

How to Select the Best Risk Management Techniques for Different Projects

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Abstract. From its inception, project management has received a lot of attention from companies. Researchers have found that risk management has an important impact on project management, however, the current scope of risk management research is relatively narrow, and there are still research gaps for the various risks encountered in projects. Therefore, the research theme of this paper is to study the risk management approach to various risks. The research methodology of this paper is as follows: first, we collect data on the impact of risks on the project, then we analyze the data and propose solutions. This paper identifies three possible risks in projects and finds ways to address them. The first is a high-cost risk, for which this paper proposes three solutions. The second is the risk of quality, which can be eliminated by quality risk management. The third is the risk of schedule. The manager should redesign the project duration. This paper provides a new way of thinking that will help future researchers broaden the scope of their research.

Keywords: Project Management, Risk Management, Techniques.

1. Introduction

The world is changing radically every day due to the accelerated globalization of the economy, the changing needs of customers, the shortening of product life cycles, and the blurring of industrial boundaries. Companies and projects are faced with an environment full of uncertainties. These uncertainties put companies and projects at great risk. To maintain stable and healthy development in such an environment, companies are formulating their risk management in projects and are constantly developing with their excellent innovation capabilities.

The ability to respond effectively to complex and changing internal and external situations and to manage the risk of a project has become a major factor in the success or failure of a project. If uncertainty is not addressed, not only will the opportunities offered by uncertainty not be exploited, but a series of risks will be introduced into the project, making it impossible to achieve the objectives of the project, or even causing the project to suffer a catastrophic loss.

However, in the practice area, the risk management function, although it has become one of the basic management functions of the business, is limited in scope to static risks as well as financial risks and the risk management methods applied vary from project to project.

In some cases, risk management is included in the planning of individual functions, but there is a lack of enterprise-wide risk management based on the risks of each function. The issue of risk in project management is receiving increasing attention and enterprise urgently need risk management. In conclusion, risk management become more and more important not only in project management but also in the whole enterprise.

2. Method

The papers for this essay were cited from SCI, SSCI, ISTP, and Web of Science. A total of 1760 papers were searched using the theme of risk management in project management. Those papers are from 2017 to 2022 and the number of papers per year is shown in Figure 1.

These papers discuss ways of responding to different risks in different situations, such as when there is a risk of cost and uncertainty, when there is a small deviation between the expected outcome and the desired project objectives, and when the solution to the target decision problem is guided and

shaped by extracting and analyzing historical examples of previous solutions to similar problems. Some papers also relate risk to work activities from an overall project perspective.

We have summarised several themes from the papers, starting with an overview of the risks of project management, followed by a discussion of a few representative situations, and finally, a summary of the methods used to address these risks.

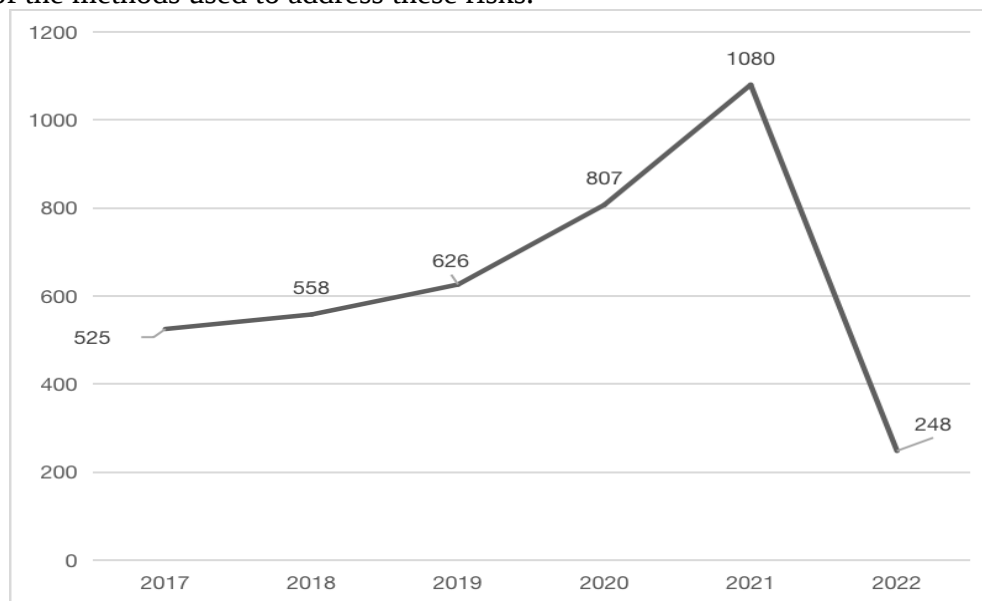


Figure 1. The number of papers per year

3. Discussions

3.1 Definition

Risk is the possibility of adverse consequences to human life, health, property, or environmental safety, which is measured according to the ultimate consequences and possibilities. Risk management is a risk control measure based on risk assessment and comprehensive legal, political, social, and economic considerations, which is a management activity to identify, estimate, evaluate and control risks, implement effective control of risks and properly deal with losses caused by risks in the hope of achieving maximum safety and security at minimum cost. The key aspect of risk management is to establish a systematic model for problem-solving based on risk identification, quantitative analysis of the impact of risk factors, and estimation of the probability of occurrence of various risks and the losses they may cause, to find the key risks of the project and provide a scientific basis for focusing on these risks.

As a systematic science, risk management emerged in the early 20th century in the industrialized countries, and since the 1930s, risk management has grown significantly as an emerging management discipline, rapidly becoming an international movement that is highly valued by governments, businesses, and academics worldwide, and is gradually being applied in business and government management[1].

The period from the 1930s to the 1970s was a period of theoretical exploration and disciplinary development of risk management. Since the 1930s, when the idea and theory of risk management began to emerge, risk management gradually developed as a discipline and formed an independent theoretical system. During this period, risk management was mainly applied in the field of business management, the main purpose was to provide appropriate protection of people, property, and natural and financial resources of the enterprise, and private citizens and enterprises were the main protagonists of risk management at this stage, with insurance as the core of risk management.

In the 1950s, risk management began to develop as a discipline in the United States, where the basic idea of risk management was developed and an independent theoretical system was gradually

formed. In 1950, American scholar Russel B. Gallagher first use the term "risk management", and the concept of risk management began to spread widely [2]. During this period, insurance became the main method of dealing with risks in enterprises. In the 1960s, the approach to enterprise risk management was further expanded, and many scholars began to systematically study risk management methods and seek diversification of risk management methods and achieved fruitful results.

Beginning in the early 1970s, insurance brokers took the initiative to provide risk management services, and risk management consulting firms began to emerge, driving the popularity of risk management. At the same time, risk management courses were commonly taught in the schools of business administration and insurance departments of many universities, integrating risk management education and training throughout the economic management curriculum, and many universities changed the name of their traditional insurance departments to risk management and insurance departments [3].

Since the 1970s, risk management has been recognized as an important element in the field of business management, and the control of risks and uncertainties in the business environment has become a central issue in business management. At the same time, risk management was gradually standardized, management methods were enriched and the management field expanded. At this stage, risk management has gradually expanded from the field of business management to the field of social management, becoming an important aspect of government management and policy making, and scientists have become the main protagonists of risk management.

Since the beginning of the 21st century, risk management has entered a new stage and started to receive widespread attention from governments in all aspects. Countries have invested a lot of people, material and financial resources to emphasize the cooperation among government, research, and enterprises to carry out theoretical research and practical operation of risk management. In this process, a novel partnership has been formed between different stakeholders, such as government, business, and society, regarding theoretical research and practical operation of risk management - the private sector and business are the users of risk technology, and scientists are the researchers of risk science, and the government is the manager of risk affairs.

At present, theoretical research and practical work on risk management are flourishing and showing a growing momentum. Research on risk and risk management has gradually become a focal point and a hot issue of great concern to the international community, and risk management has thus become a major challenge for governments around the world. In the process of interaction and mutual promotion between theory and practice, global risk management has transcended the traditional concept and gone beyond the scope of single-disciplinary and purely academic research to become interdisciplinary, integrating natural science and social science, research, and management.

3.2 Analysis

3.2.1 Financial burden and risk

Excessive project costs place a significant financial burden and risk on companies. When the economy and competition allowed it, companies could use their profits to cover these costs overburdens. However, due to the current slow economic growth and increased competition in the market, companies are being forced to lower their prices to remain competitive. Consequently, as prices continue to fall and costs continue to rise, a company's profits can be significantly reduced and the continued high cost of multiple projects can lead to bankruptcy [4]. If the project costs are significantly high and the company has already spent a lot of money to cover the costs, uncertainty in a project increases the risk that the company will become insolvent in the event of an unforeseen crisis, as the company has less money left and is less resilient to risk.

3.2.2 Quality risks

The occurrence of quality risks in projects is often made up of many factors, such as human factors and equipment factors. Human factors arise from differences in education, experience, background,

and skills between people. It is also related to the working attitude of the workers, some workers behave irregularly, designers do not comply with the national norms of design, and construction personnel violates the operating rules and regulations against the rules and regulations. The equipment factors are mechanical fatigue due to prolonged use of the machine, or the quality of the machines is not qualified and many other reasons that lead to the production of substandard products [5].

Quality risks are serious and companies can lose profits or even face serious legal penalties due to problems with product quality. For example, the poor quality of the food manufactured can lead to diarrhea, poisoning, and even death, which can hurt the company's reputation, reduce product sales and even lead to consumer lawsuit in serious cases.

3.2.3 Duration of project

Duration of the project refers to the time required between product design and development, small batch prototyping, mass production, and delivery. In a product-based enterprise, the process from product research, development, and pilot production to mass production is a complex process involving multiple partners. Since the enterprise is often formed based on a specific market opportunity, it is highly time-sensitive. Therefore, the duration of the product is an important factor in determining whether the company can achieve the expected benefits.

Companies always want to be completed as early as possible so that they can benefit as soon as possible, but often encounter a variety of problems that cause delays in the schedule. Once the schedule is delayed, it may have significant risks, which reduce the overall economic benefits of the product or even lead to the failure of the business [6].

The risk of work schedules is serious, for example, Intel and Japan's NMB Semiconductor, Sharp, and other enterprises produce fast memory chips, but because NMB cannot produce qualified chips on time, resulting in the start of the product market, Intel's market share fell by nearly 20 percent a year [7]. And there is another example, Shanghai rail transit line 4 tunnel construction using the freezing method to meet the construction schedule caused the tunnel part of the collapse, a large amount of ground settlement, and flood control wall cracking, resulting in the whole line cannot being opened on time and caused huge economic losses, causing a great impact on the community [8].

3.3 Measures

It has become critical for companies to understand cost risks in advance and to manage them effectively. This requires managing project risks and uncertainties at the cost estimating stage using appropriate methods to reduce the risk posed by the cost and reduce the impact of the risk. Managing project risks requires identifying the key risks in a project. Identifying risks in advance can help a company to manage them proactively and effectively. Companies that have effectively identified risks can use a variety of risk management methods to reduce the risks and impacts. There are several project approaches that companies can choose to face risk, namely risk rejection, where companies can choose to refuse to underwrite risky projects and only contract low-risk projects once they have detected the risk. The second is to prepare in advance, as the company needs to have the funds to deal with the risk in advance to ensure that the project and the company will not be hit hard in the event of a risk. The company can also transfer the risk by taking out insurance and transferring the risk of the project to the insurance agency, with the company only paying the cost of the insurance.

Establish and improve the quality risk management system for the production process. Quality risk management identifies and controls potential quality risks during the product life cycle by adopting proactive, prior, and preventive methods and measures to eliminate potential quality risks that may exist in the product. The quality risk management process includes quality risk identification, analysis, and quality risk control. Quality risk identification is the process of identifying potential defects or hazards based on the characteristics of different products and the process steps that affect product quality, using a combination of historical data, theoretical analysis, existing judgment, personnel involved in risk, and other information to identify products that can go wrong and the possible consequences of errors and determine the list of potential defects or hazards. Quality risk analysis

uses appropriate risk management tools and statistical techniques to qualitatively or quantitatively analyze the probability of occurrence, severity, and detectability of the identified quality risk items and to determine the level of risk of each factor based on acceptance criteria. Quality risk control aims to eliminate or reduce risk to an acceptable level. Risk control measures are implemented to eliminate risks or reduce them to an acceptable level by developing risk reduction plans and risk control programs based on the results of the quality risk assessment for those quality risks that can be reduced [9].

In the project, it is very common for enterprises to blindly compress the duration to complete the project as early as possible, and the duration design will lack reasonableness. Enterprises know that the duration design is unreasonable, but to occupy the market share as early as possible also forces the compressed duration, which is the main factor causing the delay of the project duration. The unreasonable duration design not only makes the contract duration non-binding but also brings many conflicts to all parties. Therefore, for the duration of a construction project, the manager should design the duration with the characteristics of the project and the reality of the capital, environment, use function, and benefit requirements. The project should be divided into parts and periods for calculation. The manager should also ask the professional and technical personnel and management personnel related to this project to review the duration of the project and review the scientificity, reasonableness, and feasibility of the design duration so that the designed duration has a solid binding effect on all parties involved in the construction. Both can be achieved through efforts, but are also in line with the actual project [10].

4. Conclusions

Through the research, this paper found that there are many kinds of risks in the project, so we need to find the risks that may impact the project and manage these risks. High costs can create risk for projects, this paper proposes several project management approaches to reduce the impact of risk. The first is that the company can choose to decline to underwrite risky projects and contract only low-risk projects. The second is for the company to prepare sufficient funds in advance to ensure that costs do not put excessive pressure on the company's capital operations. Finally, the company can also purchase insurance to transfer the risk. The quality of the product also poses risks to the project. The potential quality risks can be eliminated through quality risk management, which includes quality risk identification, analysis, and quality risk control, it takes proactive, prior, and preventive methods to risk elimination. Duration is also a risk to the project. The manager should redesign the project duration and review with the project professional whether the design duration is reasonable and feasible according to the actual situation.

The main contribution of this paper is to analyze several potential project risks and propose ways to control them. It is useful for project managers to avoid project risks when managing new projects. It also serves to throw light on a new way of thinking to help project managers manage risk more comprehensively. In the current research, the number of risks is not sufficient to fully address the variable risks in the project. Future research should study the potential risks in the project more extensively and increase the number of risks and solutions for them to address the various risks that may arise in the project.

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