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Providing a Framework to Identify Key Risk Indicators of Ecxecutive Projects of Natural Gas Distribution Companies, Case Study: Isfahan Gas Distribution Company

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ABSTRACT

One of the risk management phase is to identify risks which is not only an essential and inevitable part of each project but also can inform project stakeholders for internal and external threats and causes to make more realistic decisions and more efficient and precise programming. The main goal of this research is to provide a framework in which key risk indicators are determined and identified in executive projects of gas distribution companies. Accordingly, the provided frame involves stages in which projects' risk indicators are divided to 4 groups, identified based on the standard of body of management knowledge, analyzed the effects of each factors and finally these factors are determined as key risk indicators. Based on theoretical and results and provided conceptual model, all stages have been done in Isfahan Gas Distribution Company as case study.

KEYWORDS: Project management, risk management, executive projects, natural gas distribution companies.

1. INTRODUCTION

A project is a set of activities which is performed to achieve a purpose or special goal. The projects involve activities which must be done in certain dates, costs and determined quality. The necessity of every project implementation is to achieve 3 factors of time, cost and determined quality, simultaneously. The lack of each 3 factors will cause to occur unsuccessful and non-economical projects. Although, most projects which were assumed to be under control, faced to unknown risks and tried to control them. In most projects, these risks were removed successfully but risk events were both determined and controlled before happening or through a plan while happening using a comprehensive risk management [1].

Project Management Institute (PMI) defines a project as a set of temporary efforts to fulfill a commitment, produce a product and present unique, non-repetitive and specific services. Given the uncertain nature of projects and the necessity to optimal spend of resources, each project faces with uncertainties. This belief that the projects are full of uncertainties such as technical skills or quality of management and so on would strengthen this fact that many projects fail to achieve goal as benefits, cost, limitation and expected time. Risk and uncertainty reduces accuracy in estimating goals and projects' efficiency. So, the need to identify and mange risks in projects is completely obvious [2]. According to PMI, risk is an uncertain event or position that if it happens, it will affect the project goal either positive or negative. Risk has a reason and also causes new experiences. It is the intrinsic component of all projects and it isn't possible to remove it. Although, it can be managed more effectively to reduce the effect of risk to achieve project goals [3].

The most well-known and widespread standard is Project Management Body of Knowledge (PMBOK). In this standard, it is introduced 9 knowledge areas to drive the projects successfully which include project cost management, project time management, project quality management, integration management, risk management, project human resources management, project communications management, supply management and project scope management in which one of the main supportive areas is risk management [4].

In PMI definition, risk management is a systematic process to identify, analyze and react to project risks in order to maximize results and positive events as well as minimize the possible negative events.

The goal of risk management is to identify and analyze the risk in such a way that would be perceived and managed easier and more effective [5].

A systematic process of risk management falls into 3 groups: 1. Risk identification and classification, 2. Risk analysis and 3. Risk reduction [6]. So, identifying risk is an important issue. Now, the question is that which frame could be used to identify risks?

In recent years, risk and its management have been considered as an important and vital topic of organization especially project-base ones. The success of a project is measured due to its predetermined goals such as time, cost, quality and so on.

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The country basic infrastructures include physical resources, services, IT, facilities and equipments, networks and properties. If they were damaged or disrupted, they would have serious effect on society health, safety, security, economy and social welfare. Gas distribution networks is one of these vital infrastructures that its defects cause damages to structures and people. So, due to the increasing rate of natural gas demand in Iran, it is really important to consider its distribution and transmission. Due to the necessities of increasing responsibility of macro management of supplying required natural gas of different consuming sectors, gas industry have assigned various projects to contractors in recent years. In all projects, especially in executive projects of natural gas distribution companies, it can be anticipated unexpected and off-plan events. One of the actions which increase success coefficient of these projects is to create indentifying frame and scientific management of coming risks. So, risk management of these projects can provide the possibility of planning of unexpected events by identifying coming threats and opportunities of projects. It helps to maximize the use of coming opportunities and minimize the effects of possible threats as much as possible. In fact, identifying risks is not only the essential and inevitable part of projects but also can inform project stakeholders of its internal and external environments risks. This can cause more realistic decision making. Identifying project risks for managers provide a possibility of more detailed and efficient planning.

Given to the development of natural gas distribution pipelines, province gas companies have set executive projects with contractors. Isfahan Gas Company is one of the biggest natural gas distribution companies in which there are various types of executive projects. In addition, it executes all its projects through setting contracts with contractors. So, due to decision making problems about assigning projects to contractors, it is highly important to identify their risks and make decisions based on these risks analyses. In this research, after reviewing available concepts in project risk management, it is provided a frame based on PMBOK standard to identify executive projects of natural gas distribution companies. Then, data related to executive projects of Isfahan Natural Gas Distribution Company are identified as case study using proposed frame.

2. RESEARCH LITERATURE

It has done different researches in risk management area in which each of them are looking for more effective management. So, firstly, it is provided a summary of fulfilled researches about project risk management:

Ebrahimnejad et al have used multi-goals fuzzy approach to identify and assess risk in projects in an article known as "identifying and assessing risk of built-exploit and deliver projects". Hierarchical structure of risks has provided based on project-based aspect and introduced effective criteria to rank project risks. Then, it has been used LINMAP method (The linear programming technique for multidimensional analysis of preference) and fuzzy TOPSIS for ranking risks [7].

Cervone has discussed about it in an article known as "Project Risk Management" and explained the inter-project risk. He defined a model to decrease it and noted that project risk management is a vital and necessary task of manager and project team. Risk management need to be understood by factors of contexts resulted in project risks which often ignores project nature. The first step of risk assessment is its identifying. Firstly, a team of risk projects are grouped in respect of effects on project and predicted the consequences of determined risk event. As risk identifying was completed, it would be performed risk analyses to identify the possibility of identified risks event. Risk ranking is necessary in each stage of project due to the need for providing a program to confront with it. Through risk management in a project, project team and manager will assure that project will be delivered in adjusted time and finally attracted customer satisfaction [8].

Jabal Ameli et al have studied project risk ranking in an article as "project risk ranking using multi attribute decision making process" and reviewed the ability of using different multi attribute decision making methods as an quantitative approach based on problem features.

In this article, to identify project risks of energy industry, it had been used brain storming tools session which resulted in indentifying 50 effective risks. In the next stage, 10 other risks which were most effective had been identified by elites. These risks fall into 4 groups as follow: external predictable risks, non-technical-internal risks, technical-internal risks and logical risks. Then, it has been used 4 indicators of probability, impact, uncertainty and capability as risks ranking indicators. Their values and weights using Shannon entropy method were determined. TOPSIS method was used to rank project risks and finally it was compared with traditional method [9].

Kumar et al in an article called "project risk management using AHP (analytic hierarchy process) combination and risk map" have tried to develop an integrated frame for project risk management, analyze risk in all over project, provide task and activity package and develop responses. They firstly have investigated different literature of contemporary risk management and frames to identify gaps of project risk management knowledge and then developed its conception using AHP combination and risk map. To review the effectiveness, the proposed frame method has been used in constructing oil pipelines in India. Risk factors of projects level are created due to external forces such as business environment (e.g. customers, competitors, technology development, policy, social and economical, environment) and risk factors of task and activity packages are essentially operational and have been created due to internal reasons such as the lack of productivity of materials and human resource, implementation problems, team inefficiency and so on [10].

Aundhe and Mathew have classified risks into 3 main groups of project risks, communications risks and macroeconomics risks. And then, they have discussed about it using deductive methods based on Grande theory to analyze risks and determine their interrelations [11].

Baccarini in his article which was called " project risks ranking" have considered 3 stages for risk management project for all contractors activities: 1. Risk rank which determines how projects are risky, 2. Risk management programming which focuses on what it can be wrong and how it can be managed and 3. Risk monitoring which permanently focuses on risk, control and risk ranking process [12].

Abdollah & Verner have provided a frame for outsource risk analyses. They have provided this frame based on customers' ideas. To do so, they have studied 9 cases of unsuccessful outsourcing projects in which it was firstly identified main areas of critical risks and then risk factors related to each area. The main risk areas which were identified in this research are complexity, financial, legal, organizational environment, programming and control, project need and range, working team and customers' areas in which related risks to complexity and working team are discussed in all studied cases [13]. Peixoto et al in an article called "risk management method" have introduced defined risk management methods for ongoing pilot projects. Their proposed method was based on PMBOK. They have used this method as a case study in electrical power distribution projects. Most identified risks in these projects have technical and external resources and were classified as high and medium level [14].

In previous researches, risks of particular project or particular type of project have been identified and sometimes have also been ranked. So, in risk management area, there is a need to provide a frame for determining main project risks, as its great complexities in current projects is essential for successful projects' execution.

3. RESEARCH METHODOLOGY

This research methodology has descriptive nature and its goal is practical. It is tried to identify the main risks of executive projects of gas distribution companies in regard to failing structure by providing a conceptual model as a frame of identifying risk indicators in project management. As it can be seen in Fig 1, it is firstly discussed about risk identifying frame which is one of the main areas and stages of project risk management and then all related documents such as meetings records, work failing structure, contracts, and project description are considered. In second stage, elites and experts which include project managers, team members, risk management team, customers, experts out of project team and stakeholders are selected. In third stage, due to the project condition, one or a combination of risk identifying techniques are selected. It is necessary to note that there are several techniques to identify which are as follow [15]:

- Documents and records review
  Reviewing all project documents will let you perceive all project facts as well as all project management methods and identify its pros and cons. Without reviewing all documents and records, it is possible some project risks don't be identified. So, the goal of this review is to identify potential risks which we face them during project interval [17].
- Interview
  Identifying risks can be performed by an interview with experienced managers and elites. The appropriate persons are recognized and being informed from project condition. Then, it is provided data such as project fail and a list of its hypotheses for them. The interviewers identify project risks based on their experiences, its data and other useful resources [17].
- Brainstorm:
  One of the most popular and basic risk identifying techniques and risk management tools is brain storm. The goal is to get a list of risks which are used in analyzing process. This technique is usually done by project team or a number of different sectors' elites. By providing various ideas and their review by the group, risk resources are identified and then classified based on their types [17].
- Delphi Technique
  It is a technique of elites to achieve an agreement about an issue such as project risks. In this method, elites are determined but anonymously. To get the related data to main risks, it was used a questionnaire. The answers were provided and exchanged among members to gather suggestions and ideas. To achieve an agreement about project main risks is attained in the first step. The advantage of this technique is to decrease biased data and the lack of undue effect on results [17].
- Controlling Forms
  These forms are used based on past records of similar projects and other data resources. One of the advantages of using controlling forms is that identifying risks is so simple and quick. However, it is impossible to create a full controlling form of a series of identified risks which can be considered as a disadvantage. It is also possible that identifying risks would be limited to existing risks classification in controlling form. Controlling form includes a series of questions which are provided based on experience of past projects and this will create an opportunity for project manager to offer a quick list of risks which reflects occurred risks of past projects [17].
- Hypotheses Analyses
  Each project is possible and easy to develop based on a series of hypotheses. In this method, project risks due to inaccuracy, inconsistency and incomplete hypotheses are identified [17].
- SWOT Analyses (Strengths, Weaknesses, Opportunities And Threats)
  The difference of this method with other analyses methods is that it considers risks from general organization view, not within project area. In this method, it is offered 4 main questions and the answers must be brief and clear as much as possible. [17].

The fourth stage is identify and record of risks, determine the structure of risk fail and organize identified risks. Risk classification is the basic part of risk identification. Generally, the effective risks of projects based on PMBOK standard fall into 4 groups:

1. Technical – quality – functional risk: these risks are occurred due to applied technology in projects or working environments [16].

2. Project management risk: it includes factors such as lack of time allocation, cost and suitable job resources, the use of inappropriate program, insufficient attention to project management to achieve the goals, communications and poor control [16].
3. Inter-organizational risk: it produces due to the lack of organizational resources [16].
4. Extra-organizational risk: it doesn't in the domain of project manager's authorities. The main factors include inflation, tax rate, environmental factors (weather) and social events.

So, project risk indicators fall into 4 groups: 1. Technical – quality – functional risk, 2. Project management risk, 3. Inter - organizational risk and 4. Extra - organizational risk. These 4 groups are classified based on standard of body of management knowledge according to risk management team view. As we know, risk identifying are those which may be effective on project. So, all gathered data are recorded as project risk.

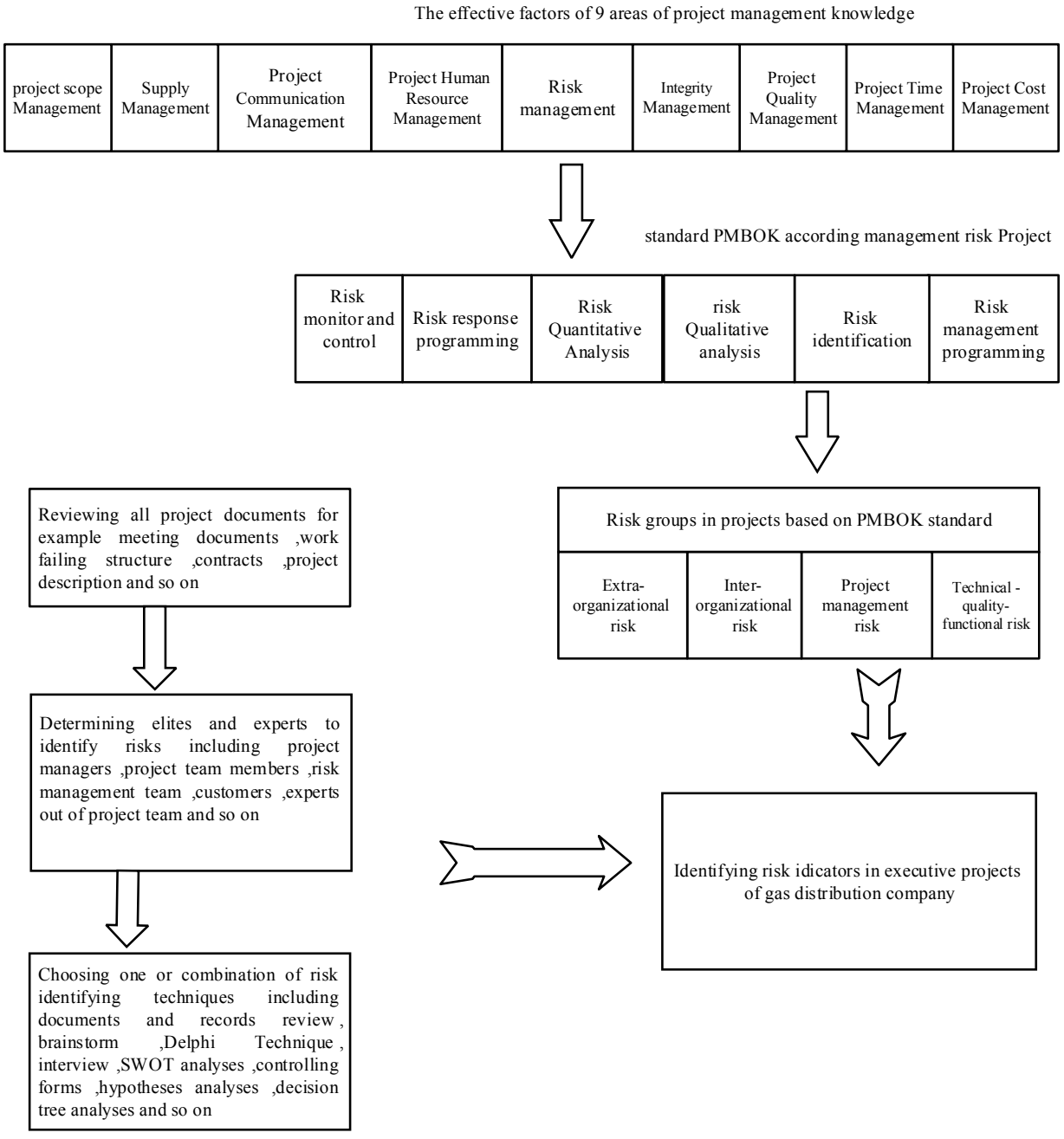

Fig. 1. identifying frame of risk indicators of executive projects of gas distribution companies

4. Results (case study)

The proposed frame of this research had implemented in Isfahan Gas Distribution Company. In the first stage of identifying Isfahan Gas Distribution Company risks, all project documents such as meeting records, the structure of project failure, contracts, project distribution, and documents related to project specifications, project working area were gathered

and reviewed. Then, in the second stage, elites in executive projects including project manager, head of units and branches, experienced supervisors and several experienced experts were determined. Due to the performed studies, a list of major risks of executive projects were provided. This list was delivered to these persons to be familiar with main risks. It helps us to determine their thinking strategy and indicated them what we are looking for. We asked them to review it to be able to identify risks for next stage, think about them and write down their ideas to offer.

Then, in the final stage namely risk identifying and determining the structure of risk failure, it was held a meeting for risk management team members and data related to identify risks were gathered. In this meeting, it was used brain-storm technique to identify project main risks. At the beginning of the meeting, it was stated rules related to brainstorm and provided risks list reviewed. The team members stated their different views about executive projects risks based on standard of knowledge body of project management which fall into 4 groups. All ideas and data were received and recorded without any assessment. Then, main risks of these 4 groups were determined based on members' view. These have indicated in Table 1, separately. The obtained results indicated that controlling actions are needed to accurate management of these risks

Table 1. Identified risks of executive projects of natural gas companies

Risk classification	Risk description
Technical – quality- functional risk	Falling drilling channel
	Gas leak from executive networks, fire and explosion
	Machines, tools and people falling into canal
	Failure to check the principles of carrying steel and poly-ethylene pipelines
	Lack of using safety equipments by personnel
	Shovel hit with gas channels and electric cables while drilling
	Failure to meet necessary standards for tubing
	Using old and non-standard tools and devices
	Gas poisoning while gas pipelines looping
	Lack of using warning devices beside drilling canals
	Risks of welding gas steel pipes
	Risks of radiography of welding points of steel pipes
Risk of project management	Project managers and authorities change
	Use of personnel or engineers with insufficient experience in the supervision and control of project
	Assigning projects to inefficient and inexperienced contractors
	Failure to allocate enough time and financial resources to execute project
	Poor planning to execute project stages
	Inaccurate estimate of contract value
Inter-organizational risk	Inappropriate prioritization of project
	Non-technical planning, regardless of the project position and circumstances
	Inability of contractor to supply consumer goods and required equipments to begin the project
	Lack of using experienced and skillful experts such as welders and skilled personnel by contractor
	Budget deficit to execute the contract
	Disruption in supplying required materials such as pipe and so on by central warehouse
Extra-organizational risk	Natural disasters such as flood, wind and so on
	Property opponents
	Legal licenses such as drilling from municipality, department of roads and others
	Inflation and market conditions such as sanctions and so on
	Dealing with other organizations' projects such as departments of water, electricity and telephone and remove the disputes
	Inappropriate suppliers
	Failure to pay contractors' statements timely due to the lack of enough financial resources

5. Conclusion

Due to the increasing use of natural gas as clean fuel, there is a need to develop gas distribution networks. So, the security and safety of natural gas distribution infra-structures must be fully investigated. Risk management is essential to successful and timely implementation of projects considering its high complications in natural gas distribution. So, it is important to identify the risks of these projects as a part of risk management process for project-based organizations. In this research, it is provided a frame in which projects' risk indicators are divided to 4 groups and identified based on the standard of body of management knowledge with provided frame. Identifying risk allow to recognize and document those risks which possibly affects project goals. So, this can be resulted in applying necessary practices to reduce and remove these risks, improve project control, increase success chance, develop communication among participants, facilitate decision making and prioritize actions.

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