IDENTIFICATION OF HUMAN ERRORS FACTORS TO REDUCING WORK ACCIDENT LEVELS IN BENGKULU CITY

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ABSTRACT

Many opinions suggest that workplace accidents are closely related to human error, which is considered the main source of workplace accidents. Human error occurs when a series of activities in the field that have been planned, it turns out that it does not go as planned, so it fails to reach the expected target. Human error can occur due to many factors, such as, induced human error system, where the mechanism of the work system allows workers to make mistakes; induced human error design, namely the occurrence of errors due to poor work system design errors; and pure human error, errors originating from humans themselves, for example due to limited ability and work experience. This study aims to determine the priority factors of human error in reducing the level of workplace accidents in the city of Bengkulu. In general, the method of research analysis begins with determining the factors and research variables regarding human errors through literature studies, followed by collecting data through the distribution of questionnaires to 35 respondents in the city of Bengkulu. The study was conducted using an explorative study approach consisting of literature studies, questionnaire surveys, and expert interviews. Statistical data analysis was performed using the help of numerical processing computer programs and statistical data. The results of the study are based on the human error priority factors that have been identified, so to reduce the level of workplace accidents, more optimal control is needed regarding matters relating to work safety for all construction workers; the procedure for implementing construction activities must be clear, so as not to confuse workers; wages given to construction workers must be more adequate, so as not to force workers to overtime; regulate working hours so that workers are not too tired; and optimizing workers' rest time, not allowed to overtime if they have been working too long.

Keyword: - *human error, work accident, construction*

1. BACKGROUND OF RESEARCH

Workplace accidents are unexpected, unplanned, and certainly unexpected events, which result in injury, illness, and loss both to humans, goods, and the environment. Many opinions suggest that workplace accidents are closely related to human error, which is considered the main source of workplace accidents.

According to Peters (2008), human error is a deviation from predetermined performance standards that causes delays due to difficulties, problems, incidents, and failures. Human errors are work errors that are caused by incompatibility with what is expected. In practice, human error occurs when a series of activities in the field that have been planned, it turns out that it does not go as planned, so it fails to reach the expected target.

Human error can occur due to many factors, such as, induced human error system, where the mechanism of the work system allows workers to make mistakes; induced human error design, namely the occurrence of errors due to poor work system design errors; and pure human error, errors originating from humans themselves, for example due to limited ability and work experience.

2. RESEARCH PROBLEM

Based on the background research, the main problems in this study can be formulated as follows:

1. What are the factors of human error in reducing the level of workplace accidents in Bengkulu City?
2. What are the priority factors of human error in reducing the level of workplace accidents in Bengkulu City?

3. LITERATURE REVIEW

3.1 Construction Project

According to Gould (1993), construction projects can be defined as an activity that aims to establish a building, which includes the needs of the cost, labor, material and equipment resources used for construction in detail and clearly.

Heizer and Render (2016) explain that the project can be defined as a series of tasks directed at a main outcome. Cleland and King (1983) stated that the project is a combination of several resources, which are collected in a temporary organization to achieve a certain goal. Activities or tasks carried out on the project in the form of construction or repair of facilities (buildings, roads, bridges, dams, etc.) or can also be in the form of research and development activities.

3.2 Construction Failure

Oyfer (2002) states that construction failures including quality defects are not only sourced from one cause, but many causes. Barrie and Paulson (1992) state that construction is one of the dangerous industries.

According to Reid (1995), the construction industry is an industry that has an irregular character, many parties are involved with different objectives from each other (consultants, contractors, material suppliers, laborers and project owners), and are dangerous because the construction process is carried out in the open air where the influence of weather and nature greatly affects the process of implementing construction.

3.3 Work Accident

According to Budiono et al. (2003), in the early 1970s argued that the mechanism for the occurrence of workplace accidents was called a domino sequence, namely:

1. Ancestry and social environment, namely in people who are stubborn or have other bad qualities that are obtained due to heredity, environmental influences and education, resulting in someone working inadvertently, and making many mistakes,
2. Fault of person, is a series of hereditary and environmental factors mentioned above, which leads to wrong actions in doing work.
3. Unsafe act and or mechanical or physical hazards, explain that dangerous actions accompanied by other mechanical and physical hazards, facilitate the occurrence of the next sequence,
4. Accident, is an accident that befalls workers and is generally accompanied by various losses,
5. Injury, that accidents result in minor or severe injuries, injuries, and even death. the main cause of workplace accidents is inequality in the management system, while unsafe actions or circumstances only affect it

3.4 Human Error

According to Dhillon (1987), human errors often occur in human life when doing their respective activities, even humans are often called error makers. According to Reason (1990), there are three kinds of errors, namely skill based errors, rule based errors, and knowledge based errors usually occur when someone does a routine job and is not an activity that requires thought and is done in familiar conditions. Routine habits are included in this condition, and usually those habits when experiencing interruptions or disturbances often make mistakes.

Knocke in Love and Josephson (2004) defines errors and omissions as deviations from proper construction, including checking and supervision, technical inspection, and adequate instructions for building maintenance and operations. According to Eldukair and Ayyub (1991), errors that occur in buildings can be in the form of management errors, technical errors, or environmental errors. Management errors include mistakes in work responsibilities, work communication, and work cooperation, while environmental errors include political pressure, financial pressure, and weather conditions.

3.5 Risk Management

According to Noshworthy (2000), risk management is the identification of threats and the implementation of measurements aimed at reducing events and reducing any damage. Risk analysis and risk control form the basis of risk management where risk control is an application of management that is suitable for obtaining a balance between security, use and cost. Project Management Body of Knowledge (PMBOK) defines that risk is the cumulative effect of the possibilities of uncertainly which is detrimental to the achievement of project objectives.

Stoneburner et al. (2001), risk management is the process of identifying, controlling and distributing information related to risk through a system and encompassing risk assessment, cost benefit analysis and the selection, implementation, testing and evaluation of security from safeguards by taking into account the effectiveness and efficiency of both impacts on mission and limitations related to policies, regulations and laws.

4. RESEARCH METHOD

4.1 Research Process

The study was conducted using an explorative study approach consisting of literature studies, questionnaire surveys, and expert interviews. In summary, the research process carried out can be observed in Figure 1 below:

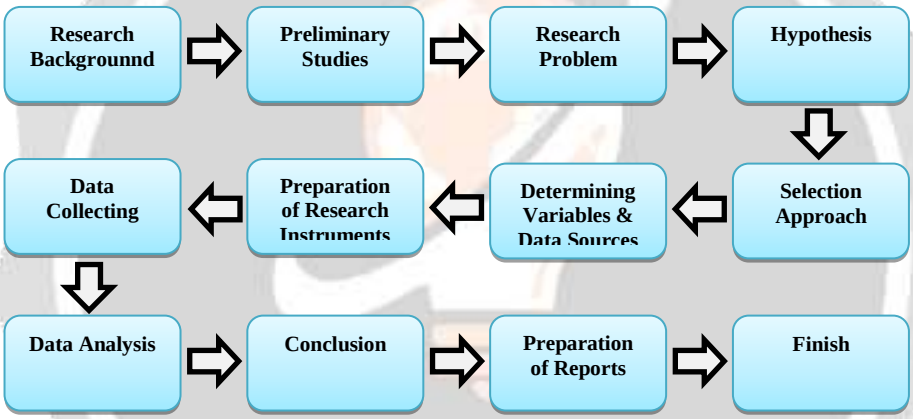

Fig-1: Research Process

The research begins with the selection of problems followed by a preliminary study with the intention of seeking information needed by researchers so that the problem becomes clear. The next stage is to formulate a problem so that research can be carried out as well as possible, and clearly where to start. After formulating the problem, the research is continued by formulating basic assumptions or something that is believed to be correct by the researcher which will serve as a research reference, choosing the type of approach to be used, determining research factors based on literature studies and determining research data sources, compiling research instruments, collecting data, analyze data, then draw conclusions and suggestions, and end with the preparation of research reports.

4.2 Research Instruments

In this study, the instrument used was a questionnaire sheet in the form of a structured questionnaire. The questionnaire was designed based on factors that have been determined through literature studies. Distribution of questionnaires was carried out in two stages. The first stage was conducted to measure the respondents 'opinions on the factors of human errors in reducing workplace accidents in the city of Bengkulu, while the second stage was conducted to see the consistency of respondents' answers through a comparison between the answers to the first stage and the second stage. The method of analysis of the consistency of the respondents' answers used is the Spearman and Kendall correlation method.

4.3 Data Collecting Method

The method of data collection is a method carried out by researchers to obtain the data needed in a study. In general, the data in this study are divided into two data sources, namely primary data sources and secondary data.

4.3.1 Primary Data

The collection of primary data in this study will be conducted by means of a questionnaire survey of the respondents of the construction actors (owners, contractors, and consultants) in the city of Bengkulu.

4.3.2 Secondary Data

Secondary data collection is carried out by researchers in an indirect way to the object of research, but through documents relating to the object of research. Secondary data collection will be carried out through the official website of the Public Works Agency, the Central Statistics Agency/Badan Pusat Statistik (BPS) Bengkulu Province, as well as other official elements involved in the management of infrastructure assets in Bengkulu City.

4.3.3 Measuring Instrument

The measuring instrument to be used in this study is a questionnaire with a Likert scale, where the Likert scale is used to measure attitudes, opinions, influences and perceptions of a person or group of people about social phenomena. In the Likert scale procedure, a number of questions are arranged with the respondent's answers in one level of assessment by giving certain weights.

4.4 Respondent

Respondents in this study were taken randomly by incidental sampling method to the population of construction actors in the city of Bengkulu, namely as many as 35 respondents. The population of the construction actors is from the owner, contractor, and consultant.

4.5 Research Location

This research was conducted in the city of Bengkulu by reviewing and exploring aspects of workplace accidents that occurred

4.6 Research Analysis Method

Statistical data analysis was performed using the help of numerical processing computer programs and statistical data. The steps carried out in this study are shown in the following figure 2:

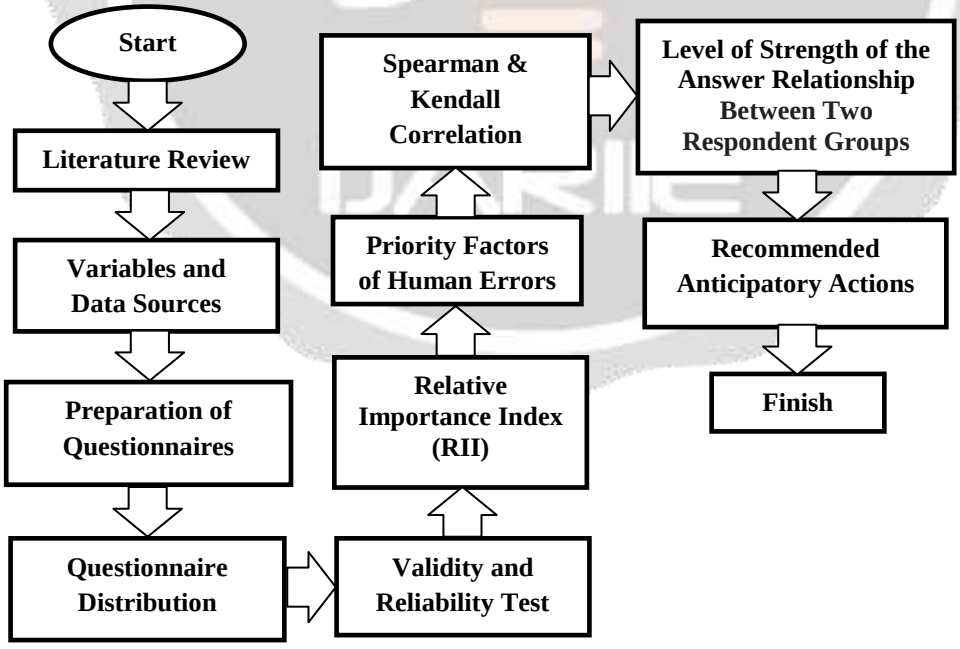

Fig-2: Research Analysis Method

5. ANALYSIS

5.1 Human Error Factors

Based on the literature study that has been conducted, human error factors are obtained as follows:

Table-1: Human Error Factors

Factors	
X1	Lack of break time for workers
X2	Low skill and competency level
X3	Security equipment does not operate properly
X4	Workers experience stress
X5	Workers suffer from illness or other medical problems
X6	Taking an unsafe position
X7	Poor working environment and equipment layout
X8	The work procedure is not clear
X9	Work equipment is not feasible
X10	Lack of control about work safety
X11	Poor lighting
X12	Excessive noise level
X13	Lack of imagination / foresight
X14	Less wages, forcing workers to overtime
X15	Inadequate protective equipment
X16	Equipment broken
X17	Workers experience fatigue and concentration when working
X18	Warehouse that is not safe, crowded and too full
X19	Unavailability of work safety equipment
X20	Throw away the remaining ingredients out of place
X21	Operate or work at an unsafe speed
X22	Lack of supervision on the application of OHS
X23	Use unsafe equipment
X24	Imposing an unsafe procedure
X25	Lack of explanation about job risks
X26	Design equipment that is not suitable or not suitable for the user

5.2 Test of Classical Assumptions

Based on the classic assumption test (validity & reliability test) that has been done, then conclusions are obtained:

1. All variable items meet the requirements of data validity.
2. All variable items meet the requirements of data reliability.

5.3 Priority Factors of Human Error

The priority factors for human errors are obtained through the top 5 ranking analysis values relative importance index (RII), so that the priority factors are obtained as in table 2 below:

Table-2: Priority Factors of Human Error

No.	Factors		Level of RII
1.	X10	Lack of control about work safety	74.857
2.	X8	The work procedure is not clear	74.857
3.	X14	Less wages, forcing workers to overtime	74.286
4.	X17	Workers experience fatigue and concentration when working	73.714
5.	X1	Lack of break time for workers	73.714

5.4 Spearman and Kendall Correlation

Based on the results of the Spearman and Kendall correlation calculations, there is a significant relationship between the RII of the first stage respondent's answer and the second respondent's RII, with the Spearman correlation value of 92.80% and the Kendall correlation of 83.10%. Correlation values are shown in table 3 below.

Table 3 Spearman and Kendall Correlation

			RII_Step1	RII_Step2
Kendall's tau_b	RII_Step1	Correlation Coefficient	1.000	.831**
		Sig. (2-tailed)	.	.000
		N	51	51
	RII_Step2	Correlation Coefficient	.831**	1.000
		Sig. (2-tailed)	.000	.
		N	51	51
Spearman's rho	RII_Step1	Correlation Coefficient	1.000	.928**
		Sig. (2-tailed)	.	.000
		N	51	51
	RII_Step2	Correlation Coefficient	.928**	1.000
		Sig. (2-tailed)	.000	.
		N	51	51

**. Correlation is significant at the 0.01 level (2-tailed).

6. CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions

Based on the results of the analysis and discussion of the data that has been carried out, then conclusions can be taken as follows:

1. There are 26 factors that influence human error that influence the implementation of construction in the City of Bengkulu, namely:
2. There are 5 priority human error factors that influence the implementation of construction in the City of Bengkulu based on the analysis of relative importance index (RII), namely:
   a. Lack of control about work safety
   b. The work procedure is not clear
   c. Less wages, forcing workers to overtime
   d. Workers experience fatigue and concentration when working
   e. Lack of break time for workers

6.2 Recommendations

Based on the human error priority factors that have been identified, then to reduce the level of work accidents more optimal control is needed regarding matters relating to work safety for all construction workers; the procedure for implementing construction activities must be clear, so as not to confuse workers; wages given to construction workers must be more adequate, so as not to force workers to overtime; regulate working hours so that workers are not too tired; and optimizing workers' rest time, not allowed to overtime if they have been working too long.

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