Application of Kano Model in Risk Identification of Software Development Projects

Yanchen Liu[1, *, †], Kai Ruan[2, †]

[1]School of Dalian University of Foreign Languages,Dalian,China

[2]School of Hubei University of Economics,Wuhan,China

*Corresponding author: 200452235@student.dlufl.edu.cn

[†]These authors contributed equally.

Abstract. Risk management and identification of software projects is an important factor in software project management. Software project risks will affect the implementation of the project plans, and if they do, they will affect the project progress, increase the project costs, and even make the software project unfeasible. Risk occurrence can be minimized if risk management and identification are implemented in a project. However, in China, many software development companies do not have the awareness of risk management and identification, or use inappropriate management technology, resulting in software development projects are often delayed, beyond the budget or even failed. Successful project management requires good risk management and identification of projects. This study adopts the Ko model to scientifically and reasonably determine the priority of risk management of software projects, and take corresponding countermeasures for different risk factors, to ensure the smooth implementation of software projects, and then ensure the completion of them and the realization of objectives. This ensures the successful completion of software projects and optimal management with limited resources.

Keywords: KANO Model; Risk; Identification; Software Project

1. Introduction

With the progress and development of the Internet, the trend of risk management and risk identification of software development projects is becoming increasingly important. The prestigious CHAOS Research (2003) report shows that 82% of the software projects were delivered too late and 66% had failed. A KPMG (1995) study of "runaway" companies found that 55% of "runaway" projects had no risk identification, while in 38% of risk identification projects (some respondents did not know), 50% did not. The size of the software development scale of the size and the size of the risk is proportional, many risks need to effectively identify, so ensure the software project on time, high quality, efficient important content is to complete every stage of the project accurate, flexible, real-time risk control, as far as possible to avoid or minimize the risk. The major reason for the failure or absence of software project control is the awareness and management vacancy of the risks existing in the software project development procedure. Risk identification is becoming increasingly important as one of the most neglected and complex aspects of project management. Risk identification is now seen as an important tool to reduce errors in software projects. In situations where it is impossible to predict the future with certainty, structured risk identification can be used to identify errors in a plan and take measures to reduce the likelihood and negative impact of potential problems. Risk identification denotes that a crisis can be managed before it occurs. This increases the chances of project success and reduces the impact of the inevitable risks. In this study, the Carno model was used to scientifically and reasonably prioritize the risk factors associated with the software projects, and to take appropriate responses to the different risk factors according to the established risk identification focus, to ensure the smooth completion of the software projects and achieve the desired results. This ensures the successful execution of software projects and the optimal management of limited resources.

2. Literature Review

2.1 Relevant introduction to the K A N O model

Inspired by behavior scientist Hertzberg's double factor theory, Tokyo tech university professor Kano ji zhao and his colleagues FumioTakahashi in October 1979 published "quality health factors and incentive factors", the first satisfaction and unsatisfactory standards into the field of quality management, and in 1982 Japan quality management conference 12th annual meeting read out the "charm quality and necessary quality" research report. The paper was officially published on January 18,1984 in the Japanese society of quality management (JSQC) magazine quality total issue 14, marks the maturity of Kano model (KANO model).

2.2 The K A N O model and the current status of the software development

The term software engineering was introduced at the prestigious NATO software engineering conferences in 1968 and 1969, and has been developed and refined ever since then[1]. By the 1980s, software had entered software development from the programming and programming system stages[2]. The technology and development tools were relatively advanced. Management requirements are also relatively high[3]. The concept of the software lifecycle consists of six stages: planning, demand analysis, design, programming, testing, operation, and maintenance[4]. In 1989, Bary W Boehm's book (Software Risk Management) was published by IEEE, being the first book to study risk management deeply enough Boehm considers software risk management as "an attempt to standardize and control the risks that affect the success of a project, using a set of principles and practical methods to identify, qualitatively, and eliminate risk factors before endangering the normal operation of the software"[5]. Since then, more and more organizations have become interested in software project risk management. It proposed the Continuous Risk Management (CrM) model and organized several annual meetings on software risk management[6]. Since the 1990s, information highways characterized by computer networking have developed rapidly. Component-based development technologies further expand the possibilities of software development. Not only is the software growing rapidly and increasing in number, but its complexity also increases dramatically[7]. Development costs and time have become even more unpredictable. Successful software development is no longer just a technical issue, software project management Play an important role. On this basis, the research in the field of software project risk indentification is gradually comprehensive, some theoretical ideas of risk classification and management have emerged: some quantitative risk management methods and software tools also appear in practice. Specialized risk management has become one of the main indicators of the maturity of a software company. Despite the great industry interest and efforts in the risk management field, it seems likely that very few project development organizations really actively use risk management technology in the software development process[8].1995 At the International Software Engineering Data Symposium (IWSED) a survey conducted at the conference showed that risk management techniques were not widely used, not because of a lack of confidence in its effectiveness, but because of methods and practices[9]. Scholars Yuan Yue and Hou Wenjun used the Kano model to study the functional requirements of a mobile phone client, Get the results of a search client function requirement on a mobile phone, And to maximize the savings of development costs, Create product highlights, On the basis of improving the user experience degree, Basically determined the first phase of the product direction of this product launch, Two scholars believe that KANO helps to schedule the project[10]; Scholars Wang Zhipeng and Sun Wei analyzed and summarized the problems of medical treatment under the existing epidemic situation, User visits were ranked in importance by kano model analysis functional attributes, In analyzing the needs of all party stakeholders by using the service design tool, Design and present a new set of service processes, Optimize the medical experience, Reasonable planning of medical resources, Reduce the risk of doctor-patient mismatch[11]. Qiao Juanjuan used the kano model to quantitatively quantify the live broadcast platform, and applied the Better-

Wores coefficient matrix map to quantitatively distinguish the priority sequence of different elements under each Kano attribute. The key service elements of the live broadcast shopping platform are determined more accurately, which reduces the loss of merchants and is conducive to maximizing the benefits[12].In 2002, Mo Xiangqun adopted the risk impact index method to quantify the risk and rank the risk to effectively control the project progress risk.[13] In 2003, Wen Yadong applied the project risk management theory and methods in the software development project, and discussed the core content and management method of the software project risk management[14]. In 2004, Fang Deying and others reviewed and compared the three typical risk management systems of Bo, Shaland software projects, expounded the system design standards and constructed the comprehensive risk management system;[6 Huang Meng proposed the risk management mode based on the needs of software project users, through Bayesian network technology[15]. All the above studies have recognized and proved the advantages of kano model in software development projects, but they did not see the potential shortcomings of kano model in the application process, and the current Kano model used in software project risk identification technology is not perfect.

This article tries to classify the various factors for the risk identification of software projects with the Kano model, which will be EXCEL and LIKER 5 attribute evaluation methods are applied to study the smooth completion under the limitation of human and property resources.

3. Method study

3.1 KANO, model construction

The traditional view is that when the product or service quality attributes have, customers will feel satisfied, phase Conversely, if the product quality attributes are not available, customers will feel dissatisfied. In 1984, Dr. Ka n o et al. found that one-dimensional quality cognition methods did not adequately reflect customer preferences and behaviors. Dr. Kano and other researchers have proposed the KANO 2 D mass model after extensive empirical research. Because this paper studies the risk identification of software development projects, the KANO two-dimensional quality model is transformed. The KANO 2 D mass mode

Type transformation into a two-dimensional attribute model. High satisfaction

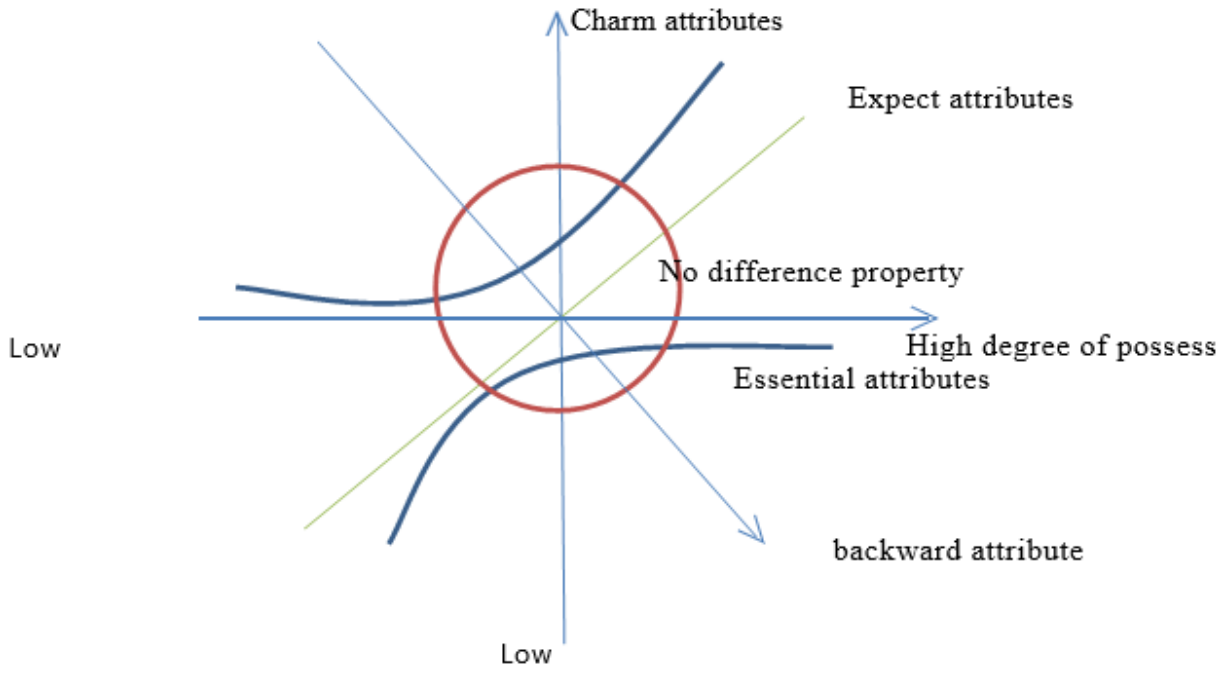


Fig. 1 KANO Model

1. First, the survey of the KANO model was applied to obtain the basic information needed for the classification and identification of risk identification factors.

Table 1. Identification of risk identification factors

If in the item Before the eye begins Be able to fully To identify the item Eye risk, you Think the right item The purpose is smooth Have to do Use	be of great use	More useful	Generally useful	Not very useful	to no avail
If it can not be adequately identified before the project starts	be of great use	More useful	Generally useful	Not very useful	to no avail
Project risk, do you think it works on the smooth progress of the project					

2. sort out the above form and get the following form

Table 2. KANO Form

Sufficient risk identification / Insufficient risk identification	be of great use	More useful	Generally useful	Not very useful	to no avail
be of great use	S	A	A	A	O
More useful	R	I	I	I	M
Generally useful	R	I	I	I	M
Not very useful	R	I	I	I	M
to no avail	R	R	R	R	O

A: Represents the charm attribute
O: Represents a one-dimensional attribute
M: Represents the required properties
I: Represents an irrelevant attribute
R: Represents the reverse attribute
BETTER-WORSE coefficient:
BETTER: Increasing the experience improvement degree of a certain function is usually positive, the greater the completion of the demand effect on improving user satisfaction.

$$\text{Formula: } SI = (A + O) / (A + O + M + I) \quad (1)$$

WORSE: Excluding the experience improvement degree of a certain function, the value is usually negative. The larger the absolute value is, the more significant the effect of the completion demand is on reducing user satisfaction.

$$\text{Formula: } DIS = -1 * (M + O) / (A + O + M + I) \quad (2)$$

4. Results

4.1 Samples and studies

In order to determine the priority of different items, it is analyzed by kano, as follows:

1. KThe ano model frequency number resultsTobear fruitbe in progressproperexplain

Table 3. KanoModel frequency results

Features / Services	A	O	M	I	R	Q
R1 is positive & R1 is inverse	10	189	97	0	9	5
R2 positive & R2 inverse	0	129	54	115	8	4
The R3 is positive & the R3 is inverse	0	117	59	113	18	3
The R4 is positive & R4 is inverse	91	59	58	81	14	7
The R5 is positive & R5 inverse	157	1	10	130	8	4
R6 positive & R6 inverse	110	0	15	145	23	17
R7 positive & R7 inverse	60	0	87	111	29	23
R8 positive & R8 inverse	52	22	206	0	14	16
R9 positive & R9 inverse	2	157	10	135	6	0
R10 positive & R10 inverse	19	7	76	193	10	5

2. KANO Model Frequency Distribution Results

Table 4. Kano model frequency distribution results

Features / Services	A	O	M	I	R	Q
R1 is positive & R1 is inverse	3.23%	60.97%	31.29%	0.00%	2.90%	1.61%
R2 positive & R2 inverse	0.00%	41.61%	17.42%	37.10%	2.58%	1.29%
The R3 is positive & the R3 is inverse	0.00%	37.74%	19.03%	36.45%	5.81%	0.97%
The R4 is positive & R4 is inverse	29.35%	19.03%	18.71%	26.13%	4.52%	2.26%
The R5 is positive & R5 inverse	50.65%	0.32%	3.23%	41.94%	2.58%	1.29%
R6 positive & R6 inverse	35.48%	0.00%	4.84%	46.77%	7.42%	5.48%
R7 positive & R7 inverse	19.35%	0.00%	28.06%	35.81%	9.35%	7.42%
R8 positive & R8 inverse	16.77%	7.10%	66.45%	0.00%	4.52%	5.16%
R9 positive & R9 inverse	0.65%	50.65%	3.23%	43.55%	1.94%	0.00%
R10 positive & R10 inverse	6.13%	2.26%	24.52%	62.26%	3.23%	1.61%

3. KANOmodel Better-Results of the worse analysis

pass through Better-The worse analysis can determine the priority of different items, generally speaking, essential attributes> expected attributes> charm attributes> no different attributes.

First of all, judging from the necessary attributes, R8It is a necessary attribute; from the expected attribute, R1、R2、R3、R9belongs to the desired attribute, R4、R5belongs to the charm attribute, R6、R7、D10Belong to the no-difference attribute, that is to say

Table 5. Summary of the results of the KANO model analysis

Features / Services	Classification results	Better	Worse
R1 is positive & R1 is inverse	Expect attributes	67.23%	-96.62%
R2 positive & R2 inverse	Expect attributes	43.29%	-61.41%
The R3 is positive & the R3 is inverse	Expect attributes	40.48%	-60.90%
The R4 is positive & R4 is inverse	Charm attributes	51.90%	-40.48%
The R5 is positive & R5 inverse	Charm attributes	53.02%	-3.69%
R6 positive & R6 inverse	No difference property	40.74%	-5.56%
R7 positive & R7 inverse	No difference property	23.26%	-33.72%
R8 positive & R8 inverse	Essential attributes	26.43%	-81.43%
R9 positive & R9 inverse	Expect attributes	52.30%	-54.93%
R10 positive & R10 inverse	No difference property	8.81%	-28.14%

A: Charm attributes,O: Expect attributes,M: Essential attributes,I: No difference property,R: backward attribute,Q: Suspicious attributes

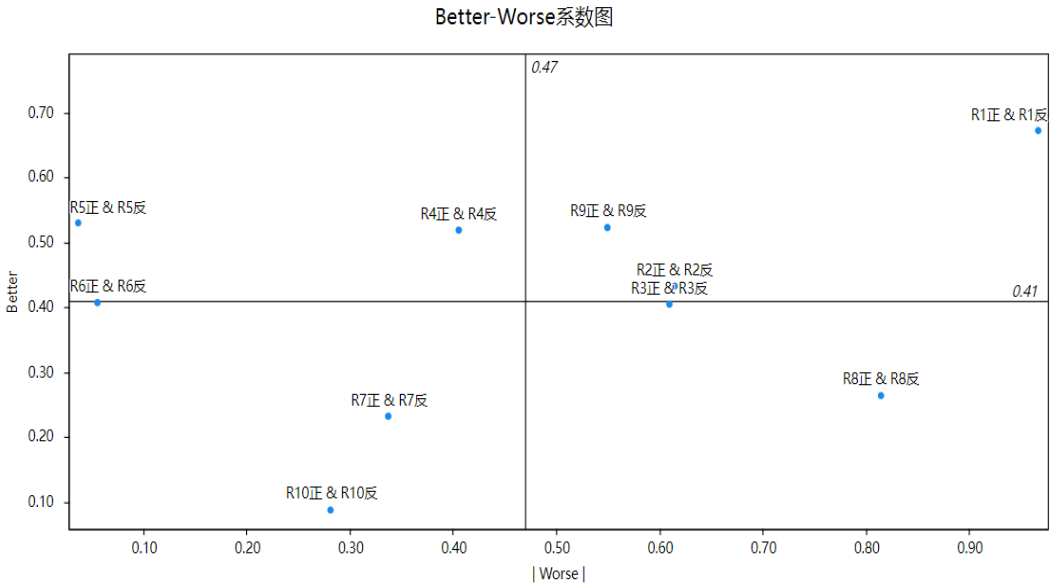


Figure 2. Better-Worse coefficient

That is, the priorities are as follows:

Table 6. priority ordering

priority	risk factor
1	R8
2	RI R2 R3 R9
3	R4 R5
4	R6 R7 R10

5. Conclusions

This paper reviews the software project risk management theory software project risk identification and Kano model, constructs the index system of software project risk factors in the management and identification, the Kano model transformation, the model is applied to the software project risks identification, and the top ten software project risk identification factors from the influence of risk factors and risk management effect of priority management. The results showed that the risks related to HRM and software quality are important features that require effective management, which would otherwise increase the probability of project failure. In other words, technical personnel and software quality assurance are necessary for the success of the project. Feasibility risk, hardware management risk and cultural communication risk have charming characteristics, while feasibility risk involves capital and time. Thus, if conditions permit, the effective management of financial budgets, supply estimates, hardware, and communications can be improved, thereby increasing the possibility of achieving project goals. Technical risk is a feature of a single dimension, which means that it is linear related to the success or failure of a project. In practice, according to the technical requirements of the project development, the management and evaluation of the factors of ensuring that the level of technology development meets the requirements of the project development. Project managers can also identify software projects and make the best choice in managing costs and leaders.

References

[1] Yuan Yue, Hou Wenjun KANO model application research in the Internet user experience [j] software 2013,34 (4): 74-78

[2] Wang Xue, Dong Xingqing, Zhang Bin, user demand analysis framework and empirical research for online reviews, —— is based on KANO model 10.16353/j.cnki 2022.02.021.1000-7490.

[3] Wang Zhipeng, School of Fashion and Art and Design, Xi'an Engineering University, Sun Wei THE DESIGN OF INTERNET MEDICAL APP SERVICE SYSTEM BASED ON KANO MODEL

[4] Mo Xiangqun Software Project Progress Risk Management [J] Computer and Information Technology 2002 (4): 19-20

[5] Huang Meng's Software Project Risk Management Model based on user Requirements [J] Computer Engineering and Application 2003 (4) : 23-24

[6] Risk management of Wen Yadong Software Project [J] Computer System Application 2002 (2): 25-26.

[7] Fang Deying, Li Minqiang, Kou isong, Comparison and Analysis of software project risk management methods [J] Operations Research and Management, 2004 (6): 27-28

[8] CAI Ling KANO Model in software Project Risk Management of Applied Research Master dissertation 2014.3

[9] Huang Xunjiang, Hou Guangming. Evaluation Study on Risk Management Priority of Investment Projects [J].industrial technology economics.2005 (2): 107-109.

[10] Chi Renyong.project management [M]. Beijing: Tsinghua University Press, 2004:4-5.

[11] Li Jiamei. Empirical study on the effectiveness of aviation services based on the Kano model [D].[Master's dissertation]. Nanjing University of Aeronautics and Astronautics, 2009.

[12] Luo Ronggui. A practical risk management approach for developing small software projects [J]. Journal of Wuhan University of Technology (Information and Management Engineering edition), 2003 (5): 16-17.

[13] Mo Xiangqun. Progress Risk Management for software projects [J]. Computer and Information Technology, 2002 (4): 19-20.

[14] Li Shaoming. The Project Risk Management Priority Evaluation Study [D].[Master's dissertation]. Southeastern University, 2006.

[15] Shen Jianmin. Project Risk Management [M]. Beijing: Machinery Shanghai Industry Press, 2003.80.