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APPLICATION OF SAFETY AND RISK MANAGEMENT TECHNIQUES IN CONSTRUCTION USING ANALYTIC HIERARCHY PROCESS (AHP) - A CASE STUDY

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ABSTRACT

The construction firm has a standing as one of the most insecure firms in terms of high incident damage and accident rates. Safety risk management is an effective system and it can minimize accident rates and protect construction company investments and bring profits to the project. If all data registers and checklists gathered during quality checks and labor safety inspections at construction sites are not analytically arranged. The status of improvements is not conformed and tracked in a well-timed manner, not only while engineering quality and construction safety be influenced but work load at construction sites will increase. In view of the above scenario, development of a quality control and safety risk management system is important. Construction projects are considered as very difficult projects where improbability comes from different stages. On the other hand there is a space between risk management techniques & their standard practical application measure by construction contractors. A suitable safety risk classification system was formed using a combination of relevant and high effective safety programs were recognized in literature. The capability of each safety program component to lessen a percentage of each of the safety risk classes was quantified using AHP process.

Keywords: Risk management, Risk control, Analytic Hierarchy Process (AHP), Construction safety management, Quality control.
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1. INTRODUCTION

Safety management is a managerial function which safeguards that all safety risks have been recognized measured& satisfactorily moderated by using the computers to conduct quality control and risk management of construction for a construction site office. This method involved actual construction site status inspection records and tracking of improvement measures, controls measures in construction progress. In construction industry risk is frequently denoted to as the existence of potential or actual threats or chances that influence the objectives of a project during construction commissioning or at a time of use. It is essential to detect all risks involved at all phases of the project so as their assessment and analysis can be complete accordingly.

The management of industrial health and safety in construction consist of unique challenges. Features of the industry such as dynamic work environment. Construction safety management techniques have developed significantly following the employment health and safety act of 1970. Safety research usually operates under the fundamental assumptions that simply put on more safety programs will create better results. Construction safety risk management is not where a firm produces revenue but it is a place does generate profit by decreasing safety risk and thus the possible for loss. In effect safety risk management structure can be used as a firm approach by Construction Company to can be earned a competitive position of finest advantage.

2. LITERATURE SURVEY

The huge mainstream of construction safety literature emphases on identifying and describing the several methods of improving site safety strategies such as job hazard analysis. Each of the publication discussed above operates under the same fundamentals such as a firm should implement as many safety program elements as their budget permits.

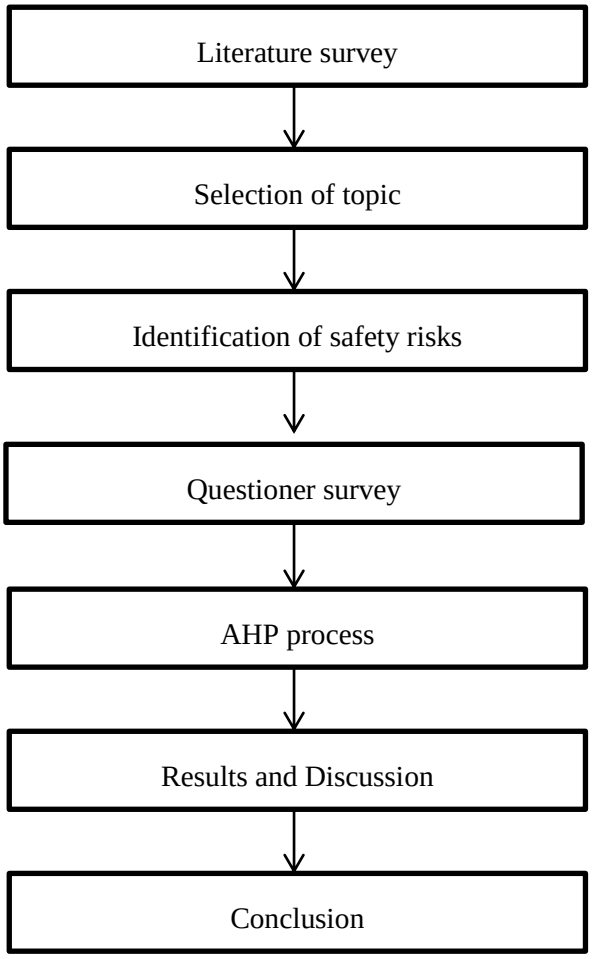
The determination of this system is to assist construction companies to improve a standardized quality control and risk management system. To conduct threat identification, risk calculation and risk control according to the risk management procedures.

3. OBJECTIVES OF THE STUDY

- Risk & safety identification in construction management.
- Qualitative and quantitative risk analysis.
- Usage of Analytic Hierarchy Process

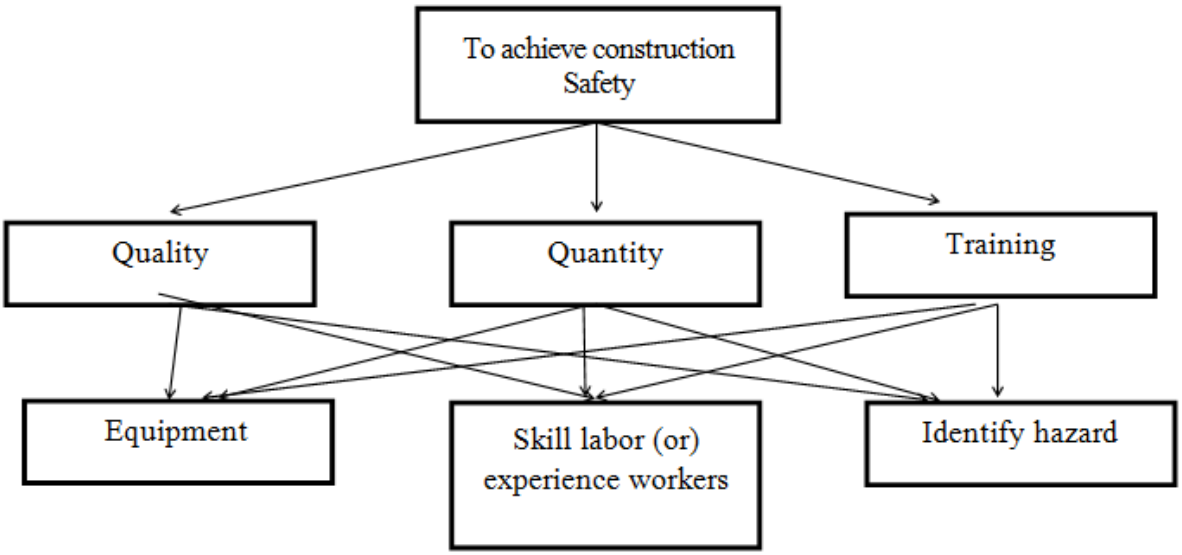
4. METHODOLOGY

Literature survey was done and based on that risks in construction were identified, depending on those impacts questioner was developed, analyzed from 50 engineers based on the results ranking was given using (AHP)analytical hierarchy process.



5. RESULTS AND DISCUSSION

The questioner was simplified and solved using analytical hierarchy process by that the ranking was given.



Ranking Criteria

	Quality	Quantity	Training
Quality	1	2	4
Quantity	½	1	3
Training	¼	1/3	1

$Ax=\lambda_{max}$

A= $\begin{pmatrix} 1 & 2 & 4 \\ 0.5 & 1 & 3 \\ 0.25 & 0.33 & 1 \end{pmatrix}$

SUM= 1.75 3.33 8

NORMALISED COLUMN SUMS=

$\begin{pmatrix} 0.58 & 0.60 & 0.50 \\ 0.28 & 0.30 & 0.38 \\ 0.14 & 0.10 & 0.12 \end{pmatrix}$

PRIORITY VECTOR X= $\begin{pmatrix} 0.56 \\ 0.32 \\ 0.12 \end{pmatrix}$

Criteria

Quality =0.56

Quantity =0.32

Training =0.12

Calculation of consistency ratio

$AX=\lambda_{max}$

A $\begin{pmatrix} 1 & 2 & 4 \\ 0.5 & 1 & 3 \\ 0.25 & 0.33 & 1 \end{pmatrix}$ X $\begin{pmatrix} 0.56 \\ 0.32 \\ 0.12 \end{pmatrix}$ = AX $\begin{pmatrix} 1.68 \\ 0.98 \\ 0.36 \end{pmatrix}$

$AX/X=\lambda_{max}$

λ_{max}=3.02 (avg of ax and x)

C.I= $(\lambda_{max}-n)/(n-1)$

=(3.02-3)/(3-1)

=0.02/2

=0.01

CR=CI/RI

RI=0.52 for n=3 (from table)

RI=(0.01/0.52)=0.019

CR≤ 0.1

Sufficient consistency for making a decision

Ranking Alternatives

Quality	Equipment	Experience	Identify hazard	Priority vector
Equipment	1	1/3	4	0.31
Experience	3	1	3	0.57
Identify hazard	¼	1/3	1	0.12

Quantity	Equipment	Experience	Identify hazard	Priority vector
Equipment	1	5	3	0.64
Experience	1/5	1	2	0.20
Identify hazard	1/3	½	1	0.16

Training	Equipment	Experience	Identify hazard	Priority vector
Equipment	1	4	3	0.62
Experience	¼	1	2	0.22
Identify hazard	1/3	½	1	0.16

Criteria	Quality	Quantity	Training		Priority x		Rank
Equipment	0.31	0.64	0.62		0.56		0.45
Experience	0.57	0.20	0.22	X	0.32	=	0.40
Identify hazard	0.12	0.16	0.16		0.12		0.15

According to the result obtained on case study through analytic hierarchy process (AHP) that the preference was given in an order that the equipment, experience and hazard respectively with quality, quantity and training of workers. In case of equipment quantity ,training and quality comes in an order to be in 45% of total work. Whereas in case of experience Quality, training and quantity respectively are in order to be in 40% of total work. And finally in case of hazard identification quantity, training and quality respectively are in order to be remaining part of percentage of work.

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