RISK MANAGEMENT ANALYSIS OF THIRD CONSTRUCTION STAGE IN DIAGNOSTIC AND CARDIAC CENTER BUILDING AT DR. HASAN SADIKIN GENERAL HOSPITAL

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Abstract - Dr. Hasan Sadikin General Hospital (HSGH) is a teaching hospital as well as a tertiary referral hospital for West Java province. To support this role, HSGH is required to be capable of providing a high quality health services corresponding to the demands of society. Following this, the development of Diagnostic and Cardiac Center Building are being carried out. However, it should be consider that there are risks that could arise at anytime in the future, along with the development of Diagnostic and Cardiac Center. Risk management analysis of Diagnostic and Cardiac Center Building done firstly through risk identification. Secondly is risk measurement. Lastly, the recommendation of risk response planning for HSGH. The identified risks in third construction stage is 36 risks with the majority classified in moderate and high risk. Furthermore, for risk response planning there are four strategy namely acceptance, mitigation, risk transfer, and avoidance. The proposed risk response planning for risk associated with third construction stage mainly using risk transfer strategy.

Keywords: Risk Management, Risk Identification, Risk Response Planning

1. Introduction

HSGH was established in 1923 under the name of Het Algemeene Bandoengsche Ziekenhuis. In 1967 its name was changed into Dr. Hasan Sadikin General Hospital. As a class A and the biggest hospital in West Java Province, HSGH has function as a top referral hospital for tertiary health services in the province and a national center of excellence in Nuclear Medicine. Currently, HSGH with 1,100 beds could provide a wide range of services comprising 20 medical specialities with 127 sub specialities. Every year more than 360,000 patients visit the Outpatient Department, 40,000 patients are admitted to the Emergency Department, 11,000 patients undergo surgeries, and 30,000 patients are admitted for hospitalization.

Based on several programs that have been set out in the HSGH Strategic Business Plan, there has been much improvement whether in the form of physical development or service development. However, HSGH diagnostic service including nuclear medicine services that become a national center of excellence, and cardiac service which will be the referral center of West Java Province still considered poor, in terms of service quality and the availability of medical devices, though HSGH already has experts in those area.

To address the problem, there should be a one stop medical services that include diagnostic, cardiac, and nuclear medicine services through the provision of integrated and centralized services in the form of “center”. Those services are expected to be able to meet the needs or demands of all levels of society, from low income society to middle and top. Following this, HSGH build Diagnostic and Cardiac Center. An integrated medical services with a high quality medical equipment and experienced health personnel.

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However, it must be noted that along with the development of HSGH Diagnostic and Cardiac Center, there are also the risks that could arise at anytime in the future. The main issue is, up until now, the risk assessment conducted by HSGH is only in environment and work safety area. However, HSGH did not make a risk mapping and mitigation plan from those assessment. Build upon those issue, risk analysis from the development of Diagnostic and Cardiac Center could be useful to minimize unwanted loss and negative impact in the future.

2. Business Issue Exploration

The impact of risks associated with Diagnostic and Cardiac Center Building could influence negative outcomes regarding cost, time, scope, and quality. To began the analysis, factors that influence the success of the development of Diagnostic and Cardiac Center are being analyzed. Those factors are: qualified consultants, government funding, high technology medical equipment, qualified healthcare professional, development schedule, and community demand.

A. Conceptual Framework

Subsequent to analyzing factors that affecting the development of Diagnostic and Cardiac Center Building by HSGH combined with literature studies, the next step is to formed conceptual framework. Using Olsson (2002) model and the risk management process based on ISO 31000, the main types of risk which faced by HSGH regarding the Diagnostic and Cardiac Center Building could be identified. Following this, the identification of risks that associated with Diagnostic and Cardiac Center Building by HSGH is refering to Chapman (2006) business risk taxonomy.

![Conceptual Framework](image)

**Figure 1. Conceptual Framework**

Risks associated with the development of Diagnostic and Cardiac Center Building derived from internal processes and business operating environment. Based on business risk taxonomy by Chapman (2006), Internal processes risks are: financial risk, operational risk, and technological risk. While business operating environment risks are: economic risk, environment risk, legal risk, political risk, market risk, and social risk. After determining the risk category and risk types, the next step is to perform risk analysis that consists of: risk identification, risk measurement, and determining risk response planning. The result of risk analysis are used as a business solution and the implementation plan for HSGH to overcome the business issue.

B. Method of Data Collection and Analysis

The method of data collection of Diagnostic and Cardiac Center Building project is using primer data and secondary data. Primer data are collected through interviewing key personnel, examining project document and historical information. Secondary data are done through literature studies from text book and examined the result of similar project. The method of analysis could be seen on Figure 2.
First step began with problem formulation. It is arise from the risk management system in HSGH. Lacking of risk analysis application in Diagnostic and Cardiac Center Building project became influence to conduct a risk management analysis as a business solution and recommendation for HSGH.

Second step is literature studies which being carried out to support and strengthen the methodology and analysis of the research.

Third step is, collecting data and gathering information of Diagnostic and Cardiac Center Building project that already described in previous paragraph.

Fourth step is risk analysis. Identifying risks is the first action step in performing risk management strategy. The risk that being identified in this research came from business situation analysis; historical information; interviewing key personnel; and common risks from text book : Project Manager’s Spotlight on Risk Management by Kim Heldman (2005), Simple Tools and Techniques for Enterprise Risk Management by Robert J. Chapman (2006).

Following the risk identification is risk measurement. The risk measurement data are came from the questionnaires that distributed to HSGH employee. The purpose of the questionnaires distribution is to determine the perspective of probability and impact of each risks from HSGH employee that engaged with Diagnostic and Cardiac Center Building project. There are two calculation in risk measurement process. The first calculation is to determine mean, mode, and standard deviation using Microsoft Excel. The second calculation is using Monte Carlo Simulation. The output from risk measurement is risk mapping using two statistical measurement which is, mean and mode that generated from Monte Carlo Simulation.

Finally, the recommendation of risk response planning for risks associated with Third Construction Stage of Diagnostic and Cardiac Center Building are carried out based on risk mapping. All in all, this research will conclude the business solution for HSGH regarding risk management analysis of Diagnostic and Cardiac Center Building. Following this, the recommendation of implementation plan will be provided to give description for HSGH on how to implement the given business solution as a positive feedback for the organization.

C. Analysis of Business Situation

Business situation analysis carried out to understand the business situation that faced by the object of research, which is Diagnostic and Cardiac Center Building of HSGH. This analysis comprised of organization structure of the project, project budget, Work Breakdown Structure (WBS), and the project schedule for development stage.

1) Organization Structure

The execution of Diagnostic and Cardiac Center Building development handled by : Commitments Maker Officer (CMO), CMO Supporting Team, SPM Maker Officer (Surat Perintah Membayar – SPM), SAI Implementer (Sistem Akuntansi Instansi – SAI), Treasurer, Procurement Workgroup, The Committee of Receipt Goods. All of them report to the authorized budget user which is President Director of HSGH.
2) Project Budget

The development budget of Diagnostic and Cardiac Center Building divided into three section. Basically, each section represent the development stage. Following this, HSGH management classified Diagnostic and Cardiac Center development budget into four main parts, they are: regular monitoring cost by planner consultant, cost for construction management consultant, construction cost, and the cost of managing. The highest percentage of budget needed for the development is at construction cost, while the lowest percentage is at the cost of managing.

<table>
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<tr>
<th>No.</th>
<th>Budget Description</th>
<th>Total Cost (Rp)</th>
<th>Development Total Cost (Rp)</th>
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<td></td>
<td></td>
<td>2011 1st Development</td>
<td>2011 2nd Development</td>
</tr>
<tr>
<td>1</td>
<td>Regular Monitoring Cost by Planner Consultant</td>
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<td>2</td>
<td>Cost for Construction Management Consultant</td>
<td>313,160,000</td>
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<td>3</td>
<td>Construction Cost</td>
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<td>4</td>
<td>The Cost of Managing</td>
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<td>379,767,790</td>
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<td></td>
<td>Total</td>
<td>21,348,092,284</td>
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</table>

3) Work Breakdown Structure

According to Heldman (2005), Work Breakdown Structure is a deliverables-oriented hierarchy that defines the total work of the project. The first level of the work breakdown structure depicts the project, the next level the project deliverables, and so on. The analysis of Work Breakdown Structure will useful to indicate the types of risks that may occur in the development phase of Diagnostic and Cardiac Center Building.

Figure 3. Work Breakdown Structure of Diagnostic and Cardiac Center Building Development

4) Project Schedule

Project schedule for each stages basically are the same. However, at the implementation there are delay and changes in project schedule. First of all, preparation for the project including the creation of projected budget (HPS – Harga Perkiraan Sendiri), project auction along with it terms and condition (RKS – Rencana Kerja dan Syarat-Syarat). Second of all, the implementation of the project consists of: (1) Selecting planner and construction consultants, (2) Administration, technical, and budget evaluation of the consultants, (3) Determining the winner, (4) Signing contract. Third of all, the investigation of Diagnostic and Cardiac Center Building. Fourth of all, building maintenance. Lastly, project report.

3. Business Solution

Business solution aims to address the problem that arise in the organization, which is HSGH. The lack of risk management implementation could bring adverse impact, it could damage operational and financial of organization. To minimize those impact, risk analysis must be set out early. A series of risk
management begin with risk identification, followed by risk measurement and risk response planning. Risk analysis is an ongoing process, it did not stop in risk response planning. Risk management must be monitored and reviewed to give a continual improvement in risk management design itself. To support the success of risk management practices, all divisions within organization must be communicated.

D. Analysis of Business Solution

1) Risk Identification
The total identified risk of Third Construction Stage in Diagnostic and Cardiac Center Building, Dr. Hasan Sadikin General Hospital is 36 risks. It comprised of: 6 financial risks, 19 operational risks, 2 technological risks, 3 economic risks, 1 environmental risk, 1 legal risk, 2 political risks, 1 market risk, and 1 social risk.

2) Risk Measurement
Risk measurement of Diagnostic and Cardiac Center done in both qualitative and quantitative technique. Qualitative risk analysis concerned with the probability or the likelihood and the impacts of a risk events. Hereafter, in quantitative risk analysis, numeric values are assigned to probability and impact so the overall total risk score could be measured and risk could be mapped into risk matrix. To strengthen the quantitative risk analysis, the nominal impact assessment of risk are being carried out. It is to describe the minimum capital requirement that must be provided by HSGH. As it is mentioned earlier in Method of Data Collection and Analysis, the output from risk measurement is risk mapping using two statistical measurement which is, mean and mode that generated from Monte Carlo Simulation.

Before proceeding to constructing risk mapping, each risk score are being determined. Heldman (2005) mentioned that a total risk score or the expected value could be obtained by multiplying the Probability and Impact. The risk matrix refer to NHS, The National Patient Safety Agency from London.

Based on the Table 2, There are four different level of risk grading, as follows:
- Risk score : 0.025 – 0.02 considered as low risk (LR – Green Zone)
- Risk score : 0.03 – 0.08 considered as moderate risk (MR – Yellow Zone)
- Risk score : 0.12 – 0.24 considered as high risk (HR – Orange Zone)
- Risk score : 0.32 – 0.64 considered as extreme risk (ER – Red Zone)

<table>
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<tr>
<th>Impact</th>
<th>Probability</th>
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<td>Extreme</td>
<td>ER</td>
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</table>

Table 2. Risk Matrix for Diagnostic and Cardiac Center Building, Dr. Hasan Sadikin General Hospital

- Risk Mapping Based on Mean Value
The result of Third Construction Stage is, from total of 36 risks, there are 1 risk that considered as low risk, 20 risks that considered as moderate risk, 14 risks that considered as high risk, and 1 risk that considered as extreme risk. The minimum capital requirement that must be provided by HSGH in case the risk with highest score occurred is Rp 1,057,474,444 with the highest risk score 0.36.

- Risk Mapping Based on Mode Value
The result of Third Construction Stage is, from total of 36 risks, There are 3 risks that considered as low risk, 13 risks that considered as moderate risk, 16 risks that considered as high risk, and 4 risks that considered as extreme risk. Compared with risk mapping based on mean value, risk that considered as extreme risk is higher in risk mapping based on mode value rather than risk mapping based on mean value. Furthermore, risk that considered as moderate risk is became the dominance risk in Third Construction Stage. The least dominance risk in risk mapping based on mean value is risks that
considered as low risk and extreme risk, while in risk mapping based on mode value is risks that considered as low risk only.

The minimum capital requirement that must be provided by HSGH in case the risk with highest score occurred is Rp 1,409,965.925 with the highest risk score 0.48. When it is compared with the minimum capital requirement for Third Construction Stage based on mean value (Rp 1,057,474.444), the modus value minimum capital requirement is higher, therefore it is recommended to set out the minimum capital requirement for Third Construction Stage based on the higher value which is Rp 1,409,965.925

3) Risk Response Planning
Risk response planning is the process that describe the actions that should undertake by the management of HSGH to reduce the threats regarding risk associated with Diagnostic and Cardiac Center Building. There are several strategies to perform risk response planning. Each of the techniques has its own strength and weakness. Each risk must be treat with proper risk response planning techniques to maintain its effectiveness. The common strategies of risk response planning referring to Heldman (2006) are:

- Acceptance. This technique means the organization accept the risk and did not made an attempt to avoid or mitigate the risk, they willing to accept the impacts of risk events when it occurred in the future. Risk acceptance strategy aimed at risks that located in green zone or low risk with risk score from 0.025 to 0.02.

- Mitigation. Mitigation is the most common strategy to treat the risk. The purpose of this technique is to reduce the probability and risk impacts to an acceptable level. Risk mitigation strategy aimed at risks that located in yellow zone or moderate risk with risk score from 0.03 to 0.08.

- Transference. Transference technique done through transferring the risk to a third party. The responsibility of managing risk change to another party. Risk transference strategy aimed at risks that located in orange zone or high risk with risk score 0.12 to 0.24.

- Avoidance. This technique is about avoiding risk. It include avoiding the risk itself, eliminating the triggers that cause the risk to occurred in the future, and changing the project plan in order to protect the project objectives from the negative impact. Risk avoidance strategy aimed at risks that located in red zone or extreme risk with risk score from 0.32 to 0.64.

- Risk Response Planning for Third Construction Stage
The result for risk response planning is, from the total of 36 risks in Third Construction Stage, based on mean value, there are 1 risk that treat with acceptance strategy, 20 risks that treat with mitigation strategy, 14 risks that treat with transference strategy, and 1 risks that treat with avoidance strategy.

Furthermore, from the total of 36 risks in Third Construction Stage, based on mode value, there are 3 risks that treat with acceptance strategy, 13 risks that treat with mitigation strategy, 16 risks that treat with transference strategy, and 4 risks that treat with avoidance strategy. The same outcome of risk response planning strategy both from mean value and mode value from total 36 risks is 13 risks or around 36.11%. Following this, the decreasing one level of risk grading in the outcome of risk response planning from mean value to mode value from total 36 risks is 7 risks or around 19.44%. Moreover, the increasing one level of risk grading in the outcome of risk response planning from mean value to mode value from total 36 risks is 15 risks or around 41.67%. In addition, there are one risk or around 2.78% that decreased two level of risk grading in the outcome of risk response planning from mean value to mode value

E. Conclusion of Business Solution
The objectives of risk analysis in this research is to build risk mapping and risk response planning. Each risk grading in risk mapping (see Table 2) will be treat differently, using the right strategy. Whether the risk should be accept, mitigate, transfer, or even to avoiding the risk. After determining the right strategy, the following step is to develop an action plan, what action should be undertake by the organization to deal with risks. All in all, the development of risk response planning will increase the chance to get a successful project and decrease the overall project risk. It could also made the project management team to remain calm and knowing what to do when the risk events occurred.
In overall, the proposed risk mapping and risk response planning for HSGH either it is from the mean value or mode value could be used as a business solution for HSGH. The result of risk mapping and risk response planning from mean value could supported the lacking in risk mapping and risk response planning from modus value and vice versa. The flowchart that provided steps in implementing risk response planning could be seen on the Figure 4.

![Flowchart of Risk Response Planning](Image)

**Figure 4. Flowchart of Risk Response Planning**

### 4. Conclusion and Implementation Plan

The result of risk management analysis of Diagnostic and Cardiac Center Building at RSUP Dr. Hasan Sadikin General Hospital elaborate in two points, based on risk mapping result and the proposed risk response planning.

- From the total of 36 risks in Third Construction Stage, the result of risk mapping based on mean value is 2.78% risks is at the low risk classification, 55.56% risks is at the moderate risk classification, 38.89% risks is at the high risk classification, and 2.78% risks is at the extreme risk classification.

- From the total of 36 risks in Third Construction Stage, the result of risk mapping based on mode value is 8.33% risks is at the low risk classification, 36.11% risks is at the moderate risk classification, 44.44% risks is at the high risk classification, and 11.11% risks is at the extreme risk classification.

- From the total of 36 risks in Third Construction Stage, based on mean value, there are 1 risk that treat with acceptance strategy, 20 risks that treat with mitigation strategy, 14 risks that treat with transference strategy, and 1 risks that treat with avoidance strategy.

- From the total of 36 risks in Third Construction Stage, based on mode value, there are 3 risks that treat with acceptance strategy, 13 risks that treat with mitigation strategy, 16 risks that treat with transference strategy, and 4 risks that treat with avoidance strategy.

The implementation plan for risk management analysis of Diagnostic and Cardiac Center Building, Hasan Sadikin General Hospital began with the establishment of implementation team. Once the team already formed the next step is to execute several activities to support the business solution.

Firstly, review the risk analysis result. The result of Diagnostic and Cardiac Center Building risk analysis are reviewed to understand the project risk status, learn the risk management process, and to conduct a lesson learned. The human resource needed to perform this task is usually project manager. In this case, head of every division in Hasan Sadikin General Hospital.
Secondly, communicate and consult the result to each division in the organization. Risk management process is a dynamic process that must be supported by each division in the organization. In order to implement risk management, communication is the key. Each division in the organization must be aware with the risk analysis result and should had a meeting to discuss the result and review the risk analysis result. Each step of risk management process must be communicate well. Every division in the organization should have similar view and perspective to identify the risk, analyze the risk, evaluate the risk, and treat the risk. The human resource needed to perform this task is head of every division in Hasan Sadikin General Hospital along with its staff.

Lastly, to monitor and review risk associated with Diagnostic and Cardiac Center Building. Risk management is a process that needed continual monitor and review. The purpose of monitor and review is to identify new risks and re- assesment of existing risks. The human resource needed to perform this task is head of every division in Hasan Sadikin General Hospital along with its staff. With the formation of implementation plan, the business solution for risk management analysis of Diagnostic and Cardiac Center Building in Hasan Sadikin General Hospital is expected to give a positive impact to the management and the result of this research could be used as a benchmark for similar project in the future for the assessment of risk analysis.

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