Risk Analysis in Project of Software Development

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Abstract
The Project Management in the area of IT is becoming hot topic now. The risk problems in IT Projects, especially in software projects become more and more concentration in software project management in China. This paper analyze systematically the characteristics of project management for software itself, then the paper analyses the risk of software development project in following two aspects : one for owners another for contractors. To owners the paper identify and analyze the risk in software development projects according to life cycle of a project. To contractors the paper identifies and assess the risk of project management in software development, and on the bases of investigating of software development project in the IT enterprises of China some conclusions are obtained with the method of AHP.

Keywords
Software development project; risk analysis.

INTRODUCTION

The Project Management in the area of IT is becoming hot topic now. The risk problems in IT Projects, especially in software projects become more and more concentration in software project management in China. There are characteristics of project management for software itself, i.e. software development is differ from manufacturing of other products and the whole process of development is design; software development do not need other material resources, it needed only manpower resources; the products of software development is procedure code and technique documents only. Although there are some paper issued in some web page about problems existed in software development in project in China there is no systematically analysis the risk problem in software development project. This paper will analyze systematically the risk of software development project in two parts--owners and contractors and some suggestions will be give based on the analysis.

THE RISK IDENTIFICATION AND ANALYSIS TO OWNERS IN SOFTWARE DEVELOPMENT PROJECT

The Risk Identification To Owners In Software Development Projects

The risk identification is identify the causes of risk and the conditions of causing risk. According to life cycle of a project the risks of software development project to owners are as follows:

Conceive Stage

In conceive stage the main risk of software development project is to determine whether the project is feasible. The reasons are as follows: the requirements of identification is not correct ;the application environment is not suitable the development of the IT technology; the wrong technical course; the time of execution project is not suitable.

Develop Stage

In develop stage the main risk of software development project is that the results of design do not reach the expected effect. The reasons are as follows: the owners demands are too ideality and are divorced from practice; there are communication problem about demand analyses between owners and contractor.

Execute Stage

In execute stage the main risk of software development project are implement obstacle and stock risk. The reasons are as follows: the high level leader do not recognize the importance of IT project; the execution of IT project will strike the original management system.

Finish Stage

In finish stage the main risk of software development project is that the owner do not pay enough attention to the knowledge management. There is no standard and criterion in management of documents for software development.

The Risk Analysis To Owners In Software Development Projects

Qualitative Analysis

The results of qualitative analysis for software project in different life cycle show in table 1.

Table 1 Qualitative analysis for software project in different life cycle

Stage	Risk	Affection to project
Conceive	Project's feasibility	Very high
Develop	Design do not reach the expected effect	High
Execute	Implement obstacle and stock risk	Middle
Finish	Knowledge management problem	Higher

Quantitative Analysis

The results of quantitative analysis for software project in different life cycle show in table 2.

Table 2 Quantitative analysis for software project in different life cycle

Stage	Risk	Affection to project
Conceive	Project's feasibility	5
Develop	Design do not reach the expected effect	4
Execute	Implement obstacle and stock risk	2
Finish	Knowledge management problem	3

Risk Ranking

The outcome of ranking of the risk for software project in different life cycle show in table 3.

Table 3 Outcome of ranking of the risk for software project in different life cycle

Stage	Risk	Risk ranking
Conceive	Project's feasibility	1
Develop	Design do not reach the expected effect	2
Execute	Implement obstacle and stock risk	4
Finish	Knowledge management problem	3

THE RISK IDENTIFICATION AND ASSESSMENT TO CONTRACTOR IN PROJECT OF SOFTWARE DEVELOPMENT

The Risk Identification To Contractor In Project Of Software Development

The risk of project management in software development include following aspects: technique risk, management risk and scope change risk etc.

Technique Risk

Technique risk include the reliability of technology and using of technology that is out-of-date.

Management Risk

Management risk include the accuracy of cost budget, the perfection of development schedule, the suddenly leave of main technician, the skill of management of manager. High cost budget will lose opportunities of development a project; low cost budget will get nothing benefit in the development a project. The lack of perfection in development schedule are as follows: wok breakdown structure is not suitable to the project organization structure; the outcomes for submission are not clearly defined; there is no milestone in development schedule; there is no plan of schedule management.; the estimation of work time is not enough. The suddenly leave of main technician will cause abandonment for a project. The skill of management of project manager mainly show in leading capability.

Scope change risks

Scope change risks include follow two aspects: customs can not describe their own demands clearly and technician can not understand entirely the needs of customs.

The details of risks in project of software development are listed in figure 1.

The Risk Assessment To Contractor In Project Of Software Development

Risk assessment is analyses the risk qualitatively and sequence the risk factors according to the seriousness affecting the objectives of a project. In the project of software development we can assessment the risk in following aspects: the probability of occurrence and outcome of occurrence.

On the bases of investigating of software development project in the IT enterprises of China table 4 to 8 give the results obtained with regard to figure 1.

Table 4 First level risk assessment

Classify of Risk	Probability of Occurrence	Outcome of Occurrence
Technical	little	large
Management	middle	large
Scope change	large	very large

Table 5 Second level risk assessment---- Technical

Classify of Risk	Probability of Occurrence	Outcome of Occurrence
Reliability of technology	little	large
Use of out-of-date technology	large	little

Table 6 Second level risk assessment---- Management

Classify of Risk	Probability of Occurrence	Outcome of Occurrence
cost budget	large	large
perfection of development schedule	large	large
skill of management of manager	middle	middle
suddenly leave of main technician	middle	very large

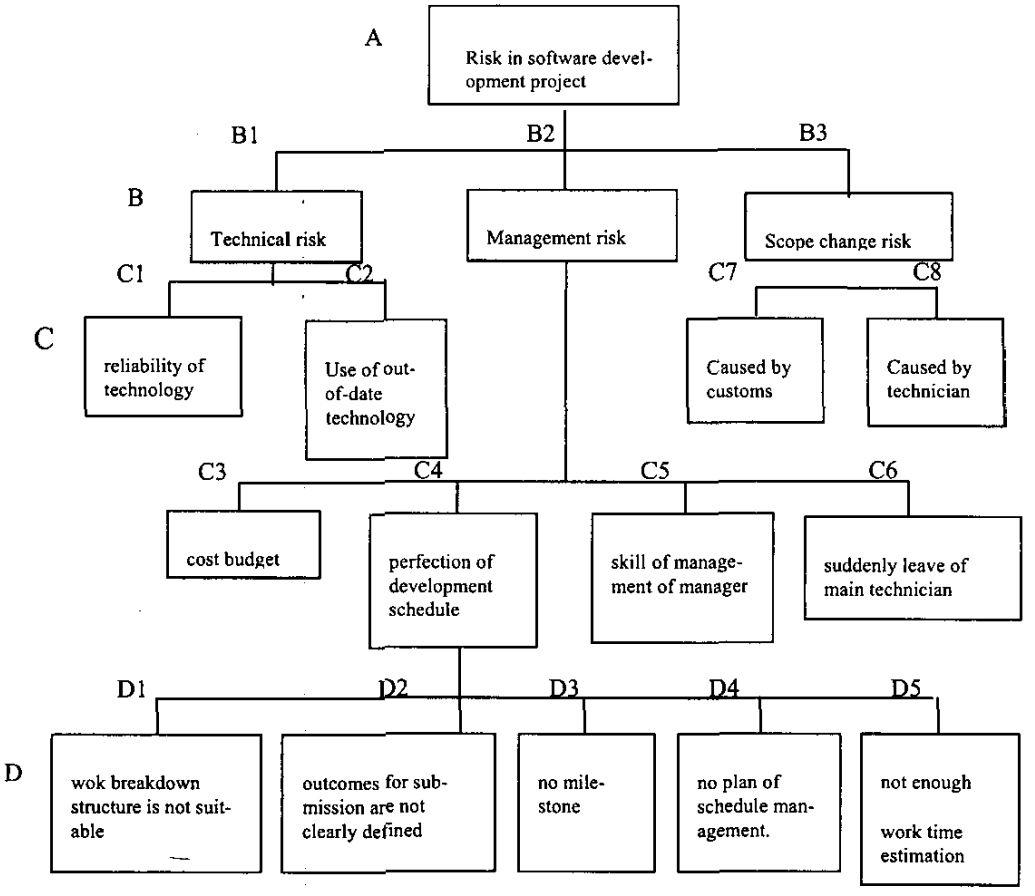

figure 1 The structure of the risk in software development project

Table 7 Second level risk assessment---- Scope change

Classify of Risk	Probability of Occurrence	Outcome of Occurrence
Caused by customs	very large	very large
Caused by technician	large	large

Table 8 Third level risk assessment---- perfection of development schedule

Classify of Risk	Probability of Occurrence	Outcome of Occurrence
WBS is not suitable	middle	middle
No clearly outcomes for submission	large	very large
no milestone	very little	middle
schedule management.	little	middle
time estimation	large	large

With the method of AHP the results of sequencing the risk factors according to the seriousness affecting the up level factor will be obtained. Without lose of generality we only consider three level in figure 1.

According to table 4 to table 8 and Saaty's qualitative standard in the method of AHP [1] the following results shown in table 9 to table 13 are obtained.

Table 9 Assessment matrix----A-B

A-B	B1	B2	B3
B1	1	1/3	1/7
B2	3	1	1/5
B3	7	5	1

$W=(w_1, w_2, w_3)=(0.00807, 0.1884, 0.7308)^T$

Table 10 Assessment matrix----B1-C

B1-C	C1	C2
C1	1	5
C2	1/5	1

$W=(w_1, w_2)=(0.8334, 0.1666)^T$

Table 11 Assessment matrix----B2-C

B2-C	C3	C4	C5	C6
C3	1	1/3	5	1/5
C4	3	1	4	1/4
C5	1/5	1/4	1	1/6
C6	5	4	6	1

$W=(w_1, w_2, w_3, w_4)=(0.1336, 0.2314, 0.0531, 0.5819)^T$

Table 12 Assessment matrix----B3-C

B3-C	C7	C8
C7	1	5
C8	1/5	1

$W=(w_1, w_2)=(0.8334, 0.1666)^T$

Table 13 Assessment matrix----C4-D

C4-D	D1	D2	D3	D4	D5
D1	1	1/3	5	4	1/2
D2	3	1	9	7	3
D3	1/5	1/9	1	1/2	1/3
D4	1/4	1/7	2	1	1/3
D5	2	1/3	3	3	1

$W=(w_1, w_2, w_3, w_4, w_5)=(0.1803, 0.5036, 0.0462, 0.0671, 0.2028)^T$

According to table 9 to table 13 and above computation we can obtained the following results: the most dangerous risk of software development project in China is the Scope change risk, the second is management risk, the third is technical risk.

In the scope change risk the more importance one is the changing of custom's demands. It will cause difficulties in project management for software development or even cause to failure to a project if customs can not describe their own demands clearly.

In the management risk the suddenly leave of main technician is the most serious risk , the second is the perfection of development schedule, the third is accuracy of cost budget, the forth is the skill of management of manager.

In the technique risk the reliability of technology is the most important effect in technique risk.

In the risk of perfection of development schedule the most contribution effect is that the outcomes for submission are not clearly defined. The second is that the estimation of work time is not enough. The third is that wok breakdown structure is not suitable to the project organization structure. The fourth is that there is no plan of schedule management. The fifth is that there is no milestone in development schedule.

CONCLUSION

This paper analyze systematically the characteristics of project management for software itself, then the paper analyses the risk of software development project in following two aspects : one for owners and another for contractors. To owners the paper identify and analyze the risk in software development projects according to life cycle of a project. To contractors the paper identifies and assess the risk of project management in software development with the theory of risk analysis, and on the bases of investigating of software development project in the IT enterprises of China following conclusions are obtained with the method of AHP. The followings conclusions obtained through analysis the risk of owners side: the main risk in conceive stage is project's feasibility and the affection to project of this risk is very high; the main risk in develop stage is that the design do not reach the expected effect and the affection to project of this risk is high; the main risk in execute stage is implement obstacle and stock risk and the affection to project of this risk is middle; the main risk in finish stage is knowledge management problem and the affection to project of this risk is higher. The followings conclusions obtained through analysis the risk of contractors side: the most dangerous risk of software development project in China is the scope change risk, the second is management risk, the third is technical risk. In the scope change risk the more importance one is the changing of consumer's demands. In the management risk the suddenly leave of main technician is the most serious risk . In the technique risk the reliability of technology is the most important effect in technique risk.

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