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Occupational Safety and Health Management System in Procurement of Goods and Warship Repair Services

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Abstract

Warship repair is a work that contains quite high risks, especially when carrying out work in a narrow workspace, resulting in difficulties in placing lifting equipment, minimal use of body harnesses, and the large number of closed spaces that allow the accumulation of CO2 gas. To overcome existing risks, this study was conducted to determine the influence, the supporting and inhibiting factors, and the ideal system for occupational safety and health management as well as the goods and services procurement for warship repairs. The approach used in this study is a mixed method by conducting a purposive sampling questionnaire on stakeholder respondents involved in warship repairs. Processing the data from the questionnaire using the SEM method with Amos software. This study shows that the occupational safety and health management system has a significant influence on the implementation of the procurement of goods and services as well as the readiness of warships but procurement of goods and services does not have a significant effect on warship readiness. The supporting factors for optimizing the implementation model for procurement of goods and services with an occupational safety and health management system in warship repairs include workforce skills, adequate work equipment, warship repair work methods, understanding of material properties, effectiveness, competition, and procurement accountability for goods and services. Meanwhile, the inhibiting factors are the unavailability of appropriate lifting equipment, the condition of warship infrastructure, efficiency, transparency, and openness. The occupational safety and health management system model and implementation of procurement of goods and services that can optimize warship repairs are achieved by displaying variables that are supporting factors and providing additional clauses in procurement documents.

INTRODUCTION

The warship repairs are very different from the repairs of devices or buildings on land because the devices on the ship are positioned in particular places, including in the ship's hull, body, keel, bridge, and deck. In instances where these parts are separated in the steel wall bulkheads, that skill is needed to get rid of and install the parts of the ship to be repaired (Pangaribuan, Aritonang, & Anwar, 2020). With these barriers, it is impossible to transport heavy materials using a crane that uses completely mechanical power, but this is one of the jobs that can best be performed with human power due to the restricted area in the ship's hull (Sahron & Budiani, 2020). Work accidents that often occur due to these conditions include technicians' fingers almost breaking off due to being hit by a grinding blade when cutting blower housing bolts, ship electric shocks when dismantling control panels, inhalation of battery sulfuric acid vapors, personnel falling when installing crane motors due to breaking of the safety rope, injury to gear due to being hit by the stern cover of the cannon due to broken spring ties, and so on.

The novelty and originality of research are better modeled through scientific activities carried out systematically in research activities, which include:

1. Previous research has highlighted differences in the occupational safety and health climate between permanent workers and sub-contractor workers that occur in the workplace (Kim, Park, Lim, & Cho, 2017), differences in responsibilities held by workers under main contracts and those under legal sub-contractors (Fajarini, 2016), and delays in completing warship repair work (Pangaribuan, Aritonang, & Anwar, 2020). This research aims to fill this gap by modeling the implementation of occupational safety and health and the procurement of goods and services for ship repairs, examining the basic nature (ontology), knowledge system (epistemology), and impact values (axiology) of problems that occur in the ship repair war that has been carried out so far. A transdisciplinary philosophical perspective will be able to optimize warship repairs.
2. Several other studies have examined ideal modeling to effectively regulate the performance of occupational health and safety supervisors (Arikan & Sozen, 2021), the influence of work-family conflict, work stress, general health, income imbalance, and workload, as well as the atmosphere in the workplace and work accidents (Barkhordari, Malmir, & Malakoutikhah, 2019), and look for key indicators that can foster a climate of safety, health, and well-being in the workplace (Zwetsloot, Leka, Kines, & Jain, 2020). In contrast to previous research, which focused on workers and conditions in the workplace during work implementation, this research expands research on occupational safety and health conditions created during work planning to several stages outlined in contracts for the procurement of goods and services.

Implementation of occupational safety and health when repairing warships is closely related to the procurement of goods and services that initiate these activities. The procurement of goods and services is regulated by government regulations with the objectives of being efficient, effective, open and competitive, transparent, fair or non-discriminatory, and accountable. These seven principles are implemented to encourage good goods and services procurement practices and reduce budget leaks (clean governance). The implementation of the procurement of goods and services as regulated in Presidential Decree Number 54 of 2010 Concerning Procurement of Goods and Services, (2010) The government has begun to emphasize the existence of business actors who carry out procurement by including occupational safety and health (OSH)

components in overhead costs when making their own estimated prices (Presidential Decree Number 54 of 2010 concerning Procurement of Goods and Services, 2010); however, in reality, work accidents still occur frequently and can cause delays in completing work.

The problem discussed in the study is to overcome the obstacles that occur by first knowing the supporting and inhibiting factors of the occupational safety and health management system in the procurement of goods and warship repair services so that warship repairs can be optimized. This study involves warship crew, material procurement personnel, planners, activity implementers, academics, and providers of warship repair goods and services as research respondents so that they can find out the influence, supporting, and inhibiting factors, as well as the ideal system for managing occupational safety and health and the procurement of warship repair goods and services. The expected modeling concept of the occupational safety and health management system in the procurement of goods and warship repair services hopefully can overcome the problem of delays in completing work so that the readiness of warships can support national resilience in the maritime sector.

METHODS

This study uses mixed methods by starting with the quantitative analysis of questionnaire data, which is processed using the structural equation model (SEM) method using the Amos software program simulation, and then continuing with the qualitative analysis of in-depth interview data using SWOT analysis. The data processing using the SEM method was built through several stages of analysis (Santoso, 2018):

1. Identifying Aspects and Indicator Variables
   Identify variables that influence occupational safety and health management system policies using preliminary research with stakeholders involved in ship repairs and procurement variables based on procurement principles. These variables are then outlined in a questionnaire sheet, which will be distributed to respondents who are competent in the procurement of warship repair goods and services so that they can find out the current conditions in the implementation of the procurement of warship repair goods and services.
2. Weighting of Aspect and Criteria Variables
   The weighting of each aspect and criteria variable that influences occupational health and safety management system policies in the procurement of warship repair services is carried out to obtain the value or level of importance of each aspect and criteria variable in the model formulation. The assessment of the weighting of the questionnaire results was then carried out by SEM analysis using AMOS software so that we could determine the level of significance of the existing variables.

The research then continued by conducting in-depth interviews with informants to deepen the results of the questionnaire that had been conducted. The results of the in-depth interviews were then analyzed using SWOT. Data processing with SWOT is carried out through several stages of analysis, among others (Rangkuti, 2015):

1. SEM analysis results as initial data to guide conducting interviews.
2. Interviews with parties involved and experts in the procurement of goods and warship repair services.
3. Assessment of internal factors, which include strengths and weaknesses, and external factors, which include advantages and challenges.
4. Analyzing dominant factors as a basis for modeling.

Primary Data

Primary data is obtained from the outcomes of data collection by filling out a questionnaire for Indonesian Navy personnel who serve within the discipline of maintenance and repair of Indonesian Navy Warship (*Kapal Perang Republik Indonesia* or KRI) in the Indonesian military second fleet commands in Surabaya, including Eastern Region Maintenance and Materials Department (Satharmattim or *Satuan Pemeliharaan Material Wilayah Timur*), Eastern Region Materials Feasibility Department (Satlaikmattim or *Satuan Kelayakan Material Wilayah Timur*), Warship Maintenance Service (Disharkap or *Dinas Pemeliharaan Kapal*), Department of Materials and Supplies (Dismatbek or *Dinas Material dan Perbekalan*), Maintenance and Repair Facilities in Surabaya (Fasharkan Surabaya or *Fasilitas Pemeliharaan dan Perbaikan* Surabaya), Indonesian Navy Warship crews, supply providers, and interviews with the heads of the work units. It includes information on factors that influence the elements of strengths, weaknesses, opportunities, and threats, which are then used to decide the occupational safety and health management system regulations for the procurement of warship repair services to support national resilience within the maritime sector.

Based on the Slovin technique in determining samples with an error factor of 10% and sample adequacy for 17 indicators in SEM analysis, the number of samples used in this research was 260, including work units and ship repair service providers, as shown in Table 1 (Sugiyono, 2017). The characteristics of the respondents in this study are shown in Tables 2 and 3. The indicators of the occupational safety and health management system are workforce skills, availability of lifting equipment, work equipment, existing infrastructure, working method, and understanding material properties; the indicators of implementation of procurement of warship repair goods and services are efficiency, effectiveness, transparency, openness, competence, fairness, non-discrimination, and accuracy; and the indicators of warship readiness are productivity, quality, and punctuality.

The recapitulation of the questionnaire outcomes is then assessed weighting so that analysis may be accomplished using SEM. The assessment is based on the answers given by respondents based on the aspects asked inside the questionnaire as can be seen in Table 4.

Table 1. The Research Respondents

No	Work Unit	Number of Personel	Number of Samples
1	Satharmattim	63	14
2	Satlaikmattim	62	13
3	Disharkap	98	22
4	Dismatbek	87	19
5	Fasharkan Surabaya	177	40
6	Crew of KRI Mulltatuli	484	105
7	Indonesian Naval Technology Collage (STTAL)	189	41
8	Provider of goods and service	30	6
	Total	1190	260

Table 2. The General Sample Characteristics

Respondent characteristics		Percentage
Age	15-30 years	18,84 %
	31-45 years	45 %
	46-55 years	36,16 %
Gender	Man	77 %
	Women	23 %
Status	Military	93,5 %
	Civil	6,5 %
Work experience	0-10 years	18,85 %
	11-25 years	64,23 %
	Up to 25 year	16,92 %
Education	Senior High School	75,76 %
	University	24,24 %

Table 3. The Characteristics of Respondents Based on Where the Sample was Taken

Work unit	Age Average (years)	Man (%)	Education High school graduates (%)	Work Experience (years)	Field Work Positions (%)
Satharmattim	44	92,86	92,86	21	42,8
Satlaikmattim	29	100	100	13	100
Disharkap	41	72,73	63,64	20	31,82
Dismatbek	44	78,95	73,68	23	5,26
Fasharkan Surabaya	47	95	87,50	25	65
Crew of KRI Mulltatuli	34	100	90,45,	13	74,26
STTAL	42	92,68	24,39	18	34,14
Provider of goods and service	50	66,67	66,67	30	83,33

Table 4. The Weighting of Questionnaire Results

Questionnaire	Weight
Very complete/ understand/ efficient/etc	5
Complete/ understand/ efficient/etc	4
Doubtful	3
Incomplete/ don't understand/ inefficient/etc	2
Not complete/ don't understand/ inefficient/etc	1

Interviews were conducted with practitioners in the procurement of goods and services who had previously served as officials on warships, such as ship commanders, heads of engine rooms, heads of the electrical department, and heads of the warship planning and evaluation section of Satharmattim, who had direct contact with the users. The interviews have then been performed to deepen the results of the questionnaire, which are then used as a basis for developing a policy model for the occupational safety and health management system in the procurement of warship repair goods and services to support national resilience within the maritime sector.

Secondary Data

Secondary data was obtained through literature studies of reference books, laws, implementation instructions, regulations, and all documents related to empowering the

national defense industry. As the principle reference, this research refers to the law of the Republic of Indonesia number 16, 2012, concerning the Defense Industry.

RESULT AND DISCUSSION

The research results will be explained based on interview results, observations, and documentation. A discussion was carried out on the results of the data collection that had been carried out. The research was conducted at Indonesian Navy Second Fleet Commands in Surabaya with the respondents of stakeholders involved in the warship repairs for 2 (two) years by collecting questionnaire data and in-depth interviews from March to August 2023 regarding the occupational safety and health management system in the procurement of warship repair services. This research uses sequential mixed methods to obtain more comprehensive information through a questionnaire followed by in-depth interviews (Isnaeni & Kumaidi, 2015).

Variable Identification

Indicators of variables that influence occupational safety and health management system policies in the procurement of warship repair goods and services are the results of questionnaires and brainstorming with respondents, as can be seen in Table 5.

Table 5. Variable of Main Aspects of Occupational Safety and Health Management System Policies in Procurement of Warship Repair Services

No	Main aspects	Description
1	Occupational Safety and Health Management System	Influencing conditions include: • Workforce skills • Availability of lifting equipment • Work equipment • Existing infrastructure • Working method • Understanding material properties
2	Implementation of Procurement of Warship Repair Goods and Services	Influencing conditions include: • Efficient • Effective • Transparent • Open • Compete • Fair and non-discriminatory • Accountable
3.	Warship readiness	Influencing conditions include: • Productivity • Quality • Punctuality

Based on the variables and indicators that have been identified, the influence of the occupational health and safety management system as well as the implementation of the procurement of goods and services for warship repair services on warship repairs, as seen in Figure 1. Meanwhile, Figure 2 shows the data that has been processed using SEM software on the results of questionnaires from respondents.

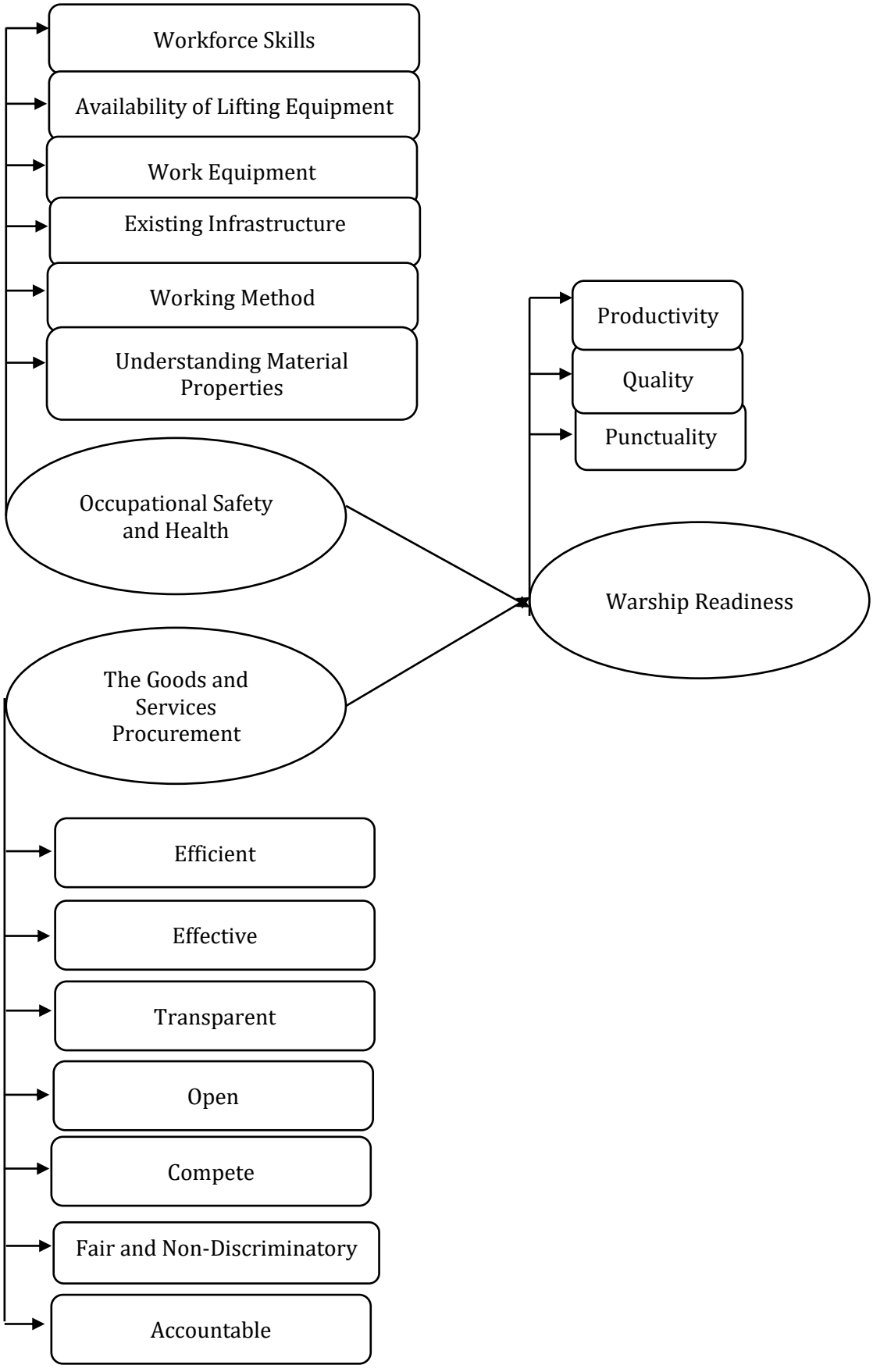

Figure 1. Model Concepts and Research Variables

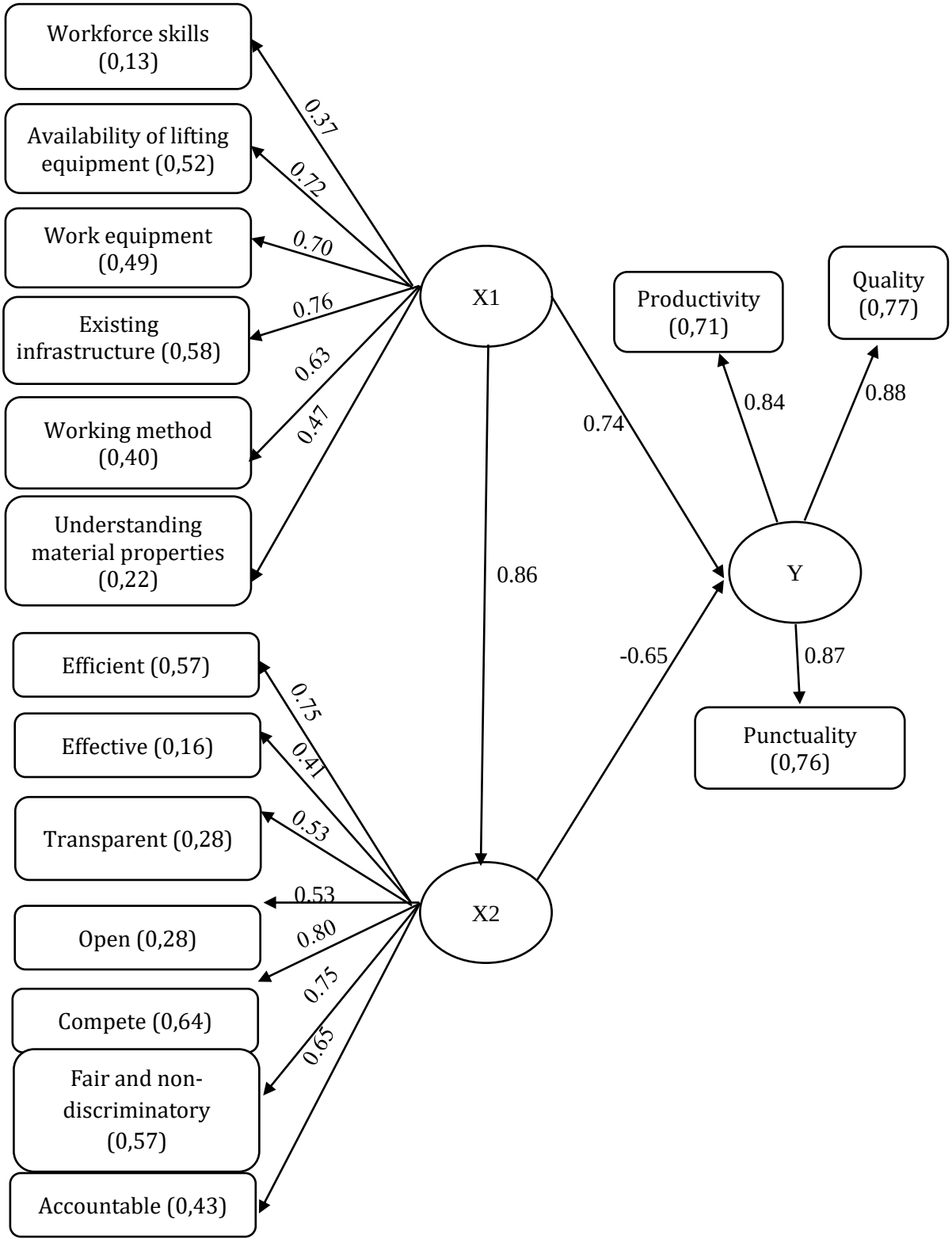

Figure 2. Path Diagram Modeling Occupational Safety and Health Management System in Procurement of Goods and Warship Repair Services

The independent variable X1 is a variable from the Occupational Safety and Health Management System with the workforce skill indicator (e1) with a regression weighting of 0.365, availability of lifting equipment (e2) with a regression weighting of 0.719, work equipment (e3) with a regression weighting of 0.700, existing infrastructure (e4) with a

regression weighting of 0.762, work methods (e5) with a regression weighting of 0.631, and understanding material properties (e6) with a regression weighting of 0.473.

The independent variable X2 is a variable from the procurement of goods and services with an efficient indicator (e7) with a regression weighting of 0.755, effective (e8) with a regression weighting of 0.406, transparent (e9) with a regression weighting of 0.528, open (e10) with a regression weighting of 0.533, competitive (e11) with a regression weighting of 0.800, fair and non-discriminatory (e12) with a regression weighting of 0.755, and accountable (e13) with a regression weighting of 0.654. The dependent variable Y1 is the variable of warship readiness, with indicators of productivity (e14) with a regression weighting of 0.841, quality (e15) with a regression weighting of 0.880, and punctuality (e16) with a regression weighting of 0.869.

Modeling of the occupational health and safety management system in the procurement of warship repair goods and services currently shows that procurement implementation variables do not really support warship repair readiness, as seen in Table 6 and 7, so efforts are needed to analyze indicators that do not support the system. The causal relationship, as an interaction of variable indicators of a system, as seen in Figure 2, will be tested using the hierarchy of needs and domino theory, so that a dominant aspect emerges that makes a positive contribution to the progress of warships.

Table 6. Regression Weight of Data Results in Current Conditions (Data processed by using Amos Software, 2023)

			Estimate	S.E.	C.R.	P Label
X1	⟶	X2	1,479	0,275	5,387	***
X1	⟶	Y1	1,282	0,366	3,502	***
X2	⟶	Y1	-0,066	0,168	-0,393	0,694

The P value of *** is very small (close to zero). The P-value <0.05 indicates a significant influence relationship. From the results of the regression weighting of the Occupational Safety and Health Management System (OSHMS) Policy variables in the Procurement of Goods and Warship Repair Services to Support National Resilience in the Maritime Sector, it can be analyzed as follows:

a. The influence of X1 (OSHMS) on X2 (procurement implementation) is positive and significant.
b. The influence of X1 (OSHMS) on Y1 (warship readiness) is positive and significant.
c. The influence of X2 (procurement implementation) on Y1 (warship readiness) is negative and not significant.

Table 7. The Model Fit Test (Data processed by using Amos Software, 2023)

Indeks Goodness of fit	Expected value	Results	Conclusion
P-value Chi-Square	≥ 0,05	0,000	Not fit
GFI	≥ 0,90	0,808	Not very fit
AGFI	≥ 0,90	0,745	Not very fit
NCP	Small	422,063	Not fit
CFI	≥ 0,90	0,825	Not very fit
RMSEA	≤ 0,08	0,112	Not very fit
RMR	≤ 0,05	0,031	Good fit
TLI	≤ 0,95	0,792	Not very fit
CMI	≤ 0,05	551,063	Not fit

Information:

- P-value Chi-Square: the smaller it is, the better the model fits the theoretical model and sample data.
- Goodness of Fit Index (GFI) value: measures the relative amount of variance and covariance.
- DF is the Degree of Freedom.
- Adjusted Goodness of Fit Index (AGFI): has the same function as GFI, but there is an adjustment of the DF value to the specific model.
- The Non-Centrality Parameter (NCP) is a fixed parameter related to DF that functions to measure the difference between the population covariance matrix and the observation covariance matrix.
- The Comparative Fit Index (CFI) is an indicator used to determine the level of suitability of a variable.
- The Root Mean Square Error (RMSEA) is a criterion for modeling covariance structures by considering errors that approach the population.
- The Root Mean Square Residual (RMR) is the average value of all standardized residuals.
- The Tucker-Lewis Index (TLI) is a provision for the acceptance of a model.

The policy is carried out by weighting these variables, and then the results obtained are analyzed to find a solution to the existing problems, as shown in Table 8. The factor analysis strategy for weighting is based on the results of academic analysis. For weighting measures of strength, weakness, opportunity, or temperature, 0.1 is slightly important. 0.2 is somewhat important. 0.3 is important. 0.4=very important.

Strength/weakness/opportunity/threat rating measures: 1=slightly strong, weak, opportunity, or threatening; 2=somewhat strong, weak, opportunity, or threatening; 3=strong/weak/opportunity/threatening; and 4=very strong, weak, opportunity, or threatening.

Table 8. The SWOT for Policy Analysis Scoring Procurement of Warship Repair Goods and Services (Data Processed from Questionnaire and In-Depth Interviews)

No	Internal	Weight (W)	Ratings (R)	WxR	External	Weight (W)	Ratings (R)	WxR
	Strength				**Opportunities**			
1.	The Work equipment is according to its purpose	0,2	4	0,8	The Work equipment is easy to get online	0,3	2	0,6
2	The Work methods for implementing improvements already exist	0,2	4	0,8	All of the ship spare parts catalog provide complete information	0,3	4	1,2
3	Mastering the properties of the materials used	0,3	4	0,12	Details of damage to equipment analyzed and calculated based on the	0,4	4	1,6

					maximum level of damage			
4	Using price evaluation based on the lowest reasonable price	0,1	4	0,4				
5	The Procurement certification and experience shows the accountability of the committee or working group	0,2	4	0,8				
		1,00		4		1,00		3,4
	Weakness				**Threats**			
6	Some limited workers have the skills to repair warships.	0,2	4	0,8	The Workers ignore work safety factors due to the narrow repair area	0,2	4	0,8
7	Not every room where repairs can be placed can be placed with lifting equipment	0,1	2	0,2	The movement and placement of hazardous materials ignore safety factors	0,1	4	0,4
8	The strength of ship-building infrastructure is difficult to predict because most warships are old	0,1	2	0,2	Universities and vocational schools do not prepare workers who have warship repair skills	0,2	4	0,8
10	Limited budget allocation for equipment repairs that comply with technical specifications and material damage	0,2	4	0,8	Infrastructure checks are carried out using a small sample area so the results are less accurate	0,1	3	0,3
11	Information on the exact damage experienced the equipment being repaired is incomplete	0,1	2	0,2	The offer to replace material spare parts is of low quality	0,1	2	0,2

12	Database on the provider itself limited based on experience in completing similar work and not every provider has the capability to complete all work	0,2	4	0,8	The provider offers a repair price by ignoring quality to win the tender	0,05	2	0,1
13	Providing the widest possible range of providers to provide a price quote for a job	0,1	1	0,1	Provider business locations are spread throughout the region making it difficult to verify the implementation	0,05	1	0,05
14					Not all Providers participate in the tender procurement has the ability and experience to complete the work	0,1	3	0,3
					The provider subcontracts some work that is not controlled by another party based on an internal agreement without a contract with PPK	0,1	4	0,4
		1,00		3,1		1,00		3,35
	S – W			0,9	O – T			0,05

The results of calculations using the data in Table 8 show that the occupational health and safety management system model and the implementation of procurement of goods and services in this condition are in quadrant I so by making efforts to modify the things that are inhibiting factors in the implementation of the system, we can optimize the implementation of improvements. warships, as can be seen in Figure 3.

Figure 3. The Graph of the Relationship Between Internal and External Factors in the Procurement of Warship Repair Services Using SWOT

Policy Analysis using SWOT and based on In-Depth Interviews

Policy for making instructions for implementing government regulations regarding the procurement of goods and services for warship repairs. This policy was carried out as a solution to overcome the problem of preparing warships, as stated in the general provisions of Defense Ministerial Decree No. 23 of 2016 concerning the development of the defense industry.

Empowerment of the national defense industry is carried out through the realization of an independent defense industry and supporting the needs of national defense equipment so that it does not depend on other countries (Susdarwono, 2020). Several important points obtained from this law are (Ministry of Defense of the Republic of Indonesia, 2015a):

1. Defense industry development is an integrated part of strategic planning for national resource management in the interests of national defense and security (Rusdiana, Ali, & Thamrin, 2021).
2. The availability of defense and security equipment has not been optimally supported by the capabilities of the defense industry, resulting in dependence on defense and security equipment products from abroad.
3. To realize the availability of independent defense and security equipment supported by the capabilities of the defense industry, visionary management is required by considering good governance and relying on human resources who have high idealism and intellectualism at various levels of management so that they can keep up to date (Efendie, Kiswara & Geger, 2022).
4. So far, the provisions of laws and regulations in the defense industry sector have not fully encouraged and advanced industrial growth and the excellence of human resources capable of achieving independence in fulfilling the needs for defense and security equipment (Ministry of Defense of the Republic of Indonesia, 2015b).
5. In increasing the human resources needed to master the applied sciences of the defense industry as well as defense and security technology, the government is obliged

to encourage cooperation between all institutional elements of science and technology in the development of information networks, defense and security science, and defense industry technology (Putro, 2022).

6. High technology and applied sciences in the defense industry that have been mastered through the defense industry process are developed at national universities.

This law aims to develop the defense industry by allowing the country's youth to realize their full potential and propel the economy, as well as by building a robust defense industrial structure that will enable the state to become self-sufficient in supplying defense equipment (Rusdiana, Ali, Thamrin & Widodo, 2021).

The policy analysis has explained the obstacles that cause a lack of involvement in the procurement of goods and services to support the readiness of warships. A breakthrough is needed to be able to overcome these existing problems. A prominent problem that is a weakness in the procurement of goods and services is that the database for providers is very limited based on experience in completing similar work, and not every provider has the ability to complete all work. The second biggest problem faced is incomplete information on the exact damage experienced by the equipment being repaired.

To resolve existing problems, this study conducted in-depth interviews with informants who have competence in the fields of occupational safety and health, procurement of goods and services, and repair of warships. Informants in this in-depth interview include the Head of the Main Equipment Materials Sub Section of Satlaikmattim, the Head of the Planned Maintenance Sub System of Satharmattim, the Head of Fasharkan Surabaya, the Head of Fasharkan Surabaya Electrical Workshop, the Head of the Electronics Main Laboratory, the Head of the Main Laboratory, the Commander of the Biological and Chemical Nuclear Ship Rescue Center, the Chief Engineer of PT Sarana Teknik Kontrol, and the and the Head of the Planning and Logistics Department of the Naval Technology College.

From the results of these in-depth interviews, it was found that several crucial things that could cause delays in optimizing the completion of warship repairs include:

1. There is a limited number of experts in accordance with job specifications because graduates from secondary technical schools and experts from universities do not yet have the skills to be ready to face the industrial world, especially the ship repair industry. The working age of experts for repairing weapons and control systems cannot be long because they come from retired Indonesian Navy officers who have served in ship maintenance units or come from retired state-owned companies engaged in ship repair, such as PT PAL Indonesia.
2. Lifting equipment cannot be used optimally on the ship, so there are often difficulties in moving the equipment to be repaired, and work accidents can even occur.
3. Minimal safety equipment is used during the ship repair process.
4. The subcontractor was negligent in carrying out the work.
5. There are no restrictions on providers who can participate in tenders for warship repair work.

Policy Analysis Based on Dominant Factors

In the analysis using SWOT, as can be seen in Table 8, the dominant factors that give rise to weaknesses and challenges in modeling the occupational health and safety management system and the implementation of procurement of goods and services for warship repairs. To make it easier to analyze existing problems, a grouping of stages carried out in warship repairs is needed, including:

1. Preparation of tender documents for warship repair work and tender documents. The most crucial thing in preparing work tender documents is determining the equipment to be repaired without verifying the damage to the equipment. The determination of the level of damage was obtained from very minimal data based only on the history of equipment repairs and information from the person responsible for the existing equipment, as well as from the results of in-depth discussions with research informants suggesting the involvement of a ship repair planning consultant. Requirements for providers who meet the qualifications need to state in detail the work safety policies, including the equipment that must be owned and the apprentices they have, in an effort to create new workers. Requirements regarding the presence of subcontractors for work should be detailed and included in the master contract.
2. Implementation of procurement tenders and preparation of work contracts. Before determining the winner of the Commitment Making Official (PPK or *Pejabat Pembuat Komitmen*) tender together with the prospective provider, it is necessary to review the work to be carried out by carrying out verification I in the form of dismantling the equipment to be repaired as a reference for carrying out the work contract, and if necessary, the PPK can carry out a re-tender based on verification I.
3. The supervisor must understand the existing contract documents as a reference for monitoring work progress.

By grouping existing problems in the implementation stages of warship repairs, it will be easier to find solutions to existing problems. Based on the results of in-depth interviews, the problem of a shortage of experts can be overcome by collaborating with universities in the form of accepting apprentices at companies that provide them when carrying out warship repairs. Based on the author's experience while working in the ship repair department, workers who came from technical universities within 2.5 months were able to absorb 60% of ship repair techniques because they already had a strong foundation. Companies also benefit from these interns for the next 3.5 months, and it is likely that after graduating, they will be interested in joining as permanent employees.

The increasing number of workers available who have special skills in warship repair will give rise to new provider companies, so the database of providers who have ship repair capabilities will increase. This condition will certainly accelerate the realization of independence in warship repairs. This can also prevent the contract winner from only acting as a broker who uses freelance labor to complete the work obtained. According to the definition of a broker, as regulated in Article 64 of the Commercial Code, a broker's job is to buy and sell merchandise, ships, shares in public funds, and other securities, as well as bonds, letters of credit, money orders, and securities for employers. credit, order letters and other trade letters, organizing discounts, insurance, credit with ship guarantees and ship loading, money transfers, and so on (Yustisia, 2014). This situation is still permissible as long as the job being transferred is not the main job.

The provider's control of the work as a whole is certainly not possible, so with the presence of a subcontractor, work that is not controlled will be completed. Including subcontractors in the main contract, allows the PPK to know information about their track record before deciding whether to allow them to take part in the work. Limitations in the warship repair budget allocation will also not be a significant problem if there is a change in the process followed during the tender before determining the warship repair provider. With Verification I, the decision to determine the priority scale for repairs will be closer to the truth when the equipment to be repaired has been dismantled. The presence of workers from a provider neglecting the use of safety equipment, lifting

equipment, and quality spare parts can be overcome by providing contract understanding training to supervisors in the field.

Evaluation of Policy Analysis

SWOT analysis of variables from the occupational safety and health system and the implementation of procurement of goods and services found that several factors can hinder and support the readiness of warships, including:

1. Supporting factors
   Factors that can support the optimization of warship repairs include workers who have ship repair skills that can speed up analyzing equipment damage and overcoming existing problems. The skills of the workforce will be optimal if they are equipped with the availability of work equipment and work methods so that any difficulties can be overcome if they have these basic abilities. Understanding the properties of the material to be repaired is very helpful in reducing damage and injury to workers when moving goods and storing them. Effectiveness in the procurement of goods and services has a positive influence on the success of carrying out warship repairs because it can provide maximum benefits for warship repairs in the face of budget availability and work completion schedules. Competing in the procurement of goods and services can provide equal opportunities for warship repair providers to make price offers according to material specifications and workforce qualifications so that goods and services can be offered competitively and produce optimal repair quality, depending on the nature of the procurement. This accountability means that all repairs to warships can be accounted for.
2. Obstacle factor
   Factors that can hinder the optimization of warship repairs include limited space on the ship so that it is not possible to place lifting equipment to carry out repair materials; The strength of the ship's building infrastructure is difficult to predict because most warships are old. The efficiency of the repair budget for warships can hinder productivity and progress toward work. Transparency in warship repairs has a tendency to be hindered because there is very little information about the exact damage to equipment to be repaired due to the complexity of the systems on board warships. Openness in the procurement of goods and services is not yet fully possible due to the limited database of providers who have experience completing similar work, and not every provider has the ability to complete all work.

The conceptualization of the Occupational Safety and Health Management System Model and Procurement of Goods and Services for Warship Repairs can be seen as shown in Figure 4.

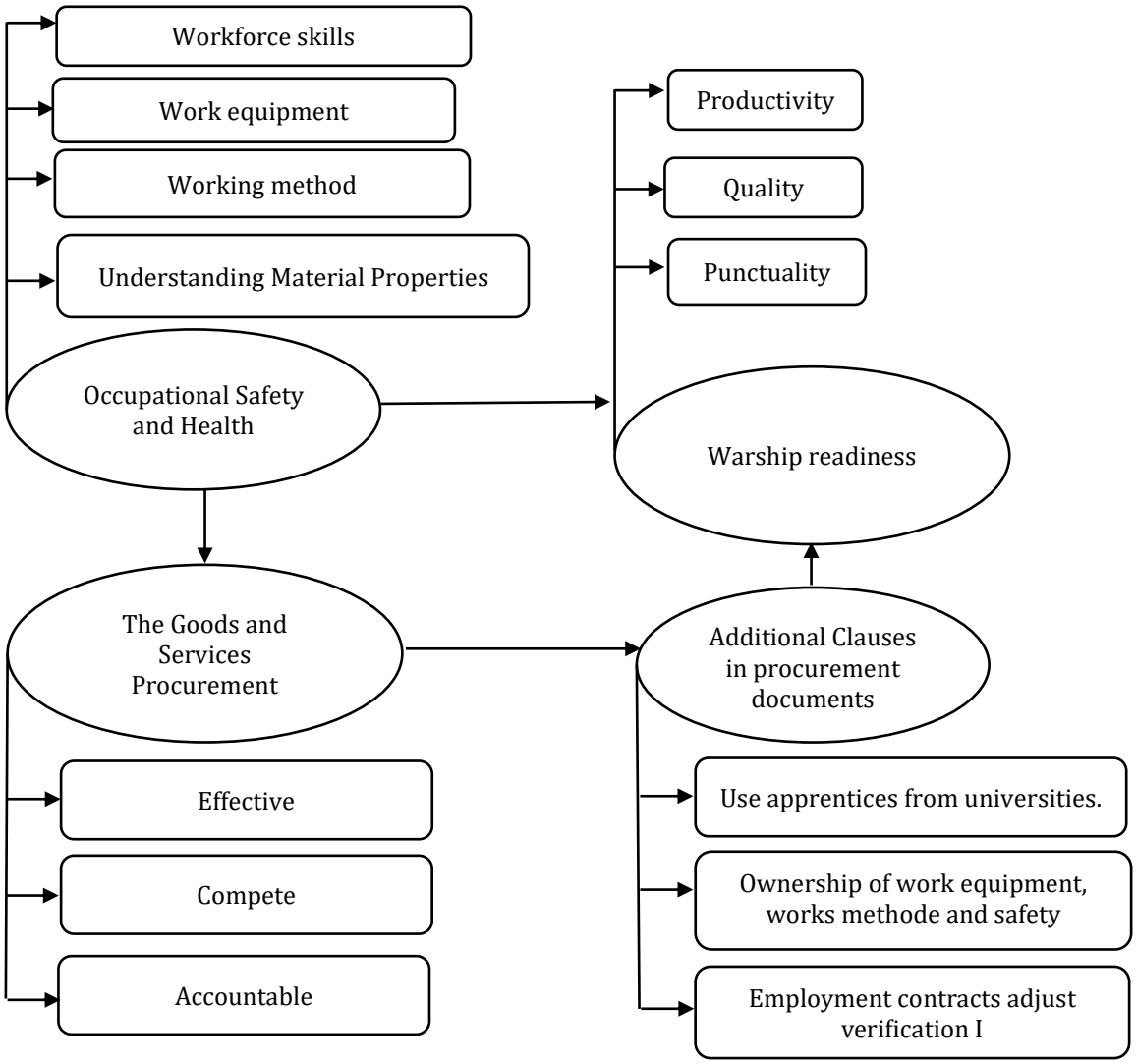

Figure 4. Model of Procurement of Goods and Services for Warship Readiness

CONCLUSIONS, RECOMMENDATIONS, AND LIMITATIONS

Conclusions

From a series of research activities, model preparation and evaluation activities, and analysis of overall results, the following conclusions can be drawn:

1. The current model for implementing the procurement of goods and services with the occupational safety and health management system shows that the occupational safety and health management system has a significant influence on the implementation of the procurement of goods and services as well as the readiness of warships. The procurement of goods and services does not have a significant effect on warship readiness.
2. Supporting factors for optimizing the implementation model for procurement of goods and services with an occupational safety and health management system in warship repairs include workforce skills, adequate work equipment, warship repair work methods, understanding of material properties, effectiveness, competition, and procurement accountability for goods and services while inhibiting factors are the

unavailability of appropriate lifting equipment, the condition of warship infrastructure, efficiency, transparency, and openness.
3. The occupational safety and health management system model and implementation of procurement of goods and services that can optimize warship repairs are achieved by displaying variables that are supporting factors and providing additional clauses in procurement documents.

Recommendations

After conducting this dissertation research, several recommendations and input were generated for future improvements, including the following:
1. For the Indonesian Navy's material service, it is necessary to submit a study to the Chief of Naval Staff regarding the implementing regulations of Presidential Decree number 54 of 2010 concerning the procurement of government goods and services specifically for repairing warships, the formulation of strategic policies regarding the involvement of the Indonesian Navy, and elements of the world of education to provide skilled personnel, especially in warship repairs, and involve all warship crews in training regarding their areas of duties and responsibilities during the repair process.
2. Providers of warship repair goods and services must socialize the importance of implementing an occupational safety and health management system to prevent losses of material and working personnel and the emergence of sanctions for delays in completing work due to work accidents.

Limitations

Although the findings from this research are very useful for the development of science in general and, in particular, for empowering the defense industry, they have several limitations. First, the variables found in the occupational safety and health management system policy in the procurement of warship repair goods and services are only five main factors, and to perfect the research results, several other variables can be looked for that influence the occupational safety and health management system policy in procurement. warship repair goods and services. Second, this dissertation research is still focused on the procurement policy for goods and services at the Indonesian Navy Second Fleet Commands area, and improvements can be made by combining it with the procurement policy for goods and services at the Indonesian Navy First Fleet Commands or the Indonesian Navy Third Fleet Commands areas, so that it will be able to provide a broader picture of the problems involved faced in preparing warships and can add conclusions regarding the phenomenon of empowering the national defense industry in increasing national defense strength through a commitment to implementing the procurement of goods and services by presidential decree number 54 of 2010.

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