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A REVIEW ON RISK ASSESSMENT

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ABSTRACT

Identification of risk factors is an important step in project success. It is the way toward recognizing, ordering, and breaking down and surveying inborn hazard factors in a task. Due to the nature of the construction projects, which consist of many related and non-related operations, many risk factors will contribute in a project. To have an effective study about risk factors in any project, as a first step the key risk factors were identified through literature review. Then, these factors were classified concerning to key construction parties such as contractors, consultants, clients, subcontractors and government bodies. Our project is intended to find out different risk factors in water and waste water projects especially in KPK. We study different articles, research papers and books from which we identified twenty risk factors. A questionnaire was designed and distributed to target parties through mail, email, social media and by hand. About 96 people responded to our questionnaire. Based on their feedback the collected data were analyzed statistically through reliability test, normality test, and relative importance index. According to relative importance index following are the top five risk factors in water and waste water projects in KPK. a) Cost overrun; b) Political; c) Time overrun; d) Corruption; and e) Availability of finances.

Key words: Risk management, Water and waste water projects, Risk factors, Relative importance index, Normality test, Reliability test.

INTRODUCTION

Construction Development is a high hazard business which impacts each member in the business, the task proprietor, development organizations, specialists, brokers, money related foundations, merchants and providers and even the specialist organizations, every ha his very own dread of confronting dangers in the lead of business [1]. Risk management is important part of the decision making process in the construction. Risk is also the object of attention because of cost overrun, worst quality and time overrun associated with the construction projects[2].

Here our main concern is about identifying risks factors water and waste water projects in all phases including planning, designing, execution and operation. From literature review it was clear that risk assessment in other construction projects like buildings, roads, dams, bridges etc are done but there is lack of study in the field of risk management in water and waste water projects[3]. And as we know that all kind of construction projects like buildings, roads, dams, bridges etc are incomplete without water and waste water project. So this means that water and waste water projects have same importance as others. Therefore, we must give keen attention to these projects as well[4].

The constructions are intended to ensure that health and safety issues are properly considered during projects development so that the risk of harm to those who build, use and maintain structure is reduced[5]. As our project is concern with water and waste water system project and there is very little work done on water and wastewater throughout the world so we selected our project on the basis of their importance[6].

Development ventures are mind boggling and can have different inward and outside dangers. A lot of codes, laws, and guidelines must be followed during the development procedure to best keep away from these dangers [7].

Specialized dangers incorporate whatever obliges you from making the item that your client needs. This can incorporate vulnerability of assets and accessibility of materials, lacking site examination, or fragmented plan [8].

Every project is unique and therefore has their own kind of designing method standard and rules as well as has their own kinds of risks. As water and waste water projects are also a unique one so these kinds of projects have their own kinds of risks.

Now our main research problem is to identifying risks factors during planning, designing, execution and operation in water and waste water projects. We did our study particularly in KPK but also generally in throughout Pakistan. Here we will not go through risks about diseases caused by these projects. So after identifying the risks factors we go through its probability and impacts as well as the main sources of these different kinds of risks in order to eliminate it or to minimize its effects.

Following are the objectives of research:

The purpose of the study is to identify the risks in water supply and waste water systems. It may be Statement of work, Execution plan, Project budget, Quality of material, Project environmental impact, Property risks, Technical risks and Political risks. And to find out different techniques, methods or principles to overcome and minimize the negative impacts of these risks as well as to prevent drinking water wastage and wastewater leakage to make the environment clean.

Methodology

Short Listing of Risk

The risk factors that are identified from literature review are prioritized according to their frequency of occurrence in literature reviews and questionnaire should be developed basis upon it. The questionnaire is based upon Likert scale. There are two circumstances in the questionnaire

- Probability
- Impact

Data Collection

Once the questionnaire was developed then data should be collected by filling the questionnaire from field, and academic experts. The questionnaire was filled by these experts by one of the following method.

- By social media like email etc.
- By personal meeting.
- By visiting to different academic and industrial organization.

Demographics of Data

In data collection phase the demographic data of the respondents were identified. The demographic data is according to the

- Organization type
- Respondent qualification
- Respondent experience

Data Analysis

Once the risks are identified, they have to be analysed and assessed to decide which risks need prompt and further action. The risks are assessed according to their probability (likelihood) of occurrence and their impact (severity) of consequences. The general risk assessment formula is:

Risk = Probability (threat) x Impact (vulnerability)

Results And Discusions:

Reliability Test

- Dependability alludes to the degree to which a scale produces steady outcomes, if the estimations are rehashed various occasions. The examination on unwavering quality is called dependability investigation. Unwavering quality investigation is dictated by getting the extent of precise variety in a scale, which should be possible by deciding the relationship between the scores got from various organizations of the scale. In this manner, if the relationship in dependability examination is high, the scale yields steady outcomes and is consequently solid.
- **CRONBACH ALPHA**

We used Cronbach alpha for reliability test here. Cronbach Alpha is a dependability test directed inside SPSS so as to quantify the inward consistency for example dependability of the estimating instrument (Questionnaire). It is most regularly utilized when the poll is created utilizing numerous Likert scale proclamations and along these lines to decide whether the scale is solid or not.

Table 5.1: Cronbach's alpha value ranges

Cronbach's alpha	Internal consistency
$\alpha \geq 0.9$	Excellent
$0.9 > \alpha \geq 0.8$	Good
$0.8 > \alpha \geq 0.7$	Acceptable
$0.7 > \alpha \geq 0.6$	Questionable
$0.6 > \alpha \geq 0.5$	Poor
$0.5 > \alpha$	Unacceptable

- **Result of our reliability test**

Here from the table it is clear that if the value is equal or greater than .7 then it will be acceptable and our reliability test values are

Table 5.2: Reliability Test Value

Factors	Cronbach's alpha value
Probability	.829
Impact	.804

5.3 Normality Test

In statistics normality test are used to find out whether the data is normal distributed or not. Normal distribution is an arrangement of data set in which most value cluster in the middle of the range and the rest taper off symmetrically towards either extreme.

- **Skewness**

Skewness is asymmetry in a factual conveyance, in which the bend seems twisted or slanted either to one side or to one side. Skewness can be measured to characterize the degree to which a dissemination contrasts from a typical conveyance.

So if the data is normally distributed then we used mean factored in RII and if the data is skewed then we will use median factored in RII.

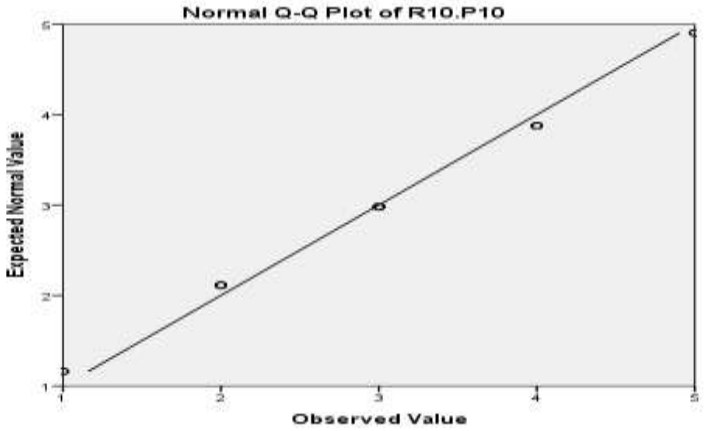

Fig 5.1: Quantile-Quantile plot

Here the graph shows that the data is almost normally distributed so that's way we will used mean in relative importance index.

5.4 Relative Importance Index

Relative importance index is used to range the different factors on the basis of their score.

Following are the risk factors arranges according to RII values.

Table 5.3: Ranking of risk factors

Risks	Score	RII		Risks	RII	Ranks
R1	9.958	5.091335		R15	6.63	1
R2	12.906	6.598498		R2	6.60	2
R3	10.448	5.341641		R5	6.31	3
R4	12.323	6.300261		R4	6.30	4
R5	12.333	6.305587		R7	5.49	5
R6	7.865	4.020877		R20	5.47	6
R7	10.729	5.485434		R3	5.34	7
R8	9.385	4.798424		R10	5.14	8
R9	8.354	4.271183		R16	5.13	9
R10	10.063	5.144592		R1	5.09	10
R11	8.938	4.56942		R19	5.00	11
R12	8.281	4.233903		R8	4.80	12
R13	6.313	3.227353		R11	4.57	13
R14	8.604	4.398999		R14	4.40	14
R15	12.969	6.630452		R9	4.27	15
R16	10.042	5.13394		R12	4.23	16
R17	7.958	4.068808		R17	4.07	17

R18	7.646	3.909038		R6	4.02	18
R19	9.781	5.000799		R18	3.91	19
R20	10.698	5.469457		R13	3.23	20

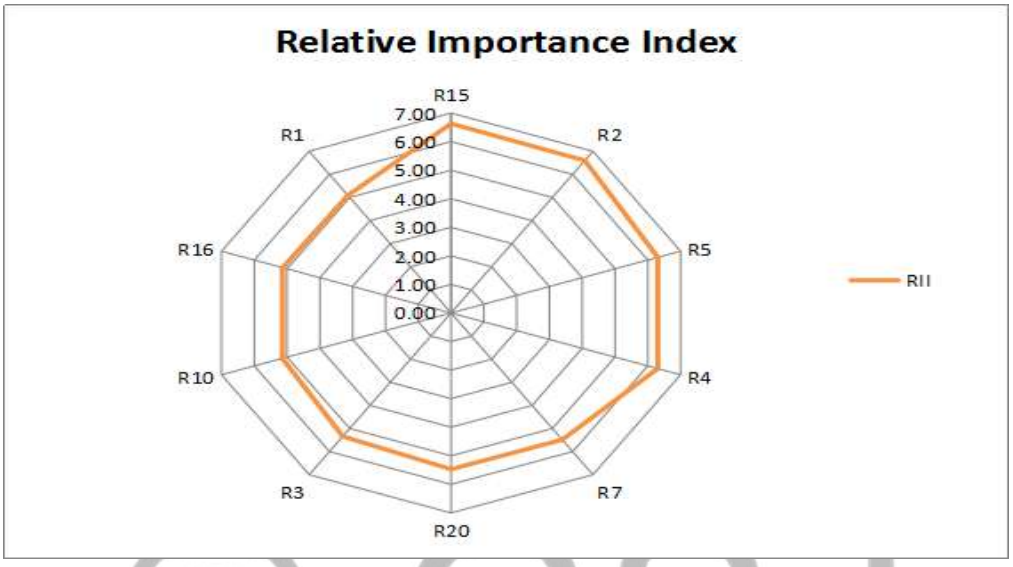

Fig 5.2: Relative importance index

Here from RII result the top ten risks are clear which the following are

a. R15 (Cost overrun risk)
b. R2 (Political risk)
c. R5 (Time overrun risk)
d. R4 (Corruption risk)
e. R7 (Availability of finances risk)
f. R20 (Inaccurate estimation risk)
g. R3 (Natural risk)
h. R10 (Quality risk)
i. R16 (Revenue risk)
j. R1 (Design risk)

Conclusion

This survey find that the top 10 risks which has severe impact on water and waste water projects system are 1) Cost overrun, 2) Political risk, 3) Time overrun, 4) Corruption risk, 5)Availability of finance risk, 6) Inaccurate estimation risk, 7) Natural risk, 8) Quality risk, 9)Revenue risk,10)Design risk. These risks have greater probability and impact on water and wastewater project in KPK therefore it required more attention than other risk factors.

These risks have more chances to occur in such projects. Doing projects of water and wastewater we have to focus on these risks in order to complete the project successfully. The main sources of these risks are: Delay in process payment by owner/client, inadequate planning, poor contract management, Delay in decision making, laws and regulation frame work, change in scope of project, financial difficulties faced by owner in constructing water and wastewater projects.

Recommendation

For successful completion of water and wastewater projects we must have to avoid such practices. Preventive risk management technique and remedial risk management techniques are applied to avoid, minimize, and control these risks. This survey is particularly for water and wastewater projects systems in KPK but it can also be generalized to whole construction industry of Pakistan and to the places having similar construction industries as Pakistan.

QUESNTIONNAIRE

RISK ASSESSMENT OF WATER AND WASTE WATER SYSTEMS PROJECTS IN KPK

This survey is conducted for BS research title* Risk Assessment in Water and Waste water system projects.The research aim is to explore the effect of risk factors on water and waste water projects*. This survey is being conducted to further measure the probability and its impact on overall project objectives. Your contribution towards this research is highly appreciated. Please be assured that the data will only be used for study purpose and no personal information will be disclosed at any forum/level.

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* Required

Probability

1-Rare
2-Unlikely
3-Possible
4-Likely
5-Certain

Impact

1-Insignificant
2-Minor
3-Moderate
4-Major
5-Severe

1. What is the probability of these risks factors *

Mark only one oval per row.

	1	2	3	4	5
Design Risk					
Political Risk					
Natural Risk					
corruption Risk					
Time overrun					
Legal and Regulatory Risk					
Availability of finances					
Planning Deficiency					
Insufficient technological resources					
Quality Risk					
Market Risk					
Inaccurate execution plan					
Lack of competition					
Operation Risk					
Cost overrun					
Revenue Risk					
Frequent staff changes					
Rework and insufficient techniques					
Construction Risk					
Inaccurate estimation of risk					

2. What are the impacts of these risks on project *

Mark only one oval per row.

	1	2	3	4	5
Design Risk					
Political Risk					
Natural Risk					
corruption Risk					
Time overrun					
Legal and Regulatory Risk					
Availability of finances					
Planning Deficiency					
Insufficient technological resources					
Quality Risk					
Market Risk					
Inaccurate execution plan					
Lack of competition					
Operation Risk					
Cost overrun					
Revenue Risk					
Frequent staff changes					
Rework and insufficient techniques					
Construction Risk					
Inaccurate estimation of risk					

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