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Article

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Interface Management Development Strategy to Improve Time Performance in The Existing Oil and Gas Production Modification Project on the Natuna Block

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ABSTRACT

Purpose: Interface management is an effort to overcome interface problems considering that projects in the oil and gas industry are mega projects that involve many parties. This study aims to develop an interface management strategy by identifying interface problems and looking for which interface problems affect time performance on the existing oil and gas field development project in the Natuna Block.

Design/methodology/approach: This research is divided into 4 stages, where the first is archive analysis and continued with expert validation, the third is a pilot survey & questionnaire of respondents, and the last is an expert validation. Factor analysis was carried out after expert validation, then validity and reliability tests were carried out with the help of SPSS software.

Findings: There are 38 interface problems with nine categories namely, participants, methods/processes, practices, resources, management, information, environment, laws and regulations as well as bids and contracts.

Research limitations/implications: This study has limitations in a specific project in specific area with certain product and a context of time/schedule performance.

Originality/value: The results of the data analysis will be used to develop a strategy for the development of interface management for the existing oil and gas field modification project in the Natuna Block.

Keywords: Problem factors for interface management, Interface management, Time performance, Existing oil and gas field optimization project, Natuna Block

I. Introduction

Oil and gas industry projects are complex and multidisciplinary infrastructure projects, usually defined as the construction of offshore oil and gas production facilities. Several oil and gas project are already in

operation. The development is a modification of the existing installation to increase production in the field. The Government of Republic of Indonesia is trying to increase production needs to fill the gap in domestic oil and gas demand. It leads to pushing the target of field development projects so that they are available on time. The head of the Working Group on Upstream Oil and Gas Trade (SKK Migas), Amien Sunaryadi, said that there are fifty upstream oil and gas projects (oil and gas) to start production in the next few years

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2018-2027 (Wicaksono, 2018). However, in the last 2 years (2019-2020), 8 of 17 oil and gas development projects have been delayed from the predetermined onstream program. This phenomenon deserves special attention. Table 1 shows the phenomenon of oil and gas projects experiencing delays. The delayed schedule for these projects was due to a lack of coordination between related parties, such as platform delays, administrative issues, lack of buyers, material delays and others. Interface management is an attempt to overcome the problem of lack of coordination between the parties, given that projects in the oil and gas industry are mega-projects involving many parties. Natuna is one of the national's oil and gas block area that is watched by the government immensely close. This block has been developed and modified by several projects to achieve goal productivity. Interfacing between parties in this area is more complex. So, Interface Management (IM) is implemented in this business process. According to Shokri, the Interface Management System (IMS) is defined as a systematic approach to the efficient identification and management of interfaces (especially critical ones) throughout the project life cycle, to facilitate the alignment process between the parties. interested in defining the features of the interface, the responsibilities of the parties involved and the time required for things to be transmitted (Shokri et al., 2012).

The IMS framework will be executed through five main steps:

1. Identification: Initial step to identify possible interfaces among stakeholders in the project.
2. Documentation: Interface information is collected and registered. This information should inform interface characteristics, stakeholder involved, deadlines, required documents, etc. This step of this process is ongoing during the entire IMS.
3. Transfer/Issuance of packages: After contract has been awarded, all interfaces identified, and documented information are being transferred to the appropriate party.
4. Communication: Related stakeholder should communicate with each other due to issuance of the Interface Agreement to manage the issue effectively. All jurisdiction in this step will be managed by Interface Manager and involve all related stakeholders.
5. Closing: All stakeholders involved should agree to consider that the interface has been completed as per agreement on the accuracy, efficiency, completion of the information/tasks and the results submitted.

Even if the formal IM has been achieved, the many parties are involved in the implementation of a project cause unexpected problems. Stakeholders, such as the operations team, the project team, the planning team, the procurement team, and external parties, both from the government and from the service companies involved in the project, can cause problems, as mentioned, lack of mutual trust, and inefficient communication can lead to hostility between the parties. If this happens, the project has the potential for delays, cost overruns, problem solving will be

Table 1. Indonesian oil and gas projects that are experiencing delays

No	Project	Initial Target	Final Target
1	Merakes	Q4 2020	Q1 2021
2	Tangguh Train 3	Q3 2020	Q1 2021
3	Suban Compression	Aug 2019	Oct 2019
4	Buntal-5	Nov 2019	Feb 2020
5	Bukit Tua Pashe-3	Nov 2019	Q2 2020
6	YY	Jul 2019	Q4 2019
7	Ario-Damar-Sriwijaya Phase 2	Jun 2019	Sep 2019
8	Temelat	Nov 2019	Des 2019

difficult, legal proceedings and project quality cannot be achieved (Huang et al., 2008).

Moreover, the problems in IM are explained that are as follows: insufficient contracts and specifications, financial problems, environmental problems and other things. Of course, it is very easy to understand that if the contract does not adequately explain and the expected specifications are not clear, then coordination problems will arise between the parties involved (Huang et al., 2008). There will be a different understanding of the content of the contract, so that the work will be limited and cause project delays.

II. Literature Review

A. Formal Management Interface

Interface Management (IM) is defined as information management, coordination, and responsibility across physical, contractual, and organizational boundaries, which are referred to as interfaces (Nooteboom, 2004; Wideman, 2022).

This point could be:

1. Physical - Physical interactions between components
2. Functional - Functional Requirements between systems
3. Contracts - Interactions between subcontractors/suppliers
4. Organization - Exchange of information between disciplines
5. Knowledge - Exchange of general information between parties
6. Resources - Points of dependency between equipment, material, and labor suppliers

Interface is formed in the process of interrelation and interaction between various organizations and stakeholders (Brown, 1983). Organizational interfaces are interrelationships between interdependent entities.

Meanwhile, Project Management Office functions to manage multi projects and strategies, control and

monitor project performance, develop project management competencies and methodologies, perform organization learning, and manage interface and bring value to the organization (Hobbs & Aubry, 2008; Ichsan et al., 2023).

In 1967, the concept of IM was first introduced using a systems approach to analyze points of contact between relatively autonomous interacting organizations, and the corresponding inter-organizational issues and their application were described in aerospace and power generation projects (Wren, 1967).

Define the following criteria to identify situations when IM is most useful (Morris, 1983):

1. The aims and objectives of an enterprise bring about the need for different groups to work closely together;
2. The environment is complex or rapidly changing;
3. This technology is uncertain or complex;
4. Companies change quickly; And
5. Companies are organizationally complex.

Several studies emphasize that implementing IM at the early stages of a project will result in higher performance in terms of scope, cost, and schedule (Caglar & Connolly, 2007; Chen et al., 2007; Nooteboom, 2004).

IMS is defined as a systematic approach to identify and effectively manage interfaces (especially critical ones) through the entire project life cycle, with the aim of facilitating the alignment process between stakeholders by defining the characteristics of the interfaces, the responsibilities of the parties involved, and the delivered time required for them (Shokri et al., 2012).

The IMS Framework will be executed through five main steps:

1. Identification: This step includes identifying as many interfaces as possible in the project.
2. Documentation: Interface information is defined in this step. This information includes interface characteristics, parties involved, deadlines, required documents, etc. It should be mentioned that this step is an ongoing process throughout the entire IMS.

3. Transfer/Issuance of packages: When the contract has been awarded, all interfaces identified and documented information is being transferred to the appropriate parties.
4. Communication: During this step, the parties will start communicating with each other through the issuance of an Interface Agreement, in order to manage the interface effectively. This step will be executed under the jurisdiction of the Interface Manager and involve all interacting parties.
5. Closing: The interface is considered complete if all parties involved agree on efficiency, accuracy, completion of information/tasks and results delivered.

Several project in Natuna is the object of the researched national oil and gas company that has implemented the concept of this IMS. As in the first step, the company identifies the needs of the relevant stakeholders which are recorded in the interface register document where the document contains;

1. Originator: The party that issued the document.
2. Responding Party: The party that must respond to the document.
3. Issue issue date.
4. The area that becomes the interface issue.
5. Issue title.
6. Deliverable points.
7. Document state.
8. The target date of the document was responded to.

B. Implementation of Interface Management in the Natuna Block

Even though the formal IM has been carried out, the large number of parties involved in implementing a project causes unexpected problems to arise if the project is still not running.

Parties involved such as the operations team, project team, planning team, procurement team and external parties both from the government side as

well as from service companies involved in the project can cause problems as mentioned as follows: lack of good cooperation, limited mutual trust, and ineffective communication can lead to hostility between the parties. If this happens, the project has the potential to experience delays, cost overruns, problem resolution will be difficult, court proceedings and project quality will not be achieved (Huang et al., 2008).

Furthermore, the problems in IM were explained as follows: insufficient contracts and specifications, financial problems, environmental problems and other things (Huang et al., 2008). Of course it is very easy to understand if the contract does not explain enough as well as the expected specifications are not clear, coordination problems will arise between the parties involved. There will be a different understanding of the contents of the contract, so that the work will be constrained and has the potential to cause project delays.

One of the real challenges in increasing national oil and gas production is the condition of oil and gas wells that have passed the peak period and limited reserves. The development of old wells is carried out to maintain pressure in the reservoir so as to increase the production life of the well. Several developments have been carried out by modifying production facilities so that the pressure in the reservoir can be maintained and the production life of the reservoir increases.

Based on Presidential Regulation 22 of 2017 concerning the National Energy General Plan, the government includes a program of activities to accelerate the completion of natural gas projects, one of which is the East Natuna Block.

Currently, Hub Timur's oil and gas production continues to decline following the depletion of the reservoir in the last three years. To increase field production and recovery, it is necessary to reduce the suction pressure of the compression system at the North Belut Central Processing Platform (NB CPP). Reducing the suction pressure at North Belut CPP will be beneficial to increase recovery and extend the life of the North Belut well. By reducing the compression system on NB CPP, it is hoped that

an increase in oil and gas production will be obtained.

The project is targeted to be on-stream at the end of 2020 where the previous target was early 2021, so there is a need for acceleration in this project. The project is also one of the objects of this research.

C. Effectiveness of Interface Management Implementation

Effectiveness is a measurement to assess the achievement of predetermined goals (Handyaningrat, 2006). If the goals or objectives that have been previously set are successfully achieved, then it is said to be effective. Conversely, if the goals that have been previously set are not achieved or are not in accordance with the targets set, then it is said to be ineffective.

The concept of effectiveness is also defined as a measure that gives an idea of how far the target can be achieved. This understanding of effectiveness is more output oriented while the problem of using input is less of a major concern. If efficiency is related to effectiveness, even though there is an increase in effectiveness it is not necessarily an increase in efficiency (Sedarmayanti, 2009).

So, the measurement of the effectiveness of the IM implementation is based on the main objective of implementing the IM. Managing interfaces in the early stages of a project will result in higher performance in terms of scope, cost, and schedule (Caglar & Connolly, 2007; Chen et al., 2007; Nooteboom, 2004). Thus, the indicators to measure the effectiveness of IM implementation are seen from scope, cost performance and time performance.

Research was conducted on the relationship between project complexity, IM implementation and the effectiveness of IM implementation (Ahn et al., 2017). The effectiveness of the implementation of IM is defined as the satisfaction of the respondents towards the implementation IM. Therefore, a subjective measure of the effectiveness of IM implementation, namely Respondent Satisfaction with IM, is used in this study. Models such as the "Subjective Rating"

have been widely used as a surrogate measure of the actual effectiveness of a system or practice in an organization (Gatian, 1994; Pothukuchi et al., 2002). During the interview, respondents were asked to give their subjective rating of their current IM practices on a 5-point scale: "How satisfied are you with your current interface management implementation on the project?" (1 = very little; 2 = a little; 3 = somewhat; 4 = big; and 5 = very big).

D. Interface Management Issues

Many researchers have provided various approaches to investigate, identify, and classify interface problems in various types of projects. Many researchers have identified, reviewed, and reported on interface problems in various countries in various types of projects through comprehensive literature reviews, pilot studies, interviews with industry experts and questionnaires in various countries without applying statistical tools (Al-Hammad, 1990, 1993, 1995, 1996, 2000).

A research study on Iran's oil mega refinery on ongoing projects to identify the main causes of interface problems and their effect (impact) on project completion through a questionnaire. Other researchers identified problem factor interfaces in different construction projects using qualitative and quantitative statistical approaches using two statistical tools such as factor analysis and multiple regression models (Mortaheb et al., 2010).

Then in the mass rapid transit system (MRTS) development project, the factors that cause conflict IM by applying statistical tools in two stages (Huang et al., 2008; Ku et al., 2010). The first stage, literature review, pilot studies and face-to-face interviews with experts from the industry to identify interface problems. The second stage, developing a survey questionnaire. This approach is considered appropriate for this research because it combines qualitative and quantitative research methods. This increases confidence in getting results. Using either method could result in finding invisible variance that might otherwise

have been overlooked through use of a single method (Hewage, 2007).

Mixed methods research can provide stronger conclusions because the data is viewed from multiple perspectives (Pole, 2007). One method can provide a deeper understanding, a wider viewpoint and they confirm or complement each other.

On the other hand, a multi-perspective approach was presented to investigate the causes of interface problems in various construction projects (residential construction, offshore construction, and commercial construction) by using the cause-and-effect diagram (C&E) method (Chen et al., 2008). C&E diagram was proposed by Kaoru Ishikawa in 1968. This method identifies and categorizes the level of implications of each problem cause by using a hierarchical prepared approach as: main causes, minor causes, and sub-factors. He categorizes interface management problems in 6 categories; participants, methods, resources, documentation, project and environmental management.

In 2013, there was research that grouped problems in interface management into 6 categories with 47 problems identified from various previous studies. Where the categories are; management factors, information factors, contract & bid factors, legal & regulatory factors, technical factors & field issues as well as various other factors (Weshah et al., 2013).

In this study, there were 38 problems selected. Then these problems will be grouped into 9 categories where these problems will be tested for their relevance to time through a questionnaire prepared to answer the first research question.

1. Participant

The participants are actors of the construction project. Between individuals or organized parties, they carry out certain activities that are correlated, because the activities themselves depend on or are competitors or the components of the product or the subsystems that they produce. Interactions between different people / participants are inevitable and must be well coordinated to prevent various conflicts and

underperformances of the project (Chen et al., 2008) and part of the interface problems caused by participants are as follows:

1. Lack of communication between parties
2. Lack of coordination between parties
3. Slow decision-making
4. Delays in requesting changes, permits, and sending design drawings and approvals

2. Method/Process

The design process / method used will be different to meet customer requirements, to manage the adequacy of the technical solution and to plan and manage the design process. The chosen design method affects the interface not only in the design phase, but also in production, construction and operation and maintenance. Construction methods and processes are mainly specified in the design document through a certain degree of flexibility, which allows contractors to select familiar and/or economical construction methods and processes for their field of work. The construction method defines the interfaces that appear in the construction (Chen et al., 2008). For example, when arranging of pipes, the "flange to flange" method is preferred in the offshore area. The welding process of the pipe is carried out at workshop to reduce 'hot work' on field, so as to minimize the occurrence of accidents that lead to damage to the installations in the field due to the danger of a fire triangle element if the welding work is performed. Improper methods and processes that increase the number of interfaces make the management of the interface more difficult to control in the field and worsen the management of the interface itself. Some of the problems caused by the method / process in the management interface are the following:

1. Business processes that are not effective and efficient
2. Low design quality
3. There is no planning document for each process discipline
4. The method used is not in accordance with the needs

3. Practice

In mega-projects, a complicated construction process is one of the causes of construction and assembly problems. Thus, in practice, this process is often ignored. The quality of the interface is largely compromised when the quality of construction work is low. For example, improper application during welding causes the joints between the pipes to crack easily, so that when the hydrotest test is performed, it fails, so that reworking takes place. The different elements of the construction works if they do not comply with each other will be the cause of the low tolerance standards. In practice, many activities do not meet working standards, even if the plan documents have been completed. This will have problems with the quality of the results, resulting in a rework. Some IM issues in practice as reference (Chen et al., 2008), are as follows:

1. Ignoring construction and design on assembly and fabrication
2. Poor quality of construction work
3. Poor design of work order and handling methods

4. Resources

Various resources are used to support the achievement of project objectives in the construction process. Traditionally, the resources for construction included labour, materials and equipment. In mega projects, the need for technology in terms of using software is also taken into account as one of the tools to facilitate communication with its users (Chen et al., 2008) and it also raised resource problems arising in IM are as follows:

1. Lack of worker skills
2. Delays in delivery and procurement of materials
3. Not well defined equipment used
4. Inadequate technology in the equipment used
5. Poor quality software in the equipment used or incompatible software

5. Management

Management is the process of planning, organizing,

executing, coordinating, monitoring, forecasting and exercising control (Wideman, 2022). The interface issues can appear in this area (Chen et al., 2008; Weshah et al., 2013), including the following:

1. There is no project coordinator
2. Inaccurate planning and scheduling estimates
3. Inaccurate cost estimates
4. Inaccurate estimate of material requirements
5. Inaccurate estimation of labor needs

6. Information

Information includes all company data and document resources, which can consist of separate text, images, audio or numeric forms related to the project. Often interface problems arise with regard to information. Several previous researchers (Weshah et al., 2013; Zhang et al., 2022) include information as factor with several problems such as:

1. Inaccurate information
2. Obstruction of the circulation of information
3. Unclear reporting structure and responsibilities

7. Environment

Environment defined as the broad setting of a construction project and the problem that affect the construction of the project directly but have nothing to do with the project itself (Chen et al., 2008; Zhang et al., 2022). The turbulency of environmental as the level of uncertainty and the highly variable events that occur in the environment where a particular industry operates are related to contingencies affect the dynamic capabilities significantly (Ichsan et al., 2023; Turulja & Bajgoric, 2019). It consists of not only weather and geological conditions of the jobsite, but also local regulations, building codes and trade union practices, materials and labor availability on the market, and cultural diversity of participants. But regarding local regulations will be put into another factor in this paper, this interface issue in this factor are:

1. The unavailability of resources in the surrounding environment

2. Drastic changes in resource prices
3. Misunderstanding due to differences in culture, habits and behavior
4. Unforeseen conditions on the ground
5. Inaccurate weather forecast information

8. Laws & Regulations

This factor consisted of the ability to translate laws and regulations in their application to the project. Often lack of experience in this area creates obstacles in the execution of a project (Huang et al., 2008; Weshah et al., 2013). Interface issue that arise in this factor are:

1. Lack of clear standard operating procedures of the company
2. Lack of experience with company codes
3. Lack of experience with applicable local laws, government regulations
4. Lack of experience with government audit protocols and procedures put in place

9. Bid & Contract

Several previous researchers (Huang et al., 2008; Weshah et al., 2013; Zhang et al., 2022) grouped this factor consisted of interface problems concerning the "bid and contract" which appears in the invitation to bid and contract execution. While contract types are divided into fixed price and time & materials where a fixed price transfers risk to vendors of time & materials will likely be better defined and more successful than a fixed price project because the buyer has an incentive to control scope and costs

(Krishnaswamy & Rathinasamy, 2015). Choosing a contract type strategy is very important because it can cause some interface problems

1. Vague contract details and poorly written contracts
2. The type of contract does not match the nature of the project
3. Lack of vision of a solid contract strategy early in the project phase
4. Lack of clear system requirements for completion
5. Lack of clear requirements in the RFP (request for proposal) documents from companies for bidders

III. Research Methodology

A. Variable Study & Expert Validation

Table 2 shows as many as 38 problems were selected and grouped according to archive analysis and review of previous research literature that affect the effectiveness of IM implementation in terms of time (variable Y).

The opinions of experts have an important role in this research, where their opinions are used as material for consideration and validation of research results. The criteria for experts in this research are those who have more than 20 years of experience on the Natuna Block offshore oil and gas project in the field of IM with a minimum of a bachelor's degree. There are 5 experts who validate these variables. Based on the results of expert validation,

Table 2. Dimensions and indicators *interface* management issues as dependent variable

No	Problem Interface Management	Reference
X.1	Participant (Chen et al., 2008)	
1	Lack of communication between parties	(Al-Hammad, 1993, 1995, 2000; Ayudhya, 2011; Choong, 2019; Huang et al., 2008; Ku et al., 2010; Yeganeh et al., 2019)
2	Lack of coordination between parties	(Al-Hammad, 1993, 1995, 2000; Ayudhya, 2011; Choong, 2019; Huang et al., 2008; Ku et al., 2010; Yeganeh et al., 2019)
3	Slow decision-making	(Al-Hammad, 2000; Ayudhya, 2011; Choong, 2019; Huang et al., 2008; Ku et al., 2010; Yeganeh et al., 2019)
4	Delays in requesting changes, permits, and sending design drawings and approvals	(Al-Hammad, 1993, 1995, 2000; Ayudhya, 2011; Choong, 2019; Huang et al., 2008; Ku et al., 2010; Yeganeh et al., 2019)

Table 2. Continued

No	Problem Interface Management	Reference
X.2	Method /Process (Chen et al., 2008)	
1	Business processes that are not effective and efficient	(Chen et al., 2008)
2	Low design quality	(Chen et al., 2008; Choong, 2019)
3	There is no planning document for each process discipline	(Chen et al., 2008)
4	The method used is not in accordance with the needs	(Chen et al., 2008)
X.3	Practice (Chen et al., 2008)	
1	Leaving construction and design over assembly and fabrication	(Al-Hammad, 1993, 2000; Ayudhya, 2011; Chen et al., 2008; Yeganeh et al., 2019)
2	Poor quality of construction work	(Al-Hammad, 1993, 2000; Ayudhya, 2011; Chen et al., 2008)
3	Poor job sequencing design and <i>handling methods</i>	(Al-Hammad, 1993, 2000; Ayudhya, 2011; Chen et al., 2008; Yeganeh et al., 2019)
X.4	Resource (Chen et al., 2008)	
1	Lack of worker skills	(Chen et al., 2008; Yeganeh et al., 2019)
2	Delays in delivery and procurement of materials	(Al-Hammad, 1993, 2000; Ayudhya, 2011; Chen et al., 2008; Ku et al., 2010)
3	Not well defined equipment used	(Al-Hammad, 1993, 2000; Ayudhya, 2011; Chen et al., 2008; Ku et al., 2010)
4	Inadequate technology in the equipment used	(Al-Hammad, 1993, 2000; Ayudhya, 2011; Chen et al., 2008; Choong, 2019; Ku et al., 2010)
5	Poor quality software in the equipment used or incompatible software	(Chen et al., 2008; Choong, 2019)
X.5	Management (Chen et al., 2008; Yeganeh et al., 2019)	
1	There is no project coordinator	(Chen et al., 2008; Choong, 2019)
2	Inaccurate planning and scheduling estimates	(Al-Hammad, 1993, 2000; Ayudhya, 2011; Chen et al., 2008; Yeganeh et al., 2019)
3	Inaccurate cost estimates	(Al-Hammad, 1993, 2000; Ayudhya, 2011; Chen et al., 2008; Yeganeh et al., 2019)
4	Inaccurate estimate of material requirements	(Al-Hammad, 1993, 2000; Ayudhya, 2011; Chen et al., 2008; Choong, 2019; Ku et al., 2010)
5	Inaccurate estimation of labor needs	(Al-Hammad, 1993, 2000; Ayudhya, 2011; Chen et al., 2008; Yeganeh et al., 2019)
X.6	Information (Weshah et al., 2013)	
1	Inaccurate information	(Weshah et al., 2013)
2	Obstruction of the circulation of information	(Choong, 2019; Weshah et al., 2013)
3	Unclear reporting structure and responsibilities	(Weshah et al., 2013)
X.7	Environment (Chen et al., 2008; Yeganeh et al., 2019)	
1	The unavailability of resources in the surrounding environment	(Chen et al., 2008)
2	Drastic changes in resource prices	(Chen et al., 2008)
3	Misunderstanding due to differences in culture, habits and behavior	(Chen et al., 2008; Choong, 2019)
4	Unforeseen conditions on the ground	(Chen et al., 2008; Choong, 2019)
5	Less accurate information forecast weather	(Al-Hammad, 1993, 2000; Ayudhya, 2011; Chen et al., 2008; Yeganeh et al., 2019)
X.8	Laws & Regulations (Weshah et al., 2013)	
1	Lack of clear standard operating procedures of the company	(Yeganeh et al., 2019)
2	Lack of experience with company codes	(Chen et al., 2008; Yeganeh et al., 2019)
3	Lack of experience with applicable local laws, government regulations	(Al-Hammad, 2000; Choong, 2019; Huang et al., 2008; Ku et al., 2010)
4	Lack of experience with government audit protocols and procedures put in place	(Al-Hammad, 2000; Choong, 2019; Ku et al., 2010)

Table 2. Continued

No	Problem Interface Management	Reference
X.9	Bid & Contract (Chan et al., 2005; Weshah et al., 2013; Yeganeh et al., 2019)	
1	Vague contract details and poorly written contracts	(Al-Hammad, 2000; Ayudhya, 2011; Huang et al., 2008)
2	The type of contract does not match the nature of the project	(Choong, 2019; Weshah et al., 2013)
3	Lack of vision of a solid contract strategy early in the project phase	(Choong, 2019; Weshah et al., 2013)
4	Lack of clear system requirements for completion	(Weshah et al., 2013)
5	Not clear condition in RFP document (<i>request for proposal</i>) from company for bidders	(Weshah et al., 2013)

there are 18 variables that have no impact to time performance; X1.4, X2.2, X2.3, X4.3, X4.4, X4.5, X5.3, X6.3, X7.1, X7.2, X7.5, X8.1, X8.2, X8.3, X8.4, X9.2, X9.3, X9.5.

B. Pearson Product Validity & Correlation Test

The validity test is used to determine the feasibility of the question items in the questionnaire to define variables related to a study. The validity test can be assisted by SPSS software. The validity test is carried out by calculating the product moment correlation.

This study will get plausible factor analysis if there is a significant correlation between the 20 identified interface problems. The Pearson product-moment correlation matrix (PPMT) is considered the most common measure of the dependence between two variables (Tabachnick & Fidell, 2013). "The Pearson product correlation coefficient is a measure of the linear dependence between two variables in the range -1 and 1. A PPMT of 1 indicates a definite positive correlation, -1 indicates a negative correlation, while 0 indicates no linear relationship" (Phillips et al., 2010). To interpret the correlation coefficients, the following guideline scales have been proposed: a correlation between 0 and 0.33 indicates a weak to low relationship, a correlation between 0.33 and 0.66 reflects a moderate to high relationship and a correlation between 0.66 and 1 reflects very high and very strong relationship.

C. Reliability Test

Reliability basically measures the reliability of the instrument, a measurement is said to be reliable if the measurement provides consistent results (Indrawan & Yaniawati, 2014). The reliability test can be carried out simultaneously on all questions. The tools that can be used in this testing phase are the SPSS software. In this study, the reliability test used the Cronbach's Alpha method. The basis of decision making in the reliability test is:

- If Cronbach's Alpha value > 0.60 [Reliable]
- If the value of Cronbach's Alpha < 0.60 [Not Reliable]

D. Risk Rating Analysis

Implementing risk management standards presents practical challenges by developing action plans, integrating risk management into corporate culture, designing a specific organizational structure for risk management, identifying all risk categories, and establishing metrics to measure and guidelines for the effectiveness of risk management (Hong, 2023).

The purpose of it is to determine the likelihood of the occurrence and impact of an event that hinders the achievement of organizational goals or objectives so that proper risk management can be carried out. This objective can be achieved through risk identification and risk analysis.

From the frequency and impact table, then multiplied by the scale value, the average frequency value and the average impact value are obtained.

		Consequence						
		C1 - Minor	C2 - Moderate	C3 - Serious	C4 - Major	C5 - Catastrophic		
Likelihood	L5-Almost Certain	Medium 11	High 16	Extreme 20	Extreme 23	Extreme 25	20-25	Extreme
	L4-Likely	Low 7	Medium 12	High 17	Extreme 21	Extreme 24	16-19	High
	L3-Possible	Low 4	Medium 9	Medium 13	High 18	Extreme 22	9-15	Medium
	L2-Unlikely	Low 2	Low 5	Medium 10	Medium 14	High 19	1-8	Low
	L1-Rare	Low 1	Low 3	Low 6	Low 8	Medium 15		

Source: AS 4360

Figure 1. Risk matrix

Furthermore, the risk level can be determined by multiplying the frequency and impact values. From the calculation of the average value of frequency and impact, the risk value is obtained. Then from the calculation of the risk value, the risk level category can be determined based on the risk category matrix qualitatively according to the following Australian/New Zealand Standard Risk Management (AS 4360):

Based on the Figure 1, the range of values to determine the risk rating, namely:

- extreme: 20 - 25 high risk, needs detailed observation, treatment must be levelleader
- high: 16 - 19 significant risks, need to be handled by the project manager
- Medium: 9 - 15 moderate risk, routine risk, handled directly at the project level
- Low: 1 - 8 low risk, routine risk, is in the project implementation budget

IV. Results

A. Validity & Reliability Test

Determination of a valid data is by comparing the corrected item total correlation which must be greater than 0.374 (critical figure of the r table in the table of r product moment values, a significant level of 5%). The results of the validity test are shown in the following Tables 3 and 4.

Determination of a reliable data instrument is to compare the SPSS output processing value items, namely the alpha value with the alpha value if the

item is deleted for each attribute where the alpha value of each variable is greater than the alpha table value or 0.6. Based on the results of the reliability test as per Table 5, it shows that the alpha value of the if item delete attribute on the factor analysis is smaller than the alpha value of the comparison, which is equal to 0.966 and 0.976 so that all of the factor analysis items can be declared reliable.

B. External Validation Analysis

External validation analysis was carried out using the Spearman Rank Correlation test between frequency and time performance. Table 6 shows the output of the SPSS correlation test results for variable X (interface management problem factor) to variable Y (time):

All variables are stated to have a good level of correlation and significance, namely the correlation coefficient is above 0.364 except X3.1 and X6.1.

C. Risk Rating Analysis

Risk rating analysis is carried out on the results of calculating the average value of the frequency and impact of risk as shown in Table 7. The variables that were analyzed for this risk rating were the variables that were reduced by the results of the validity and reliability tests, so there were 20 variables that were analyzed for risk ratings, as shown in Table 8.

The calculation of the risk value can then be

Table 3. Frequency validity test

Var.	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted	R Table	Conclusion
X1.1	47,47	287,706	0.647	0.966	0.374	Valid
X1.2	47,57	285,909	0.707	0.965	0.374	Valid
X1.3	47.90	282,438	0.841	0.964	0.374	Valid
X2.1	47,93	284,340	0.786	0.964	0.374	Valid
X2.4	48,23	289,082	0.699	0.965	0.374	Valid
X3.1	48.07	278,754	0.774	0.965	0.374	Valid
X3.2	48.03	283,689	0.740	0.965	0.374	Valid
X3.3	48.07	284,754	0.778	0.964	0.374	Valid
X4.1	48.00	280,069	0.881	0.963	0.374	Valid
X4.2	47,23	287,357	0.702	0.965	0.374	Valid
X5.1	48,27	279,926	0.823	0.964	0.374	Valid
X5.2	47,93	285,237	0.761	0.965	0.374	Valid
X5.4	47.50	286,259	0.738	0.965	0.374	Valid
X5.5	47,80	291,062	0.571	0.967	0.374	Valid
X6.1	48.00	276,069	0.895	0.963	0.374	Valid
X6.2	48,23	284,806	0.856	0.964	0.374	Valid
X7.3	48,53	293,154	0.644	0.966	0.374	Valid
X7.4	48.03	290,516	0.615	0.966	0.374	Valid
X9.1	47,93	281,030	0.831	0.964	0.374	Valid
X9.4	48,13	281,430	0.829	0.964	0.374	Valid

Table 4. Time impact validity test

Var.	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted	R Table	Conclusion
X1.1	61.07	349,995	0.779	0.975	0.374	Valid
X1.2	61,20	341,338	0.869	0.974	0.374	Valid
X1.3	61,17	340,695	0.863	0.975	0.374	Valid
X2.1	61,37	344,723	0.843	0.975	0.374	Valid
X2.4	61,67	349,609	0.789	0.975	0.374	Valid
X3.1	61,40	347,628	0.732	0.976	0.374	Valid
X3.2	61,47	346,395	0.771	0.975	0.374	Valid
X3.3	61,40	342,662	0.874	0.974	0.374	Valid
X4.1	61,67	346,299	0.800	0.975	0.374	Valid
X4.2	61,10	345,403	0.776	0.975	0.374	Valid
X5.1	61.50	336,741	0.879	0.974	0.374	Valid
X5.2	61,37	346,930	0.812	0.975	0.374	Valid
X5.4	61,23	343,633	0.837	0.975	0.374	Valid
X5.5	61,43	343,495	0.836	0.975	0.374	Valid
X6.1	61,27	339,582	0.890	0.974	0.374	Valid
X6.2	61,70	346,286	0.837	0.975	0.374	Valid
X7.3	62,23	345,220	0.706	0.976	0.374	Valid
X7.4	61,60	346,317	0.704	0.976	0.374	Valid
X9.1	61,47	339,499	0.832	0.975	0.374	Valid
X9.4	62.00	346,483	0.828	0.975	0.374	Valid

Table 5. Frequency reliability test & time impact

Description	Alpha value	N of items
Frequency	0.966	20
Time Impact	0.976	20

Table 6. Correlation of X and Y variable relationships for time performance

Variable	Correlation Coefficient	Sig. (2-tailed)	N
X1.1	.536	0.002	30
X1.2	.720	0.000	30
X1.3	.406	0.026	30
X2.1	.600	0.000	30
X2.4	.624	0.000	30
X3.1	0.223	0.235	30
X3.2	.373	0.042	30
X3.3	.377	0.040	30
X4.1	.395	0.031	30
X4.2	.572	0.001	30
X5.1	.497	0.005	30
X5.2	.383	0.036	30
X5.4	.509	0.004	30
X5.5	.634	0.000	30
X6.1	0.355	0.054	30
X6.2	.434	0.017	30
X7.3	.553	0.002	30
X7.4	.493	0.006	30
X9.1	.403	0.027	30
X9.4	.379	0.039	30

determined by the risk level category based on the risk category matrix qualitatively according to the following Australian/New Zealand Standard Risk Management (AS 4360):

Variables that are stated to have a sufficient level

Table 7. Frequency risk rating against time impact

Variable	Frequency	Time Impact	Frequency * Impact	Risk Category
X1.1	3.00	3.63	10.90	high
X1.2	2.90	3.50	10,15	high
X1.3	2.57	3.53	9.07	high
X2.1	2.53	3,33	8,44	Medium
X2.4	2,23	3.03	6,77	Medium
X3.1	2.40	3.30	7,92	Medium
X3.2	2.43	3,23	7,87	Medium
X3.3	2.40	3.30	7,92	Medium
X4.1	2.47	3.03	7,48	Medium
X4.2	3,23	3.60	11.64	high
X5.1	2,20	3,20	7.04	Medium
X5.2	2.53	3,33	8,44	Medium
X5.4	2.97	3,47	10,28	high
X5.5	2.67	3,27	8,71	Medium
X6.1	2.47	3,43	8,47	high
X6.2	2,23	3.00	6,70	Medium
X7.3	1.93	2.47	4.77	Medium
X7.4	2.43	3,10	7,54	Medium
X9.1	2.53	3,23	8,19	Medium
X9.4	2,33	2.70	6.30	Medium

Table 8. Dominant risk rating against time performance

Variable	Description of Risk Factors	Risk Rating
X1.1	Lack of communication between parties	high
X1.2	Lack of coordination between parties	high
X1.3	Slow decision-making	high
X2.1	Business processes that are not effective and efficient	Medium
X2.4	The method used is not in accordance with the needs	Medium
X3.2	Poor quality of construction work	Medium
X3.3	Poor job sequencing design and handling methods	Medium
X4.1	Lack of worker skills	Medium
X4.2	Delays in delivery and procurement of materials	high
X5.1	There is no project coordinator	Medium
X5.2	Inaccurate planning and scheduling estimates	Medium
X5.4	Inaccurate estimate of material requirements	high

Table 8. Continued

Variable	Description of Risk Factors	Risk Rating
X5.5	Inaccurate estimation of labor needs	Medium
X6.2	Obstruction of the circulation of information	Medium
X7.3	Misunderstanding due to differences in culture, habits and behavior	Medium
X7.4	Unforeseen conditions on the ground	Medium
X9.1	Vague contract details and poorly written contracts	Medium
X9.4	Lack of clear system requirements for completion	Medium

of correlation and good and dominant significance.

V. Discussion

A. Participant Factors

The participant factor is one of the factors that greatly determines the outcome of the entire project. From the results of data processing, the dominant variables in the problem factors were obtained, namely X1.1, X1.2 & X1.3:

- X1.1→Lack of communication between parties
- X1.2→Lack of coordination between parties
- X1.3→Slow decision-making

The large number of stakeholders involved in offshore projects in Natuna, makes activities very dense with sequences that are also very critical. The existence of clear communication and intensive coordination so as to provide an overview of clear goals and objectives can speed up the time performance of the project.

B. Resource Factor

The resource factor is one of the factors that greatly determines the outcome of the entire project. From the results of data processing, the dominant variables in the problem factor are X4.2:

- X4.2→Delay in delivery & procurement of materials

In terms of procuring materials and sending them to locations in the middle of the sea, it requires a very high effort. The need for expeditors to control and monitor each material is one of the keys to minimizing delays in the delivery of these materials.

C. Management Factors

The management factor is one of the factors that greatly determines the outcome of the entire project. From the results of data processing, the dominant variables in the problem factor are obtained, namely X5.4:

- X5.4→Inaccurate estimate of material needs

A competent estimator is needed considering the effort required to procure and send material offshore is also very high.

VI. Conclusion

Offshore project delays can result in huge losses. Due to the large number of parties involved, communication significantly affects resilient leadership while leadership increase performance to realizing organizational goals (Sudarso et al., 2022). Strong and clear communication and coordination are needed. Then the slowness of the decision-making process is also a matter of concern because it can cause project delays which is the effect of throwing

the ball unfinished so there is a need for a clear management decision hierarchy and RAM/RACI. In managing interfaces to all stakeholders in all areas it is expected to minimize the impact of delays.

From the procurement side, maintaining the material delivery schedule is also very important considering the domino effect on construction work which can cause delays. Then from the management point of view, in estimating needs, they must use appropriate techniques and calculation methods because the effect during procurement and difficulties in sending material to offshore areas is very high.

VII. Suggestion

- a. All limitations in this research are also expected to be continued / deepened in subsequent research, so that it is hoped that further research can be developed in cases of different types of projects, bearing in mind that projects are unique.
- b. It is also hoped that there will be feedback from the results of this study, so that the results of this research can be further developed and perfected, so that they can be used as study material both academically and practically to solve problems in implementing interface management on projects that affect time performance, although it is also necessary to study the cost performance.

References

- Ahn, S., Shokri, S., Lee, S., Haas, C. T., & Haas, R. C. G. (2017). Exploratory study on the effectiveness of interface-management practices in dealing with project complexity in large-scale engineering and construction projects. *Journal of Management in Engineering*, 33(2), 04016039. doi:10.1061/(asce)me.1943-5479.0000488
- Al-Hammad, A.-M. (1990). A study of the interface problems between owners and contractors over the construction of residential housed in Saudi Arabia. *Housing Science (USA)*, 14(4), 245-257.
- Al-Hammad, A.-M. (1993). Factors affecting the relationship between contractors and their sub-contractors in Saudi Arabia. *Building Research & Information*, 21(5), 269-273. doi:10.1080/09613219308727315
- Al-Hammad, A.-M. (1995). Interface problems between owners and maintenance contractors in Saudi Arabia. *Journal of Performance of Constructed Facilities*, 9(3), 194-205. doi:10.1061/(ASCE)0887-3828(1995)9:3(194)
- Al-Hammad, A.-M. (1996). Interface problems between building owners and designers. *Journal of Performance of Constructed Facilities*, 10(3), 123-126. doi:10.1061/(ASCE)0887-3828(1996)10:3(123)
- Al-Hammad, A.-M. (2000). Common interface problems among various construction parties. *Journal of Performance of Constructed Facilities*, 14(2), 71-74. doi:10.1061/(ASCE)0887-3828(2000)14:2(71)
- Ayudhya, B. I. N. (2011). *Appraisal of common dispute problems over residential building projects in Hong Kong appraisal of common dispute problems over residential building projects in Hong Kong* (FIG Working Week 2011). pp. 1-10.
- Brown, L. D. (1983). *Managing conflict at organizational interfaces*. Addison-Wesley.
- Caglar, J. P. E., & Connolly, M. (2007). *Interface management: Effective information exchange through improved communication* (ABB Value Paper Series). pp. 1-8.
- Chan, W. T., Chen, C., Messner, J. I., & Chua, D. K. (2005). Interface management for China's build-operate-transfer projects. *Journal of Construction Engineering and Management*, 131(6), 645-655. doi:10.1061/(asce)0733-9364(2005)131:6(645)
- Chen, Q., Reichard, G., & Beliveau, Y. (2007). Interface Management — A Facilitator of lean construction and agile. In *15th Annual Conference of the International Group for Lean Construction*, 57-66.
- Chen, Q., Reichard, G., & Beliveau, Y. (2008). Multiperspective approach to exploring comprehensive cause factors for interface issues. *Journal of Construction Engineering and Management*, 134(6), 432-441. doi:10.1061/(asce)0733-9364(2008)134:6(432)
- Choong, K. Y. (2019). Construction delays in Indonesia, Malaysia, Thailand, and Vietnam. *Practice Periodical on Structural Design and Construction*, 24(3), 4019013. doi:10.1061/(ASCE)SC.1943-5576.0000434
- Gatian, A. W. (1994). Is user satisfaction a valid measure of system effectiveness? *Information & Management*, 26(3), 119-131. doi:10.1016/0378-7206(94)90036-1
- Handyaningrat, S. (2006). *Pengantar Studi Ilmu Administrasi dan Manajemen*. Gunung Agung.
- Hewage, K. (2007). *Construction productivity improvement by worker motivation and IT based communication* (Doctoral thesis). University of Calgary.
- Hobbs, B., & Aubry, M. (2008). An empirically grounded

- search for a typology of project management offices. *Project Management Journal*, 39(1_suppl), S69-S82. doi: 10.1002/pmj.20061
- Hong, N. T. H. (2023). The effects of enterprise risk management on the performance and risk of Vietnamese listed firms: Evidence from abnormal enterprise risk management index. *Global Business and Finance Review*, 28(5), 122-136. doi:10.17549/gbfr.2023.28.5.122
- Huang, R., Huang, C., Lin, H., & Ku, W. (2008). Factor analysis of interface problems— A case study of MRT. *Journal of Marine Science and Technology*, 16(1), 52-63.
- Ichsan, M., Hamsal, M., & Abdinagoro, S. B. (2023). The role of project management office in managing project portfolio management: A descriptive study in Indonesian banks. *Global Business and Finance Review*, 28(2), 45-52. doi:10.17549/gbfr.2023.28.2.45
- Indrawan, R., & Yaniawati, R. P. (2014). *Metodologi Penelitian (Kuantitatif, Kualitatif, dan Campuran untuk Manajemen, Pembangunan, dan Pendidikan)*. PT Refika Aditama.
- Krishnaswamy, C. R., & Rathinasamy, R. S. (2015). Offshore outsourcing contracts: Real options analysis using trinomial option pricing model. *Global Business and Finance Review*, 20(1), 15-24. doi:10.17549/gbfr.2015.20.1.15
- Ku, H. K., Lin, J., Huang, C., & Shiu, R. (2010). Development interface knowledge management system for the Mass Rapid Transit system construction. In *2010 8th International Conference on Supply Chain Management and Information*, 1-6.
- Morris, P. W. (1989). *Managing project interfaces-key points for project success*. Major Projects Association.
- Mortaheb, M. M., Rahimi, M., & Zardynzhad, S. (2010). Interface management in mega oil refinery projects. In *6th International Project Management Conference*, 1-19.
- Nooteboom, U. (2004). Interface management improves on-time, on-budget delivery of megaprojects. *Journal of Petroleum Technology*, 56(8), 32-34. doi:10.2118/0804-00 32-JPT
- Phillips, T., Gauthierdickey, C., & Thurimella, R. (2010). *Using transitivity to increase the accuracy of sample-based pearson correlation coefficients*. DaWaK.
- Pole, K. (2007). Mixed method designs: A review of strategies for blending quantitative and qualitative methodologies. *Mid-Western Educational Researcher*, 20(4), 35-38.
- Pothukuchi, V., Damanpour, F., Choi, J., Chen, C. C., & Ho Park, S. (2002). National and organizational culture differences and international joint venture performance. *Journal of International Business Studies*, 33(2), 243-265. doi:10.1057/palgrave.jibs.8491015
- Sedamayanti. (2009). *Sumber Daya Manusia Dan Produktivitas Kerja*. Mandar Maju.
- Shokri, S., Safa, M., Haas, C. T., Haas, R. C. G., Maloney, K., & MacGillivray, S. (2012). Interface management model for mega capital projects. In *Construction Research Congress 2012: Construction Challenges in a Flat World, Proceedings of the 2012 Construction Research Congress, May*, 447-456. doi:10.1061/9780784412329.045
- Sudarso, D., Prakoso, W., & Widakdo, J. (2022). The effect of soft skills on organizational performance: The mediating role of resilient leadership. *Global Business and Finance Review*, 27(4), 17-26. doi:10.17549/gbfr.2022.27.4.17
- Tabachnick, B. G., & Fidell, L. S. (2013). *Using multivariate statistics*. Pearson Education.
- Turulja, L., & Bajgoric, N. (2019). Innovation, firms' performance and environmental turbulence: Is there a moderator or mediator? *European Journal of Innovation Management*, 22(1), 213-232. doi:10.1108/EJIM-03-2018-0064
- Weshah, N., Ghandour, W. El, Jergeas, G., & Falls, L. C. (2013). Factor analysis of the interface management (IM) problems for construction projects in Alberta. *Canadian Journal of Civil Engineering*, 40(9), 848-860. doi:10.1139/cjce-2012-0531
- Wicaksono, P. (2018). *Dalam 10 Tahun Mendatang, 50 Proyek Hulu Migas Mulai Berproduksi*. Tempo.Co. <https://bisnis.tempo.co/read/1083023/dalam-10-tahun-mendatang-50-pr oyek-hulu-migas-mulai-berproduksi/full&view=ok>
- Wideman, R. M. (2022). Wideman Comparative Glossary of Project Management Terms v5. <http://www.maxwideman.com/pmglossary/intro.htm>
- Wren, D. A. (1967). Interface and interorganizational coordination. *The Academy of Management Journal*, 10(1), 69-81. doi:10.2307/255245
- Yeganeh, A. A., Mojtaba, A., & Reza, F. (2019). Root causes of design-construction interface problems in Iranian design-build projects. *Journal of Construction Engineering and Management*, 145(12), 5019014. doi:10.1061/(ASCE)CO. 1943-7862.0001727
- Zhang, S., Li, Z., Ma, S., Li, L., & Yuan, M. (2022). Critical factors influencing interface management of prefabricated building projects: Evidence from China. *Sustainability (Switzerland)*, 14(9), 1-20. doi:10.3390/su14095418