results in various project situations as well.

CCS Concepts

• Software and its engineering → Risk management

Keywords

Software project; Project management; Risk management; Core banking; Boehm's top 10 risk

1. INTRODUCTION

The project management and risk management are tools needed to place the project in success with customer's satisfaction [1]. In common knowledge, there are various tools to engage in project risk management; however, they cannot automatically guarantee the project success [2]. According to statistics on the results of general project performance, the risk affected the organization with 60% as time, budget, meeting business intent and low-profit maturity projects failed 71% [3] or did not meet the original requirements [4].

Almost all projects are facing risks and the usual alternatives are managing the project, development team, and other stakeholders; understanding quantitatively; implementing the plan for acceptance/avoidance/transference, and mitigating these risks.

Additionally, risk management tries to predict and control uncertain events, knowing objectives of cost and timeframe. The risk could be identified as soon as possible to minimize the risk to the project success. Therefore, the identified risks should also be measured in accordance with the assessment criteria and then approach to risk

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response method.

The potential of a risk event occurs in all software development phase: Initiation, Planning, Execution, and Closeout [5]. The cost impact of a risk event in the project is less if the event occurs earlier. The chance to reduce the cost in the early stage of the project is easier and has no hassle. Conversely, if the project is passed the part of the way implementation, it requires more stakeholders to participate in the settlement, also cannot ensure to archive peerless result.

As a matter of fact, there is no tool to guarantee the success of a software project, the success rate is even lower in a specific area, especially banking. Development of software for banks has to meet the prerequisite requirements. Each of the studies addresses some aspects of risk management of software projects in the bank but does not cover all phases of them.

The goal of this research is to clarify risk management of software projects in a real bank, how to reduce major risks and what we can do to mitigate the risks from the perspective of project management method. There are three main research questions in this study:

RQ1: *What are the main risks in real bank software project management?*

RQ2: *What can you actually do to reduce these risks?*

RQ3: *Is there any additional way to mitigate the risk of banking software from the perspective of project management methodology?*

The remainder of this paper is organized as follows: Section 2 outlines the risk management with the process, assessment and response. Then, Section 3 concentrates on analyzing key risks and responses through actual banking projects. Finally, conclusions are discussed in Section 4.

2. RISK MANAGEMENT FOR SOFTWARE PROJECTS IN BANK

This section describes the overall risk management in a software project. It includes the process of conducting risk management planning, identification, assessment (qualitative and quantitative analysis), response plan and monitoring & controlling on a project. Project risk is always in the future. Thus, predicting the coming is nearly impossible. Unknown risks cannot be managed although the project manager might base on experience of past projects and known knowledge areas. Proposed process is collecting uncertain event in the past, then analysing the response following the current status of project or recommendation from experts.

The purpose of this process is to decrease the probability and impact of negative risk events. The detail is shown as Figure 1.

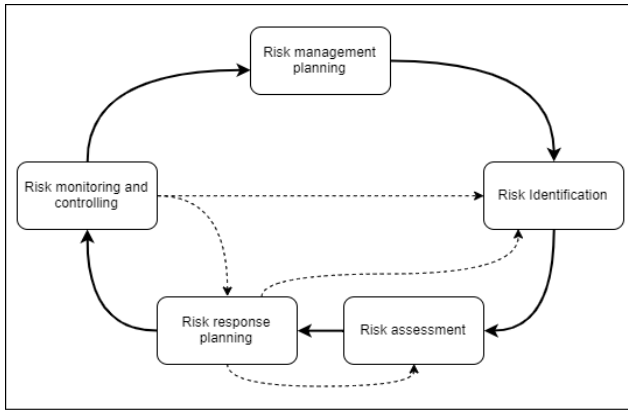


Figure 1. Project risk management process overview

The above figure indicates that risk affects the entire management process. Therefore, risk must be considered in detail at each step for project management process group.

2.1 Project Risk Management Process Overview

The risk management planning decides how to approach and plan the risk management activities for a project. It is important to make a plan to cope instead of nothing even though it is not impeccable. Following the idea of PMBook Guide [2], the process could be described as Inputs, Tools & Techniques, and Output (Table 1).

Table 1. Process of risk management planning

Items	Content
Input	<ul style="list-style-type: none"> Project charter Organization's risk management policies Defined roles and responsibilities Stakeholder risk tolerances Template plan Work breakdown structure(WBS)
Tools and Techniques	<ul style="list-style-type: none"> Planning meetings, Expert judgment
Output	<ul style="list-style-type: none"> Risk management plan

Creating a risk management plan above should clarify the level, type, and visibility that is appropriate for your organization's projects.

2.2 Risk Identification

The purpose of this step is determining which risks might affect the project and documenting their characteristics. The participants should be the direct stakeholders, other parts of the company, customers, end-users, or outside experts.

2.3 Risk Assessment

This is the step where we analyse all those risks identified in the previous step. The main job of that task is to arrange the important risk (high impact/probability) and move the lower impact/probability risk to "watch" list.

2.3.1 Qualitative

Qualitative analysis is a way to determine the importance of addressing specific risks and guiding risk response by prioritizes risks according to their potential effect of project objectives. It is easy to do and required to do in all project even though it has low complexity, low dollar value. The Table 2 is an example of the risk arising from a wrong development of interest calculations.

Table 2. Risk register with qualitative rating in bank project

Items	Content
#ID	RISK-01
Risk	Wrong development and deploy
Risk Category	Development
Risk Description	Error in calculating interest module in production server due to program development
Probability	High
Impact	High
Ranking	1

Everything unplanned or unexpected in the project management includes risks that can have a negative impact on project cost, timing or quality. One important tool you can use for risk management is the Risk Analysis Structure (RBS) (Table 3).

Table 3. Risk Breakdown Structure in banking project

Item	Contents
Classification	Technical (Policy/Technical/Operation/Etc.)
Detail Type	Development
Contents	Wrong development for calculating interest module

2.3.2 Quantitative

Quantitative risk analysis generally follows qualitative risk analysis. They both require risk identification and can be used separately or together. The quantitative risk analysis process analyses numerically the probability of each risk and its consequence. It is time-consuming, and might not require for all project even high dollar value. The quantitative risk analysis matrix allows you to create a matrix in which the vertical direction defines the impact of the risk on the project and the horizontal direction defines the potential risk to the project (Table 4).

Based on the quantitative risk analysis matrix, the probability of occurrence of a risk event and its impact can be the basis for determining how much to measure for risk mitigation. It can be measured by multiplying the risk cost with the occurrence probability.

Table 4. Quantitative risk analysis matrix

Impact	High	RISK-N	RISK-N	<u>RISK-01</u>
	Medium	RISK-N	RISK-N	RISK-N
	Low	RISK-N	RISK-N	RISK-N
		Low	Medium	High
Probability				

2.4 Risk Response Planning

This part aims to solve the cause of the analysed risk identification and evaluation. It's time to address plans, risk mitigation strategies, and contingency plans, etc. to minimize the possibility of negative risks. The plan should be applied at a risk level, cost and time appropriate for the stakeholders. The strategy here is avoidance, transition, mitigation, and acceptance (Table 5).

Table 5. Risk response in bank project

Items	Content
#ID	RISK-01
Response Type	Mitigation
Risk Response	Step up the analysis and design (Detailed phase to strengthen the verification step)
	Enhance the test scenario (Strengthen the criteria for user acceptance testing)
	Enhance application through simulation server when applying program time

2.5 Risk Monitoring and Controlling

The interactive works which are monitoring the current stage of the project, keeping an eye on residual risk, identifying implicit risks, executing risk reduction plan, checking out the “watch” list to ensure the risk impact have not changed. A good risk monitoring and controlling are enlightening the information able to make effective decisions. Risk controlling might choose alternative strategies, do a contingency plan, correct action, and is able to re-plan the project.

The 5 stages process above is the most popular risk management process which is applied in the various project during the time, supported by PMI.

2.6 Software Project of Boehm’s 10 Risk Items

This part discusses the risk management above. The following is a detailed list of well-known Boehm’s top 10 software risk items and techniques for software projects (Table 6) [6].

The principles and practices in Software Risk Management are persuasive until now [6], [7]. In the next part, based on Boehm’s top 10 software risk items, this paper will analysis the most impacting risk in Vietnam banking software project.

Table 6. Boehm’s top-ten checklist software risk items

Risk items	Risk-management technique
Personnel shortfalls	Staffing with top talent, job matching, team building, key personnel agreements, cross-training
Unrealistic schedules and budgets	Detailed multisource cost and schedule estimation, designing cost, incremental development, software reuse, requirements scrubbing.
Developing the wrong functions and properties	Organization analysis, mission analysis, operations-concept formulation, user surveys and user participation, prototyping, early users’ manuals, off-nominal performance analysis, quality-factor analysis.
Developing the wrong user interface	Prototyping, scenarios, task analysis, user participation.
Gold-plating	Requirements scrubbing, prototyping, cost-benefit analysis, designing cost.
Continuing stream of requirements changes	High change threshold, information hiding, incremental development (deferring changes to later increments).
Shortfalls in externally furnished components	Benchmarking, inspections, reference checking, compatibility analysis.
Shortfalls in externally performed tasks	Reference checking, pre-award audits, award-fee contracts, competitive design or prototyping, team-building.
Real-time performance shortfalls	Simulation, benchmarking, modelling, prototyping, instrumentation, tuning.
Straining computer-science capabilities	Technical analysis, cost-benefit analysis, prototyping, reference checking.

3. RISK MANAGEMENT USING SOFTWARE PROJECTS IN BANKING

This section discusses software project risk management that we implemented based on the analysis of the Vietnamese bank actual outcome.

3.1 Research Approach

Firstly, after completing the banking project, we analyze the requirements that occur during the current maintenance project. We perform the classification and identification by applying Boehm's top 10 risks to analyze whether this requirement was an item of risk in previously projects.

Afterward, the result is analysed, key risks and mitigations make it easier to access the main content of the case study. The final results are then analysed and discussed lessons from the case studies are also drawn.

3.2 Research Questions

RQ1: What are the main risks in real bank software project management?

RQ2: What can you actually do to reduce these risks?

RQ3: Is there any additional way to mitigate the risk of banking software from the perspective of project management methodology?

3.3 Case Study

The current company has been selected to supply core bank solutions by participating in bidding with other Vietnamese banks. The project was performed for two years by applying the bank's entire business.

After the completion of the project, we have entered into a maintenance project contract, then proceeding the on-site project. However, during the maintenance project, the frequency of modifications in previously completed implementation project was higher than the new requirements.

Analyzing these problems, we recognized the necessity of investigating whether they can be applied as a risk assessment factor when implementing new banking projects.

Based on the case study environment below (Table 7), we investigated the actual project requirements.

Table 7. Case study environment

Items	Content
Project Information	<ul style="list-style-type: none"> • Vietnam Core-Banking Project • Implemented in 2 years • Provide to the whole banking business (<i>Deposit, Loan, Foreign exchange, Trade finance, Dealing, General Ledger, etc.</i>) • Currently, perform to maintenance project
Research Condition	<ul style="list-style-type: none"> • Analysis of requirements in the whole business for the maintenance project • Analysis Period: 1 Year (2018.01~2018.12)

After classifying and applying the Boehm's top 10 risks, the following procedure is performed (Table 8).

Table 8. Case study procedure

No	Content
1	Collecting actual requirements (2018.01~2018.12)
2	Analysing and Identifying risks by requirements
3	Boehm's top 10 risk analysis and identification
4	Mapping to the requirements and Boehm's top 10 risk
5	Analysis of the relationship between unit business and higher risk identification (<i>Risk assessment</i>)
6	Case study of response between unit business and higher risk identification (<i>Risk response</i>)
7	Case study of response between project management knowledge and higher risk identification

As shown in the table 8, we have collected and identified the requirements for one year of maintenance projects. We applied the well-known Boehm top 10 risks to obtain meaningful results on the impact and response of risks.

As a result of analyzing the requirements of the project, among the top ten risks of Boehm, "3. Developing the wrong S/W functions" accounted for more than 30%. We can refer to the next section for the detailed results.

3.4 Research Result

Analysis RQ1: What are the main risks in real bank software project management?

As a result of classifying Boehm's top 10 risks through the case study, the major risk rankings have the following data (Table 9).

Table 9. Result of top-ten checklist software risk items for Vietnam bank

No	Risk item	Rate
1	Personnel shortfalls	0.68
2	Unrealistic schedules and budgets	5.23
3	Developing the wrong S/W functions	30.23
4	Developing the wrong user interface	7.95
5	Gold plating	18.86
6	Continuing stream of requirements changes	21.14
7	Shortfalls in externally furnished components	0.68
8	Shortfalls in externally preformed tasks	0.68
9	Real-time performance shortfalls	14.32
10	Straining computer science capabilities	0.68

In the above results, the current requirements analysis showed that "3. Developing the wrong S/W functions" had the highest risk, followed by three risks namely "5. Gold plating", "6. Continuing stream of requirement changes", and "9. Real-time performance shortfalls".

In addition, as a result of researching each task in the item of "3. Developing the wrong S/W functions", the following results were shown.

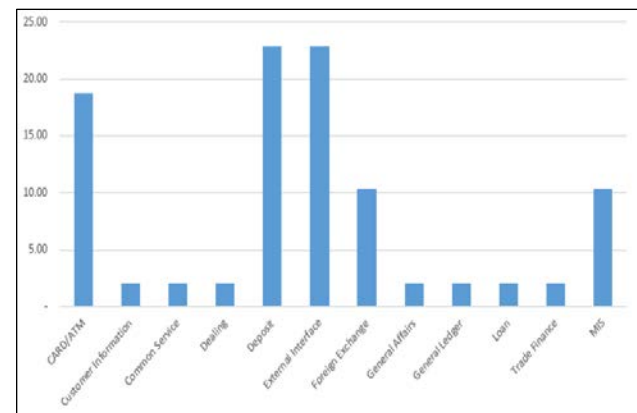


Figure 2. Detail business of developing the wrong S/W functions

From the Figure 2, you can see that the external interface, deposit, and card business are in poor development and high redevelopment.

Analysis RQ2: What can you actually do to reduce these risks?

The result of RQ1 shows the high-level risk of "3. Developing the wrong S/W functions" and "6. Continuing stream of requirements changes".

In terms of “3. Developing the wrong S/W functions”, detailed mitigations and approaches to solve problems in the past are described as follows (Table 10).

Table 10. Detail identification of developing the wrong S/W functions

ID	Developing the wrong S/W functions	Rate
N1	Organizational analysis	1.41
N2	Mission analysis	1.41
N3	Operations-concept formulation	50.70
N4	User surveys	29.58
N5	Prototyping	15.49
N6	Early users' manuals	1.41

The item “3. Developing the wrong S/W functions” had the highest mitigation from the “N3. Operation concept for formulation” method. For example, “N3. Operation concept for formulation” can be mitigated by planning and collaborating on user characterization of operations including task sequence, data flow, control, and operational procedures.

As a result, you can mitigate the bank software project risk through incremental detailing and iterative development, taking into account operational aspects.

Analysis RQ3: Is there any additional way to mitigate the risk of banking software from the perspective of project management methodology?

Based on the 10 knowledge of project management defined by the PMP organization, the risk items of the Vietnamese bank project identified above can be mitigated by the project risk management plan. The table 11 is an example matrix of the project management knowledge, linkage of risk items and management plan.

The table below shows, for example, that the "N3. Operations-concept formulation" can implement a management plan based on the user's mission characterization in terms of operations.

Table 11. Risk matrix between project management knowledge and result of research

Project knowledge areas	N1	N2	N3	N4	N5	N6
Integration	X	X	X	X	X	X
Scope			X	X	X	X
Time						
Cost						
Quality			X			X
Resource	X	X	X			X
Communication	X	X	X	X		X
Risk	X	X	X	X	X	X
Procurement						
Stakeholder						

3.5 Discussion

Based on the Vietnamese bank's one-year requirements, we conducted a case study on how to identify and mitigate major risks. As a result, we got three main points.

- Firstly, this bank is most at risk of developing the wrong software functions and continuing stream of requirements changes in the retail bank business.
- Secondly, developing the wrong software functions are mostly mitigated by the Operations-concept formulation method. Continuing stream of requirements changes can also be mitigated by incremental development.
- Finally, the project risk management matrix can be mitigated through planning, monitoring, and controlling in each knowledge area.

4. CONCLUSIONS

There are many bank software project risk management that requires more about size, accuracy, time, cost, effort, knowledge, and experience than others to avoid or address many risks. Therefore, it is necessary to investigate and analyze the risk of the bank's project management.

Besides risk management, research should be conducted on the input determination of human resources, schedule, and cost, etc. which are relevant to project performance by identifying the importance of each banking business. The analysis in this paper can identify factors that may further mitigate the risk of banking projects. The project is unique and temporary but this paper can also provide a reference to banks or other public industry that use software projects.

5. REFERENCE

- [1] Sandro Azzopardi. 2015. Evolution of project management. <https://www.projectsmart.co.uk/evolution-of-project-management-part-2.php>. Accessed 10-Sept-2019
- [2] PM Book Guide. 2018. <https://www.pmi.org/pmbok-guide-standards/foundational/pmbok>. Accessed 10-Sept-2019
- [3] Success in Disruptive Times. <https://www.pmi.org/-/media/pmi/documents/public/pdf/learning/thought-leadership/pulse/pulse-of-the-profession-2018.pdf>, Accessed 10-Sept-2019.
- [4] Standish Group 2015 Chaos Report. 2015. <https://www.infoq.com/articles/standish-chaos-2015>. Accessed 10-Sept-2019
- [5] Blake, J. 2004. Project managing the SDLC: using milestones to align project management and system development lifecycles and report project success. *Paper presented at PMI® Global Congress 2004—North America*, Anaheim, CA. Newtown Square, PA: Project Management Institute.
- [6] Barry W. Boehm. 1991. Software Risk Management: Principles and Practices. *IEEE Softw.* 8, 1 (January 1991), 32-41. DOI=<http://dx.doi.org/10.1109/52.62930>.
- [7] Kan Qi and Barry W. Boehm. 2018. UMLx: a UML diagram analytic tool for software management decisions. *In Proceedings of the 40th International Conference on Software Engineering: Companion Proceedings (ICSE '18)*. ACM, New York, NY, USA, 278-279. DOI: <https://doi.org/10.1145/3183440.3194969>.