CONTRIBUTION OF HUMAN FACTORS TO SHIPPING SAFETY

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Special dedication to my beloved mother and father ......

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ABSTRACT

This thesis empirically determines "Contribution of Human Factors to Shipping Safety". Human factors can be classified into three categories. They are organizational factor, group factor, and individual factor Based on its classification, questionnaire was made. Questionnaire was tested to 30 respondents who are working at a shipping company (PT. Baruna Jaya) to determine its validity and reliability by using Ms.Excel program. After the test is done, results shows that 17 organizational factor statements, 11 group factor statements, 12 individual factor statements, and 10 shipping safety statements are valid with reliability value for each variables are 0860, 0.767, 0721, and 0.8. By using its valid statements, questionnaires distributed to 86 respondents who are working as passenger ship's crew at two shipping companies (PT Baruna Jaya and PT. Lestari Indoma Bahari). After obtained data, analysis requirements test (normality, homogeneity, linearity and independence test between independent variables) need to be done to determine statistical method to be used. Correlation and regression method by using SPSS program was used to determine contribution of human factors to shipping safety, either carried out independently between independent variable to dependent variable, or together between three independent variables to dependent variable. Analyzed data was found that there are 28.8% contribution of human factors to shipping safety with correlation coefficient is 0.488. This lower contribution of human factors to the shipping safety is one of the causes of ship accidents frequently happen in case study area. During the last two years there were 22 cases of ship accidents. With respect to that all parties which involve in shipping include shipping companies, ship's owners, government, regulatory authorities, classification society and other parties should take a serious concern about safety in shipping by improving on all aspect of human factors.

ABSTRAK

Secara empirikal tesis ini menentukan "Sumbangan faktor manusia terhadap keselamatan perkapalan". Faktor manusia dikelaskan kepada 3 kategori iaitu faktor organisasi, faktor kumpulan dan faktor individu. Berdasarkan pengkelasannya, soal sedilik dibuat. Soal selidik diujikan kepada 30 responden bekerja di syarikat perkapalan (PT. Baruna Jaya) bagi menentukan kesahihan dan kebolehpercayaan. Selepas ujian dilakukan, keputusan menunjukkan 17 pernyataan faktor organisasi, 11 pernyataan faktor kumpulan, 12 pernyataan faktor individu, dan 10 pernyataan keselamatan perkapalan adalah sah dan nilai kebolehpercayaan setiap pembolehubah 0860, 0,767, 0721, dan 0.8. Dengan menggunakan pernyataan yang sah itu, soal selidik diedarkan kepada 86 responden bekerja sebagai kru kapal penumpang di dua buah syarikat perkapalan (PT Baruna Jaya dan PT Lestari Indoma Bahari). Selepas memperolehi data, pengujian keperluan analisis (kenormalan, kesamaan, kelinearan dan kebebasan di antara pembolehubah bebas) dilakukan bagi menentukan kaedah statistik yang digunakan. Kaedah korelasi dan regresi dengan program SPSS digunakan bagi menentukan sumbangan faktor manusia kepada keselamatan perkapalan, sama ada dijalankan secara bebas, atau bersama antara tiga pembolehubah bebas dengan pembolehubah bersandar. Analisa data mendapati bahawa terdapat sumbangan 28.8% faktor manusia kepada keselamatan perkapalan dengan pekali korelasi 0,488. Sumbangan yang rendah dari faktor manusia kepada keselamatan perkapalan ini merupakan salah satu punca kemalangan kapal kerap berlaku di kawasan kajian kes. Dalam tempoh dua tahun lepas, 22 kes kemalangan kapal berlaku. Berkenaan dengan itu pihak yang terlibat dalam perkapalan termasuk syarikat perkapalan, pemilik kapal, kerajaan, pihak berkuasa, pertubuhan klasifikasi, dan pihak lain harus mengambil kebimbangan serius mengenai keselamatan perkapalan dengan mempertingkatkan semua aspek dari faktor manusia.

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LIST OF ABBREVIATIONS

ANOVA	=	Analysis of Variance
FAHP	=	Fuzzy Analitical Hierarchy Process
HFACS	=	Human Factor Analysis and Classification System
HFIT	=	Human Factor Investigation Tools
HSOPSC	=	Hospital Survey on Patient Safety Culture Assestment
IMO	=	International Maritime Organization
KM	=	Kapal Motor
MLC	=	Marine Labour Convention
PT	=	Perseroan Terbatas
SEM	=	Structural Equation Modelling
SPSS	=	Statistical Package for The Social Sciences
SSCS	=	Short Safety Climate Survey

LIST OF SYMBOLS

σ	$=$	Standard Deviation
σ^2	$=$	Variance
$\bar{x}$	$=$	Mean or average
$(x - \bar{x})$	$=$	Deviation
$\sum x$	$=$	Sum of all values in a distribution
$\sum X$	$=$	Sum score of X variable
$\sum X^2$	$=$	Sum score variable X squared
$\sum XY$	$=$	Product sum between X dan Y variable
$\sum Y$	$=$	Sum score of X variable
a, b, c , ... , z	$=$	Regression Coefficient
cfb	$=$	Number of cases lying below the LL
F	$=$	Ratio of two Variance Estimates
fw	$=$	Number of scores in the interval containing the median
i	$=$	Width of the score interval
LL	$=$	Lower real limit of the score containing the 50th percentile,
M^2_b	$=$	Between-groups estimate of variance
M^2_w	$=$	Within-groups estimate of variance
Md	$=$	Median
Mo	$=$	Mode

N	=	Number of cases
r_{XY}	=	Product moment correlation or pierson correlation
r_{XY}	=	Product moment correlation or pierson correlation
t	=	t-test
X	=	Independen Variable
XY^2	=	Sum score variable Y squared
Y	=	Dependent Variabel

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CHAPTER 1

INTRODUCTION

1.1   GENERAL

This chapter provides preliminary information about this study. It covers background of study, problem statement, objectives, scope, implication of study, research methodology and research flowchart. It is intended to assist readers in understanding the study and to sparking interest in readers to find out more about the content of subsequent chapters.

1.2   BACKGROUND

Indonesia is an archipelagic state that have 17,480 islands (Ministry of marine affairs and fisheries, 2012) with 5.9 million km^2 of water area and 1.9 milion km^2 of land area (more than 2/3 area of Indonesia is water) (Soewedo, 2009). With the wider water area than land area, Indonesia cannot be separated with the ship as a main transportation facility.

Water transportation in Indonesia has an important role as a bridge of nationwide and can't be replaced with other transportation like land and air transportation (Ministry of marine affairs and fisheries Republic Indonesia, 2012). It is used as primary farcilities and strategic on accelerate the economical. By connecting one island to other islands, the movement of goods and passeengers can run properly and can make the unity and nation integrity to be strengthen.

The important of Indonesia water transport can be viewed with increasing the needs of water transport service from time to time for goods and passengers mobility (Ministry of transportation, 2000). It have some negative impacts like pollution and accidents.The Oxford English Dictionary defines an accident as anything that happens without foresight and expectation: an unusual event, which proceeds from unknown cause, or is an unusual effect of a known cause (Baldick, 2008). At the same time, Webster's Third New International Dictionary gives the similar essence - but with slightly more explanation, as a usually sudden event or change, occurring without intent or volition through carelessness, unawareness, ignorance, or combination of causes and producing an unfortunate result (Gove, 2002). While Akten (1982) said accident in shipping is a general term which use for any result of accident in shipping that causes financial prejudice, loss of property, and loss of life.

Although nowadays is the age of precision navigation and satellite era, with there are very advanced and sophisticated navigation and communication equipment. Its aim to preventing accident at sea, however in the fact accident still frequently happen.

There are many types of shipping accident and can effect to the environment around the ship, ship property itself, and can effect to the people. Collision or contact (can be ship to ship or ship to other structure), capsize, sinking, breaking up, breakdown of the ship underway, stranding, and fire or explosion are examples of shipping accidents commonly (Akten, 2006).

Akten (2006) said there are many factors that make accident happen. Generally can be classified as several factors :

i. Natural conditions could be natural phenomena such as tidal stream, high wave, strong winds, restricted visibility due to fog, smoke, rain or snow, storm, etc.

ii. Technical failure such as lack of repair and maintenance, setering failure, engine failure, and structure failure as a result from lack of accurately ship design.

iii. Human factors are all of human factors which contribute accident happen both of organisation, group, or individual factor.

In this study area, ship is become main transportation fasility. Due to in this area is wider than land area (the ratio is about 1 : 24) (Health Department of Riau Archipelago province, 2006). Many ship that serve international and national shipping through Riau Archipelago water. It has negative impact. Ship accident frequently happen in Riau Archipelago water. Search and Rescue Agency (2012) recorded over than 25 case ship accidents occurred during the last two years without analysis. Based on that condition, researcher is trying to discuss shipping accident in case study area, determine indicators of human factors that influence shipping safety, to determine how much correlasion and contribution between human factors and shipping safety and discuss human factors as one element of shipping safety.

1.3   PROBLEM STATEMENT

The human factors found can affect safety (Heinrich et al, 1980; Gordon, 1996; Varonen and Mattila, 2000; Gordon et al, 2005; Hetherington et al, 2006; Chin and Chaur, 2008; Baysari et al, 2008; Celik and Cebib, 2009; Oslen, 2010; Luria, 2010; Petterson et al, 2010; Chin and Chung, 2011; Nathanael, 2011; and Fugas et al, 2012). It can be classified as 3 categories. They are organizational, group and individual factors. At the organizational category, various factors may contribute the incidents and accidents, including company policies, company standard, and system and procedures. At the group category, management, supervision and work with

relationships between members of a work group have the potential factor to influence the safety. And at the individual category, competence of the individu, perceptual judgments, stress, motivation, health risks (such as work over-load) and the contribution of human error can make a probability of accidents happen (Wilpert, 1995)

However, the most significant problem which influence shipping safety that can cause accident, like collision or contact (can be ship to ship or ship to other structure), capsize, sinking, breaking up, grounding, breakdown of the ship underway, stranding, and fire or explosion are mostly caused by human (Heinrich et al, 1980). Hence, this study is to be undertaken to discuss shipping accident in case study area, to determine indicators of human factors that influence shipping safet, to determine how much correlasion and contribution between human factors and shipping safety and to discuss human factors as one element of shipping safety.

1.3   OBJECTIVES

The objectives of this study are to:

i.   To discuss ship accident and types of ship accident which occurred in case study area.

ii.   To determine indicators of human factors that influence shipping safety.

iii.   To determine how much correlation and contribution between human factors and shipping safety if hypothesis test is carried out independently between independent variable to dependent variable and if hypothesis test is carried out together between three independent variables to dependent variable.

1.4   HYPOTHESIS

Based on this study objectives, hypothesis that be proposed in this study are:

i.   Shipping safety (Y) is contributed by organizational factor (X_1).

ii.   Shipping safety (Y) is contributed by group factor (X_2).

iii.   Shipping safety (Y) is contributed by individual factor (X_3).

iv.   Shipping safety (Y) is contributed together by organizational factor (X_1), group factor (X_2), and individual factor (X_3).

1.5   SCOPE OF STUDY

The scope of this study are:

i.   This study was conducted on pasenger ships at Riau Archipelago Province – Indonesia.

ii.   This study just view one factor that can influence shipping safety, it is human factors.

iii.   Hypothesis test is conducted by using correlation method and linear regression both simple linear regression or multiple linear regression.

1.6   IMPLICATION OF STUDY

The implications of this study are:

i.   Master Thesis

To complete postgraduate study at University Technology Malaysia as a graduation requirement.

ii.   Potentian Aplication

Can be applied in the shipping company as a basic that contribution of human factors to shipping safety and to improve shipping safety mainly related to human factors.

1.7   RESEARCH METHODOLOGY

The study of this thesis is divided into two parts:

i.   Semester I

In this part, the research works began with conducting literature review of the human factors and shipping safety. The main emphasis on this part is the approaches were taken to understand the indicators of human factors and contribution of human factors to shipping safety. Then, the concept of data collecting and data analysis was studied in this semester

ii.   Semester II

The second part had been carried out in the second semester. For this part, the testing of instrument is conducted. After thet direct survey and data analyzing is conducted in this part. Then, the discussion had been carried out. Finally, the recommendation for future work has been suggested.

1.8   FLOW CHART

This research will be conducted in several processes. Flow chart is used to make the this process easier to read. The flow chart consist of several process as shown in a figure 1.1.
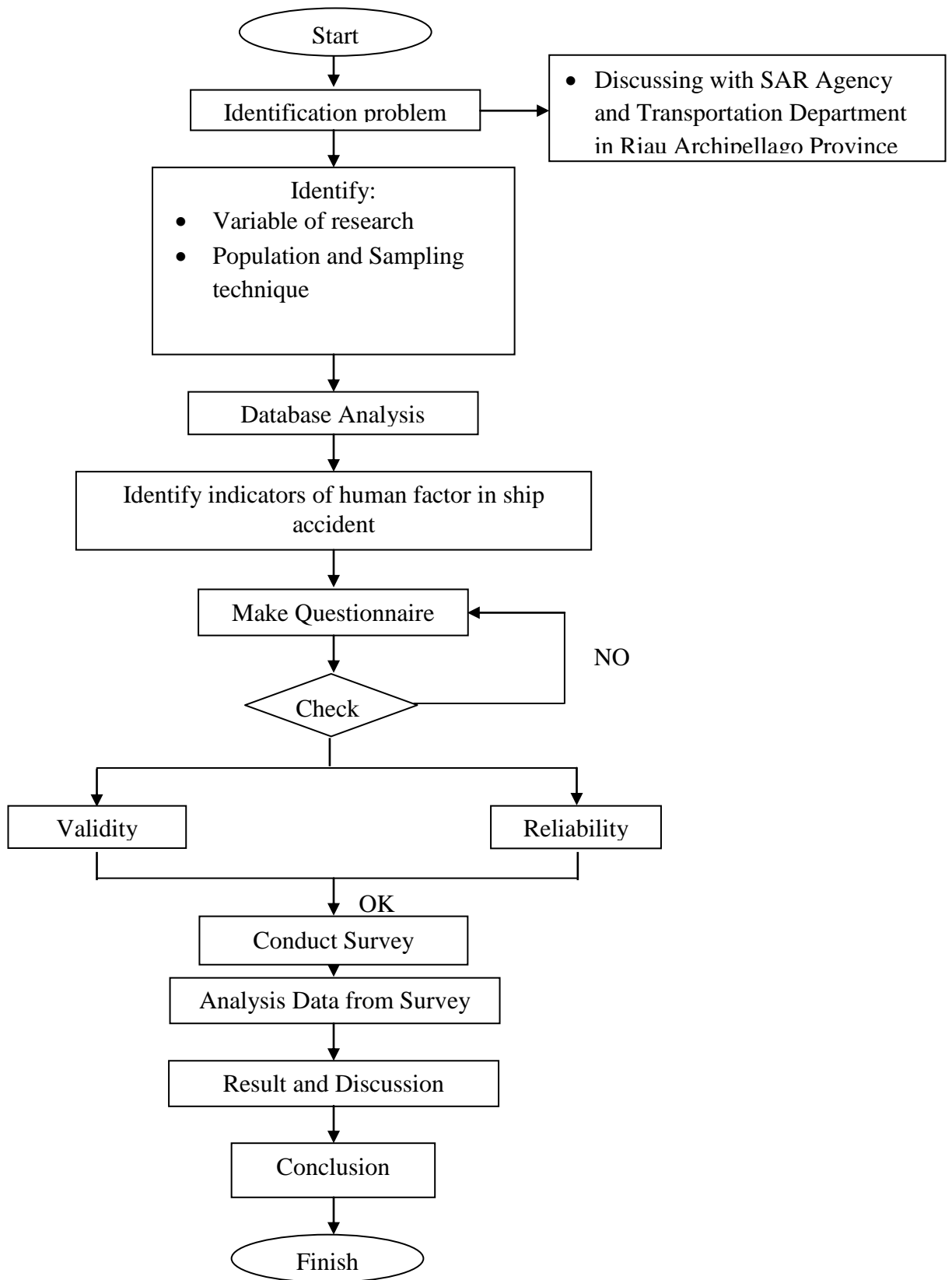
8

Figure 1.1 Flow chart

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