

Indentification Of Human Errors Risk Factors In Applying Human Resources Management In Construction Service Companies

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ABSTRACT

The main causes of work accidents in construction projects are those related to unique construction project characteristics, different working locations, weather-exposed and weathered, limited implementation time, dynamic and demanding high physical security, and many uses unskilled labor. Coupled with a very weak safety management, consequently the workers work with high-risk construction implementation methods. This research analyzes the human error factor in the bridge infrastructure project of Paya Dapur - Kp. Tinggi in the District of South Aceh. The data was collected through a questionnaire survey of respondents from construction actors involved in the project at Paya Dapur - Kp. Tinggi Bridge in South Aceh District, Aceh Province. The results showed that there were 10 human error factors, including the roles and responsibilities of the supervisor consultant and the planner consultant not yet maximal, the failure to use self-protective equipment / self-safety correctly, poor working procedures, poor Standard Operation Procedure (SOP), poor lighting, work standards often flexed, no initial checks, inappropriate or incompatible user equipment designs, excessive noise levels and poor layout of work facility layouts.

Keywords: human error, human error factor, bridges.

1. Introduction

Construction projects are a group of interconnected activities where there are starting points and end points and certain results, projects are usually cross-functional human resources so that it requires a variety of skills (skills) from various professions and organizations. Each project is unique, there are not even two projects that are exactly the same, coupled with the diversity of work cultures in each region and human nature of the project.

The development of the world of construction in the province of Aceh has become a fierce competition in the construction services company between one company and another. The tight competition makes construction service companies must be able to maximize the potential and capabilities of each company, especially in managing company resources including finance, human, technology, material, culture, and management systems.

The development process in Indonesia itself has not shown a balance between the progress of development programs and increased awareness of workplace accidents. This can be proven by the number of work accidents that occur. In Aceh province there were also several work accidents, one of which was the fall of elevator workers in shopping centers in the city of Banda Aceh, collapsing of trench walls and others.

The main causes of workplace accidents in construction projects are things that are related to the characteristics of unique construction projects, different work locations, open and influenced by weather, limited implementation time, dynamic and require high physical endurance, and many uses untrained workforce. Coupled with a very weak work safety management, as a result workers work with high-risk construction methods.

This research analyzes humans on a construction project for human error carried out by construction service actors in South Aceh Regency.

2. Research Problem

Based on the background above, the main problem in this research is what are the factors of human error factors that influence the application of human resource management in construction services companies?

3. Literature Review

3.1 Construction Industry

In the law the term construction industry is often referred to as construction services. The construction industry is an activity in the economic sector that transforms in the form of planning, design, finance and procurement, development, operation and maintenance of several resources to produce economic and social facilities and marketing (Siti, 1999)

3.2 The Role Of Construction Services

According to Ervianto (2005), the person or agency that finances, plans and implements the building is called the elements of implementing a construction project. Development implementing elements involved in development activities are the owner, consultant planner (structure and architect), contractor, and supervisor consultant

3.3 Human Resource Management

According to Effendi (2007), human resources are planning, organizing, directing and supervising procurement activities for the development, integration, maintenance, and release of human resources in order to achieve the goals of the organization and society. The purpose of human resource management in general is to ensure that organizations are able to achieve success through collaboration and active contributions from humans.

3.4 Risk Management

Risk is a threat to life, property or financial benefits due to the dangers that occur (Duffield & Trigunarsyah, 1999). In general the risk is associated with the probability (probability) of occurrence of events beyond what is expected. So risk is variation in things that may occur naturally or the possibility of an unexpected event that is a threat to property and financial benefits due to the danger that occurs.

3.5 Accident Behavior

According to Reason (1990), behavioral theory defines that an activity or action is displayed by someone from their relationship with other people and their surroundings, or someone's actions in order to adapt to their surroundings, both the environment and others. Behavior is triggered and influenced by various factors, called determinant factors. These determinants can be classified into 2 groups, namely:

1. Internal factors or internal factors commonly referred to as congenital factors (genetic). Internal factors are factors related to personal self. Such as needs, motivation, personality, hope, knowledge, perception, and many other internal factors.
2. Environmental factors are factors that come from outside a person or from the environment, both with humans and around them. Like: groups, communities, superiors, parents, friends and others

3.6 Human Error

Human Error is an error caused by the performance of activities that should not be carried out so that it can cause chaos or disruption to operations or cause damage to equipment and equipment. Dhillon (1987) Human Error often occurs in human life when doing their respective activities, even humans are often called error makers. According to Satalaksana (1979) this occurs because of human limitations, both the results of creation (work) or human behavior itself very difficult to achieve perfection. According to Atkinson (1998), the causes of human error can be divided into several parts, namely:

4. Research Methodology

4.1 Research Design

Research is the process of searching for things systematically for a long time using scientific methods and applicable rules. The word systematic means that research is related to the scientific method, which means that there is a process characterized by order and completeness (Munizar, 2017). Research design is a blue print of how data is collected, measured, and analyzed. Through design, it can be assessed the allocation of needed resources (Umar, 2004). This study was conducted based on the procedure proposed by Arikunto (2006), namely as follows:

1. Research begins with the selection of problems.
2. Conduct a preliminary study with the intention to find information needed by researchers so that the problem becomes clear.

3. Formulate a problem so that research can be carried out as well as possible, and clearly where to start.
4. Formulate basic assumptions or something that is believed to be true by researchers who will serve as a reference for research.
5. Determine the hypothesis or transient truth that is determined by the researcher, but still has to be verified.
6. Choosing an approach and determining the type of research that will be used.
7. Determine the research data variables and sources.
8. Determine and compile research instruments.
9. Collect data using predetermined research instruments.
10. Analyze the data that has been collected.
11. Draw conclusions based on the results of data analysis.
12. Prepare reports.

4.2 Lokasi Penelitian

This research was conducted in South Aceh Regency, which is located from the Capital of the Province in the range of 430 kilometers.

4.3 Sample and Population

The population in this study was divided into groups of practitioner respondents and expert respondents. Practitioner respondents were the construction actors involved in this Bridge project, which included the assigning element (owner), consultant planner (structure and architect). Contractor executive, supervisory consultant, while expert respondents are academics in the field of human resource management and construction management.

Respondents in this study were the assignors (owner) taken 15 respondents from their staff. Planner consultants numbered 15 respondents, 15 contractor implementers and 15 consultant supervisors, so the number of respondents in this study were 60 respondents.

4.4 Data Collecting Method

Primary data collection is done by surveying questionnaires, while secondary data is obtained from documents relating to the object of research. Secondary data collection is obtained from the project implementing contractor under study, in the form of drawings, personnel lists and employment contracts.

4.5 Research Variables

Research variables are the factors of the research that relate to the focus of the research to be studied. Research variables are obtained from literature studies of literature studies and which have been validated by experts, can be seen in table 1 below:

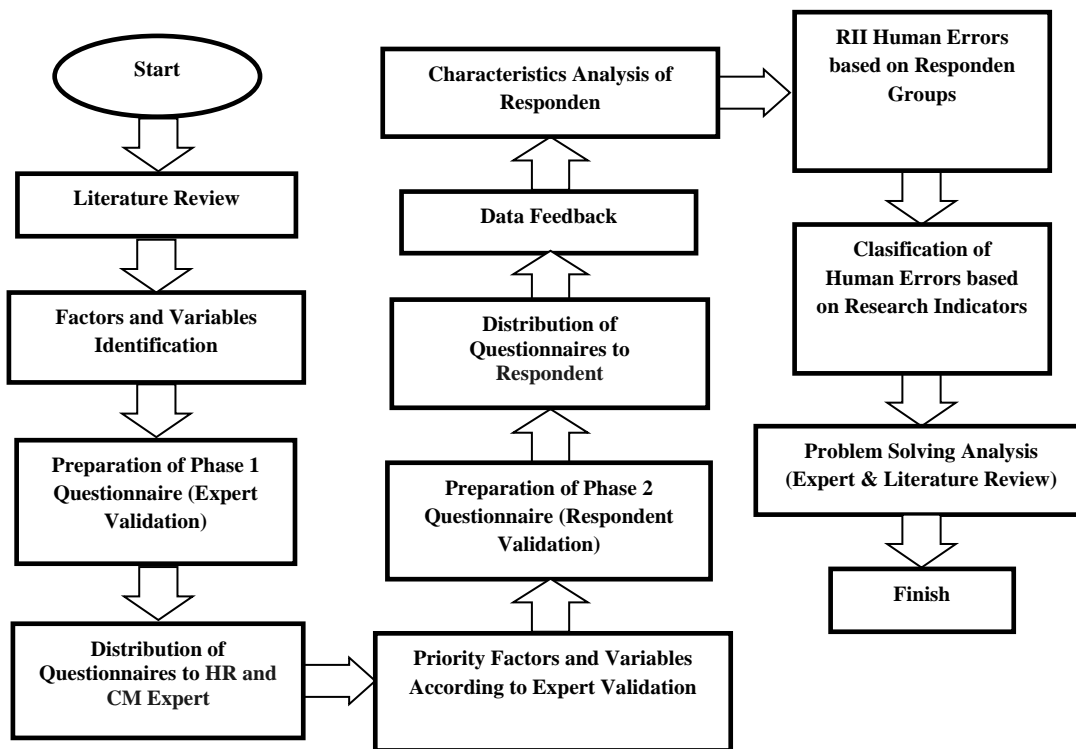
Table 1 Research Variables

No.	Factors	Variables	Source	
1.	Induced Human Error System	X1	Management only applies one-way communication	Peter (2006)
		X2	Lack of coordination and responsibility	Peter (2006)
		X3	Weak response if there is a work accident	Peter (2006)
		X4	Estimates that are too low in design and construction	Eldukair and Ayyub (1991)
		X5	A situation that is truly unknown	Eldukair and Ayyub (1991)
		X6	Inadequate training and supervision	Peter (2006)
		X7	Poor working procedure	Peter (2006)
		X8	Poor Standard Operating Procedures (SOP)	Peter (2006)
		X9	Incorrect understanding during an emergency	Reason (1990)
		X10	Do not carry out initial checks	Reason (1990)
		X11	Work standards are often underestimated	Reason (1990)
		X12	Upper and lower communication that is often delayed/ delayed	Weighmann and Shappel (2006)
		X13	Discipline in carrying out SOP is lacking	Kementrian PU (2018)
		X14	The choice of construction method does not take into account the risk aspects	Kementrian PU (2018)
		X15	The workforce does not yet have a competency certificate	Kementrian PU (2018)
2.	Induced Human Error Design	X16	Trust / dependence on other parties	Eldukair and Ayyub (1991)
		X17	Design equipment that is not suitable or not suitable for the user	Peter (2006)
		X18	Poor working environment and equipment layout	Peter (2006)
		X19	The work procedure is not clear	Peter (2006)

		X20	Work equipment is not feasible	Peter (2006)
		X21	The complexity of work and excessive conditions	Peter (2006)
		X22	Poor lighting	Peter (2006)
		X23	Excessive noise level	Peter (2006)
		X24	Poor layout of work facilities	Peter (2006)
		X25	Running tools / equipment without authority	Peter (2006)
		X26	Failure to use protective equipment / personal safety properly	Peter (2006)
		X27	Safety Factor at implementation is still low	Kementrian PU (2018)
		X28	The roles and responsibilities of the consultant consultant and planning consultant have not been maximized	Kementrian PU (2018)
		X29	Often do not follow the rules during training	Reason (1990)
		X30	Often outside the control of workers in the field	Reason (1990)
		X31	Often do not attend daily briefings / Safety Talk / toolbox meetings	Reason (1990)
		X32	Error understanding work awareness	Reason (1990)
		X33	Regardless of the sign / sign of concern	Reason (1990)
		X34	Often removes several steps in a procedure	Weighmann and Shappel (2006)
		X35	Often removes several steps in a checklist	Weighmann and Shappel (2006)
3.	Pure Human Error	X36	Inadequate knowledge	(Eldukair and Ayyub, 1991)
		X37	Lack of education and training	(Eldukair and Ayyub, 1991)
		X38	Ignorance, neglect and carelessness	(Eldukair and Ayyub, 1991)
		X39	Lack of ability to communicate	(Eldukair and Ayyub, 1991)
		X40	Lack of imagination / foresight	(Eldukair and Ayyub, 1991)
		X41	Lack of authority in making decisions	(Eldukair and Ayyub, 1991)
		X42	Low level of skill and competence of experts	(Peter,2006)
		X43	Workers experience fatigue and not concentration while working	(Peter,2006)
		X44	Workers experience stress, have personal problems	(Peter,2006)
		X45	Workers suffer from illness or other medical problems	(Peter,2006)
		X46	Does not recognize the characteristics of the work area	Weighmann and Shappel (2006)
		X47	Does not focus on work	Weighmann and Shappel (2006)
		X48	Do not have experience when working	Weighmann and Shappel (2006)
		X49	Does not match the work group	Weighmann and Shappel (2006)
		X50	Poor working technique	Weighmann and Shappel (2006)
		X51	Tends to rush into something	Weighmann and Shappel (2006)
		X52	Excessive emphasis on workers	Weighmann and Shappel (2006)
		X53	Too confident in a job	Reason (1990)
		X54	Personal ego is too high	Reason (1990)
		X55	Using minimum PPE (incomplete)	Reason (1990)
		X56	The remuneration of experts and supervisors is not maximal	Kementrian PU (2018)

4.6 Data Analysis Techniques

Statistical data analysis was performed using the help of number processing computer programs and statistical data. The simulation was carried out after the feedback of the questionnaire was processed in the form of numbers, then proceed with processing using a computer program. The steps carried out can be seen in Figure 1 below:



Gambar 1 Metode Analisis Data

4.7 Relative Importance Index (RII) Analysis

Relative Importance Index (RII) analysis is an analysis that allows a relative quantitative, where the higher the rating (rating) the higher the influence given by the variables owned (Hardjomuljadi, 2009). The formula used is:

$$RII = \frac{\sum W}{A \times N}$$

Information:

RII = Relative Importance Index

W = Weight given for dominant causative factors (1,2,3,4 and 5)

A = The highest weight (in this study is 5)

N = Total number of respondents

In this study, human error factors were determined from the top 10 variable values based on relative importance index (RII).

5. ANALYSIS

5.1 Instrument Data Test

Based on the test of validity, reliability, and normality of the data that has been done, the conclusion is obtained:

1. All variable items meet the requirements of data validity.
2. All variable items meet the requirements of data reliability.
3. The data obtained is data that is not normally distributed, so the statistics used are non-parametric statistics.

5.2 Characteristics of Respondents

The characteristics of respondents were obtained from the results of respondents' answers in the information section of respondents data from the total number of respondents (Owner, Planning Consultant, Supervisory Consultant,

Contractor). Characteristics of respondents were grouped according to gender, age group, level of education, position, and length of work. The data are explained in the following table 2:

Table 2 Characteristics of Respondents Percentage

No	Characteristics of Respondent		Frequency	Percentage (%)
1.	Gender	Man	60	100
		Woman	0	0
2.	Age	<20 years old	3	5
		20-30 years old	17	28.33
		30-40 years old	18	30
		> 40 years old	22	36.67
3.	Education	SD	0	0
		SMP	0	0
		SMA	26	43.33
		S1	19	31.67
		S2	15	25
4.	Position	Owner	15	25
		Panning Consultant	15	25
		Contractor	15	25
		Supervising Consultant	15	25
5.	Length of Work	1 – 3 tahun	9	15
		3 – 5 tahun	21	35
		Lebih dari 5 tahun	28	46.67

5.3 Relative Importance Index (RII)

Based on the analysis of relative importance index (RII), it was found that the factors that became human error factors through the top 10 ranks are relative importance index (RII), so that the 10 main human error factors were obtained in the project on the construction of the Paya Dapur - Kp. Tinggi Bridge in South Aceh District in table 3 below:

Table 3 Priority Factors

No.	Var	Factors	RII Grade
1.	X28	The roles and responsibilities of the planning consultant consultant and planner have not been maximal	40.667
2.	X26	Failure to properly use personal protective / personal safety equipment	40.667
3.	X7	Poor working procedure	40.333
4.	X8	Poor Standard Operation Procedure (SOP)	40.000
5.	X22	Lighting is less	40.000
6.	X11	Work standards are often displayed	39.667
7.	X10	Does not carry out the initial inspection	39.667
8.	X17	Design of equipment that is not suitable or not compatible with	39.667
9.	X23	Excessive noise levels	39.333
10.	X24	Poor work facility layout design	39.000

Based on the calculation of relative importance index (RII) also found the factors that influence human error through the top 5 ranks for each factor category shown in table 4 below:

Tabel 4 Human Error Untuk Setiap Kategori Variabel

No.	Category	Var	Factors	RII Grade
1.	Induced Human Error System	X7	Poor working procedure	40.333
		X8	Poor Standard Operating Procedure (SOP)	40.000
		X11	Work standards are presented	39.667

		X10	Do not carry out initial checks	39.667
		X5	A situation that is truly unknown	39.000
2.	Induced Human Error Design	X28	The roles and responsibilities of the consultant consultant and planning consultant have not been maximized	40.667
		X26	Failure to use personal protective equipment / personal safety properly	40.667
		X22	Poor lighting	40.000
		X17	Design equipment that is not suitable or not suitable for the user	39.667
		X23	Excessive noise level	39.333
3.	Pure Human Error	X48	Do not have experience when working	37.333
		X45	Workers suffer from illness or other medical problems	37.000
		X40	Lack of imagination / future review	36.667
		X47	Do not focus on work	36.333
		X44	Workers feel stressed, have personal problems	36.000

6. Conclusion and Recommended

6.1 Conclusion

Based on the results of data analysis that has been done, there are 3 categories of human error factors in the construction of the Paya Dapur bridge - Kp. High in South Aceh Province, namely Induced Human Error System, Induced Human Error Design and Pure Human Error. Based on the results of the research and discussion conducted, the top 5 human error factors were obtained in each category, namely:

1. Induced Human Error System, the factors that influence are:
 - a. Bad working procedure,
 - b. Poor standard operating procedure (SOP)
 - c. Underestimated work standards,
 - d. A situation that is truly unknown
 - e. Do not carry out initial checks
2. Induced Human Error Design. the factors that influence are:
 - a. The roles and responsibilities of the consultant consultant and planning consultant have not been maximized
 - b. Failure to use personal protective equipment / personal safety properly
 - c. Poor lighting
 - d. Design equipment that is not suitable or not suitable for the user
 - e. Excessive noise level.
3. Pure Human Error, the factors that influence are:
 - a. have no experience when working
 - b. workers suffer pain or other medical problems
 - c. lack of imagination / future review
 - d. not focus on work
 - e. workers experience stress or have personal problems

6.2 Recommended

Based on the results of the research and the conclusions above, then put forward some suggestions as follows:

1. This research is expected to contribute to various parties involved in infrastructure development programs, both the government, the private sector, the community, and other stakeholders, to better understand and consider human error factor factors in infrastructure development projects.
2. Further research needs to be done by considering occupational safety and health management factors, so that there is continuity between the causes and consequences of a construction accident.
3. This research is expected to be used as a reference and evaluation material for further research for different infrastructure development projects, and the scope of research can be extended to other regions.
4. Research data needs to be added and collected in the latest year, and with different data methods and processing to get a more accurate comparison of research results.

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