DEVELOPMENT OF ASSET OPTIMISATION STRATEGY FOR THE PUBLIC SECTOR IN INDONESIA

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Abstract

Asset optimisation strategy in the public sector is essential in the improvement of public service delivery. It assists by resolving problems in asset management, such as a large number of unregistered and underutilised land and buildings, high costs of operation and maintenance, as well as lack of control in the improvement of asset performance. These issues can also cause loss of opportunity to achieve the optimum economic use and potential benefits of assets, and an inability to reduce expenditure in maintaining or operating assets. However, the development of asset optimisation requires proper identification of key elements and alternatives to set a robust strategy and needs alignment to the adopted strategy tool. This research aims to develop a robust strategy for asset optimisation by utilising the balanced scorecard (BSC) as a strategy tool. The process of strategy development was done by examining and aligning the key elements with the perspectives of BSC after modifying its existing perspectives.

This research has undertaken a quantitative survey of all relevant stakeholders, ranging from asset optimisation advisors, budget planners, asset authority, middle and lower levels of asset managers as well as operators. The survey was undertaken to understand their perceptions of the key elements and analyse them using the analytical hierarchy process (AHP) to weight the priorities of each key element. The process of validation was conducted through in-depth interview and test case before the strategy was developed and released.

The findings of this research are the following key elements and alternatives of strategy that have been listed in order of priority. The identified key elements are (1) Competitive human resources (CHR); (2) Stakeholder requirement and natural resources fulfilment (SER); (3) Accountable asset administration (AAA); and (4) Optimum budget (OB). The alternatives of this strategy are to

(1) Utilise assets; (2) Improve the performance and value of assets, and (3) Maintain assets efficiently.

This research has also found major barriers and provide recommendations to support the application of a robust strategy of optimisation. Therefore, this research contributes to a breakthrough for the Indonesian Government in the improvement of asset performance and quality of public services. The developed strategy can be formulated into either improvement or establishment of new policies and regulations of public asset management, which can support decision-makers, governmental asset managers and local government to increase the productivity of public assets for better management of public land and buildings.

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List of Abbreviations

AA	: Asset Authority
AAA	: Accountable Asset Administration
AD	: Asset Data
AHP	: Analytical hierarchy process
AL	: Asset Layout
AM	: Asset Facility Manager
AOS	: Asset Optimisation Strategy
BF	: Budgeted Fund
BLU	*: Badan Layanan Umum* (public service agency)
BMD	: Barang Milik Daerah (Local Government-owned Property)
BOT	: Build Operate Transfer
BSC	: Balanced Scorecard
BTO	: Build Transfer Operate
CFC	: Chlorofluorocarbon
CHR	: Competitive Human Resources
CI	: Consistency Index
CR	: Consistency Ratio
DAME	: Decision Analysis Module for Excel
DGSAM	: Directorate General of State Asset Management
DIY	: Daerah Istimewa Yogyakarta
DJKN	: Direktorat Jenderal Kekayaan Negara - DGSAM
ES	: External Stakeholder
EV	: Eigen Value
FAR	: Floor Area Ratio
FPI	: Functional Performance Index
GAOS	: Generic Asset Optimisation Strategy
HPIBM	: Hadamard Product Induced Bias Matrix
HR	: Human Resources
IS	: Internal Stakeholder
KPI	: Key Performance Indicator

KPKNL : Kantor Pelayanan Kekayaan Negara dan Lelang

LMAN : *Lembaga Manajemen Asset Negara* (State Asset Management Agency)

MMR : Mixed Method of Research

MPBBSC : Management of Performance-Based Balanced Scorecard

MPM : Maintenance and Performance Monitoring

NE : Natural Environment

NGO : non-Governmental Organisation

OB : Optimum Budget

PCI : Physical Condition Index

PESTEL : Political, Economic, Social, Technological, Environment and Legislative

PP : Peraturan Pemerintah (Government regulation)

QUT : Queensland University of Technology

RAOS : Robust Asset Optimisation Strategy

RQ : Research Question

SAM : Skilled Asset Manager

SER : Stakeholder Requirements and Environmental Fulfilment

SO : Strategic Objective

SR : Stakeholder Requirements

SWOT : Strength, Weakness, Opportunity and Threat

Statement of Original Authorship

The work contained in this thesis has not been previously submitted to meet requirements for an award at this or any other higher education institution. To the best of my knowledge and belief, the thesis contains no material previously published or written by another person except where due reference is made.

Signature: QUT Verified Signature

Date: _10 September 2019_____

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Chapter 1 Introduction

1.1. Background

Asset optimisation strategy in the public sector is influential in the improvement of public service delivery by resolving problems in asset management, such as a large number of unregistered and underutilised land and buildings, high cost of maintenance and operation, as well as lack of control in the improvement of asset performance. In addition, these issues have also caused loss of opportunity to achieve optimum economic use and potential benefits of assets, and an inability to reduce expenditure in maintaining or refurbishing assets. Legal ownership of land or land registration includes the official record of information on land, including the boundaries, tenure, use, and value of land (Deininger & Feder, 2009). The existing unregistered land and underutilised lands are problems that hinder government asset managers to administer public assets properly. The lack of an asset optimisation strategy cause inability to optimising the economic use and function of the land. The lack of proper administration of assets will also cause some difficulties in optimising assets in terms of their value and use. In addition, due to insufficient information about the assets to support decision making. Consequently, this has affected in attaining the best performance of assets, especially land or buildings. These problems have compromised the role of public assets in public service delivery.

In Indonesia, representative of the public asset manager is the Directorate General of State Asset Management (DGSAM), which is part of echelon 1 under the Indonesian Ministry of Finance. This organisation has the main role in managing governmental or state assets including public land and buildings. According to the Government Regulation number 24/2016, DGSAM is responsible for formulating regulations, procedures, controls, supervisions, and administrations of state assets, including the construction of asset optimisation strategy. According to the annual financial report of the Government of Indonesia published in 2016, public lands and buildings were valued at more than AUD 169.17 -13824 in 2015 and 185.7 billion in 2017. The Board of Supreme Audit of Indonesia (BPK) has reported several issues identified with public assets owned by the government that includes 57.74% or AUD 97.67 billion of

the total assets classified as unregistered land (BPK, 2015). This represents a number of non-free and clear assets. This problem inhibits the asset management process to achieve optimum usage of the land. Besides, the non-free and clear assets potentially have legal risks in ownership asset transfers.

The Board of Supreme Audit in the same year also found that more than IDR 6.71 trillion/AU$ 0.7 billion has been underutilised. This number reduced in 2017 where the utilisation of assets has achieved 62% of total assets or AUD 115.87 billion. However, this level of utilisation has not covered all of the existing assets, where there is at least 38%, or AUD 69.83 billion assets being underutilised. Level of underutilisation represents the degree of asset management services to the stakeholders which unable to gain the optimum economic usage of assets. This also indicates the level of attention in managing assets in conjunction with the overall organisation strategy (Tunde, 2010).

Currently, DGSAM as the highest authority in public asset management is also facing not fully integrated and comprehensive asset regulation. The integrated regulation allows whole units of the organisation to have the same standard and implementation in processing every facet in the life cycle of assets. At the same time, comprehensive regulation addresses the operational and strategic management of assets (Laue et al., 2014). Without this, the governance of asset managerial process will interfere with the interaction between the asset manager and stakeholders or clients.

In addition, training and education regarding asset management were below the requisite, which might affect the capacity and skill of asset managers in this organisation. As a big organisation, DGSAM also has to manage 17 regional offices and 71 operational offices as provincial branches, requires continuing development training program over time. Hence, the role of human capital involved in the strategy development process is a fundamental aspect of accomplishing organisational missions (Brata Wibawa, 2010; Mesch, 2010). Neglect of this aspect can disrupt the effectiveness of asset management strategy (Haynes, 2008)

Interconnection of a database of assets also becomes one of the major issues. The existing database has been solely independent, offline and has no connection between asset user data. The data changes rely on a manual system. So, extra efforts of asset reconciliation have to be undertaken in order to update the entire database. As a result, asset life cycle management has not performed in an accurate and comprehensive manner. This issue also impacts on the inability to measure the asset performance in regards to deliver the public services.

Selecting the performance measurement is one of the options to overcome these problems (Chaiwat, 2014; Lavy et al., 2010; Muchiri et al., 2011; Shad & Lai, 2015; Støre-Valen & Lohne, 2016; Tucker & Pitt, 2010). The problems of public asset management as mentioned above requires a comprehensive optimisation approach to address it. This approach also should deliberate the root of every problem in the optimisation strategy. Therefore, the development of a robust asset optimisation strategy is necessary. The asset optimisation strategy describes the prerequisite condition such as a strategic tool in order to do strategy alignment, define the key element as the criteria of the organisation's goals and alternative programs. This step is then followed by the prioritisation of key elements and alternatives. This strategy also requires awareness to determine the barriers and recommendations when it comes to the implementation level and finally other support such as modification of strategy tool if necessary.

Currently, DGSAM has adopted a balanced scorecard (BSC) as one of the strategic tools in managing public assets as stated in the Minister of Finance Regulation number 467/KMK.01/2014 (MoF, 2014). The BSC has as its main goal, the promotion of better public asset management in Indonesia. However, in fact, the adopted BSC has not achieved a reduction in the number of underutilised and idle assets. This could indicate that the adopted strategy has not been articulated to asset optimisation aspects effectively. Every strategy has a key element that links between the performance of an organisation and the strategy (Allen & Helms, 2006). Numbers of key elements of asset optimisation, including asset data and asset performance as well as monitoring systems, have not been considered rigorously in the implementation of the BSC.

Therefore, problems related to asset management, such as underutilised and unregistered assets, still persist in significant amounts.

As highlighted in previous research, an asset optimisation strategy contributes to the organisation's overall goal in the form of efficient asset management and improvement of the quality of public services and asset performances (Ali et al., 2015). However, developing an asset optimisation strategy requires scrutiny of key elements such as asset data, asset layout, budgeted funds, asset maintenance and monitoring systems, stakeholder requirements and natural environment (Campbell et al., 2010; S. Deix et al., 2012; Stefan Deix et al., 2012a). These key elements are associated with the robustness of an asset optimisation strategy because each element has a contribution and different indicators of asset performance. This influential contribution and its indicators can be admitted within strategic development using the adopted strategic tool including BSC. Consequently, the adopted strategic tool has to be aligned with the process of strategy development (Smith, 2007).

Furthermore, to deal with the problems that potentially emerge during the strategy development process, scrutinising inherent barriers based on the context in all circumstances is also important. Understanding current relevant regulations, organisation goals and performance achievements of asset management can support the identification of inherent barriers. Considering the above evidence in relation to inefficient asset management in Indonesia and the current adopted strategic tool (BSC), this research consequently has to deal with the implemented BSC to develop a robust asset optimisation strategy. Within the strategic tool of BSC, this research will examine the key elements of asset optimisation within the context of Indonesia. Give the background of the problem to be explored in your study and what led you to doing the thesis. For example, you might discuss educational trends related to the problem, unresolved issues, and social concerns. You might also include some personal background.

1.2. Research Problem and Research Questions

There is a considerable problem in relation to asset management in Indonesia. This being the lack of asset optimisation strategy to promote efficient asset management.

This deficiency has affected the high cost of maintenance and operation of the asset, abetting unregistered land and unproductive public assets, and loss of opportunity to improve national prosperity. Therefore, understanding the steps in the development of asset optimisation, especially for land and buildings including comprehension of key elements and inherent barriers, is profoundly needed for efficient public asset management.

In order to overcome the problem, the research questions that need to be answered are as follows:

1. What is the generic asset optimisation strategy for public land and buildings?
2. How can this strategy be adopted for public assets in Indonesia and what are the inherent barriers in implementing the strategy?

1.3. Research Aims and Objectives

This research aims to develop a robust asset optimisation strategy for the public sector and to adopt this strategy in the context of Indonesia, particularly for public land and buildings. Since the robustness of asset optimisation depends on how to deal with the key elements of asset optimisation, the objectives of this research are to identify and examine the key elements of developing strategies essential for asset optimisation in the public sector and the inherent barriers to asset optimisation in Indonesia.

1.4. Research Significance

Developing an asset optimisation strategy contributes to the discussions and thoughts in the field of asset management specifically management of assets in the public sector. The extension of utilising AHP in multi-objective decision making as the main tool to select the importance of key elements and alternatives to asset optimisation. A combination of Balanced Scorecard (BSC) as a strategy tool and the AHP as a priority weight tool contributes a different approach in measuring the contribution level of four perspectives of BSC in achieving the main goal. These extensions of a tool for implementation and asset optimisation as a focus of asset management strategy as well as the process of strategy development provide evidence of the contribution of this research to the current body of knowledge.

This research contributes to developing a robust generic strategy for asset optimisation by distilling the frameworks for implementation of asset optimisation and providing an empirical study using the mixed method. The empirical study process commenced with the survey to collect the opinion of middle to lower level asset managers and then it was validated by interviewing top-level asset manager.

The robust asset optimisation strategy contributes the understanding and knowledge, and provides a breakthrough for the Government of Indonesia in asset and value performance, promoting better risk management and delaying or reducing capital expenditures of optimised properties as well as improving the quality of public services. When the strategy is translated into policies and regulations in Indonesia, it will support decision-makers and asset managers to increase the productivity of public assets for better management of public land and buildings. In addition, this strategic framework has the potential to contribute to social communities, particularly for the neighbours of public land and buildings because of the environmental focus is one of the key elements when developing the strategy.

1.5. The Research Scope

This research has focused on the governmental asset management and assets in the form of land and buildings in the public sector that provide public services along with the improvements on the land immediately surrounding the buildings, including surplus land and parking lots. This research is applicable in managing public assets in the central or national as well as regional level of the public sector. It is applied to the whole asset life-cycle in managing public land and buildings, comprising of planning, procurement, operation and maintenance, renewal and replacement and disposal. However, this research mainly focuses on operation and maintenance due to the following reasons:

- Optimising assets operationally can be done when assets are in the usage period. Some unpredictable aspects that cannot be met during the planning or procurement stages officially occur during this stage. Some problems due to the interaction between variables such as budget, operation and maintenance expenses, minimum

requirements, complaints and so on, become the main focus only at this stage. Therefore, the optimisation method becomes the main challenge (Roy et al., 2008).

- The challenges of asset management aim to maximise uptime, maximise accuracy, minimise cost and risk and conform to the national and international regulations (Campbell et al., 2016). These challenges occur in the operational and maintenance stage where asset optimisation strategy is desperately needed.
- Asset optimisation promises to answer these challenges by keeping assets in working order. Consequently, the optimisation strategy mainly influences the maintenance and operational stage of the asset life cycle.

Focusing on public land and buildings, the generic asset optimisation strategy will be presented as a framework for the government of developing countries to better manage their public assets and improve services to the public.

1.6. Thesis Structure

This thesis consists of six chapters, with the description of each chapter as follows:

Chapter 1. Introduction

This chapter describes the background of this research; it introduces the urgency of asset optimisation topics, outlines the research problem, aims and objectives, research significance and research scope.

Chapter 2. Literature Review

This chapter reviews the previous research in asset optimisation and in the asset management field. The review, such as the definition of asset optimisation and its key elements, benefits and the process of developing asset optimisation, is described in more detail in the body of this chapter.

Chapter 3. Research Design and Methodology

This chapter presents a mixed method that is used in this research. It consists of a description of the survey, in-depth interview and test case. This chapter also describes the details of the data collection and data analysis process.

Chapter 4. Survey Analysis and Results

This chapter explains the analysis of survey results from the purposive respondents and implementation of an analytical hierarchy process (AHP) in prioritising the key elements and optimisation options. The survey findings and contribution of the survey in developing a framework also are outlined in this chapter.

Chapter 5. Analysis of In-depth Interview

This chapter demonstrates the analysis process of the in-depth interview and the evidence of observation is based on the test case results. The interview result analysis includes validation of the most important key elements and the best alternative of strategy, barriers, and recommendation for asset optimisation. This chapter then concludes by the finalisation of the strategy of optimisation.

Chapter 6. Strategy Development of Asset Optimisation

This chapter demonstrates the strategy development process by implementing the test case. The local policy as a form of local wisdom also becomes part of the strategy development process, in improving and finalising the framework in order to be applicable.

Chapter 7. Conclusion

This chapter concludes the major results and highlights the research contribution, limitations, implication of findings and recommendations for further research.

Chapter 2 Literature Review

2.1. Overview

Asset optimisation is part of efficient asset management, which is a set of activities associated with how to plan, procure, operate, maintain, dispose of or renew assets (Hastings, 2010). Development of an asset optimisation strategy occurs in the selected strategic tool. The selected strategic tool, therefore, should reflect how key elements and barriers have been customised referring to asset management. In terms of focus, asset management concerns the whole life cycle of assets, whereas asset optimisation focuses on operating or maintaining assets (Reierson, 2006, p.61-66). According to Livingston (2015), efficient asset management can be achieved by implementing asset optimisation. This literature review describes five major themes in developing asset optimisation: definition of asset optimisation, key elements of asset optimisation, the benefits of an asset optimisation strategy, and the process of developing an optimisation strategy for public land and buildings.

2.2. Definition of Asset Optimisation and Optimisation Program

Asset optimisation is a term used in the asset management field for a broad variety of assets including land and buildings to reveal the optimum economic use and benefit. The definition of land optimisation is a process to find solutions in reducing loss and maximising land-use allocation (W. Zhang & Huang, 2015), and development of patterns of land in the most appropriate design based on the given land planning objectives (C. H. Wang, 2013). The meaning of asset optimisation for an engineered asset such as a building is where no gap optimisation of assets occurs if there is no gap between technical documentation (rule-based and as-built), the actual asset usage, best operation and maintenance (Koukias & Kiritsis, 2015).

The asset optimisation definition is concerned with a specific design or plans to achieve optimum or maximum benefit, with minimum resources or risk. (Shivalingappa, 2014), defined asset optimisation strategy as involving trade-offs to find the most favourable combination of conflicting elements such as high cost and low risks or vice versa or other combinations. (Ward et al., 2014), agree that asset optimisation strategy means a trade-off between the cost of investments against asset

life compared with serviceability improvements. The asset optimisation strategy is also related to determining the optimum repair types and timing under the budget constraints and inadequacy of asset management (Elhakeem & Hegazy, 2012). In addition, (Woodhouse, 2010) describes that asset optimisation strategy means a blend of various activities such as utilisation, maintenance, inspection, and refurbishment of assets in the optimal overall way or in the most efficient and effective way.

Optimisation strategy of land and building includes a decision to conduct refurbishment or renovation of a building. Assuming that land has been optimised in terms of zoning and patterns of land, in order to achieve the benefits of building optimisation, this refurbishment has to be able to improve building performance and optimise the life span and value of the building. Therefore, the cost of refurbishment should be at a minimum, meaning no greater than the increasing benefits of the buildings' extended lifespan. Figure 2.1 shows how the refurbishment in x time and in $ x is smaller than the benefits of the building during P1 to P1'. The value of land increases as a curve, while the value of building increases from B to B' after refurbishment. In Figure 2.1, the optimisation strategy is about finding the right time and making the decisions (Woodhouse, 2015) on point X (i.e. refurbishment) before the economic life reaches P1 (decline in building value). Therefore, it can restore or improve the performance of the building, which is consequently extending the asset life span; as a public service provider, it can also contribute to improving public service. Putting asset optimisation strategy on point X needs to consider some elements including the level of maintainability of the building, availability of budget, and natural environment to proceed with refurbishment or renovation.

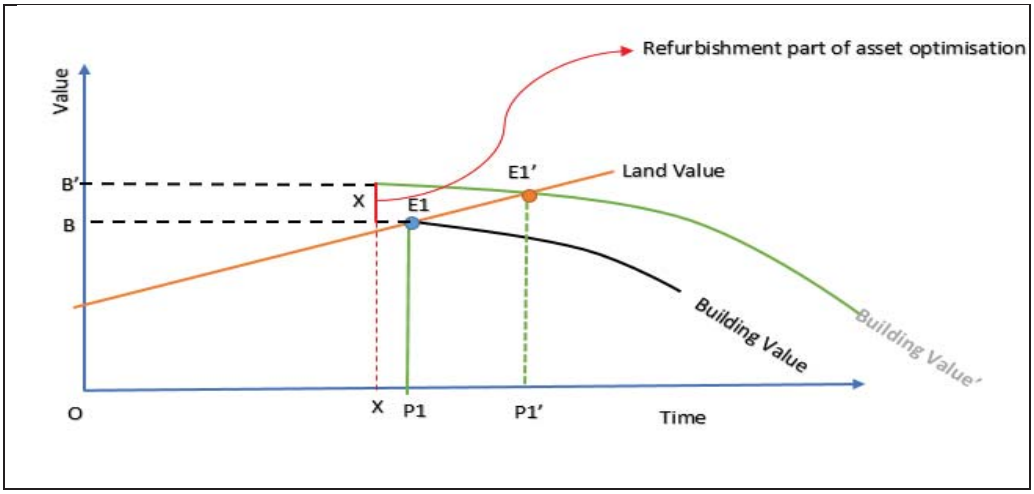


Figure 2.1 Asset Optimisation Strategy on Land and Building

(Adopted from Woodhouse (2015) and Hastings (2010)

There are various programs to optimise land and building, including refurbishment or renovation of buildings such as building improvement, installing energy-efficient systems or facilities lighting or replacing inefficient equipment (J. Huang et al., 2014; Malatji et al., 2013; Tronchin & Manfren, 2015), implementation of efficient maintenance and repair of buildings (Campbell et al., 2016; Liu & Grussing, 2014), and operational cost reduction (Bragg, 2010; Kaganova, 2010). These alternatives of an optimisation program have several techniques and requirements corresponding to the projected benefit of asset optimisation. The following paragraphs describe each alternative based on the literature.

1. Building Improvement through Refurbishments or Renovation.

   Refurbishment or renovation of buildings has objectives, including improving the performance of buildings. The performance is related to the energy efficiency (Juan et al., 2010), increasing safety, comfort, and aesthetics (Hudson et al., 2013) and maximising asset life (Ward et al., 2014). Refurbishment or renovation is upgrading buildings in order to meet minimum energy performance requirements as this is technical, functionality and economic feasibility (Atanasiu et al., 2013) and also based on the added value of assets (Council, 2007). Some activities, such

as the complete gutting of a building, removing exterior paint and restoring the original stonework, adding a balcony, etc., are refurbishment or renovation as well.

2. Implementation of Efficient Maintenance and Renovation of Buildings

   Efficient maintenance and renovation of buildings comprise one of the options in optimising land and building corresponding to the prevention of performance degradation or physical impairment, subject to age, usage, and damage. Efficient maintenance and renovation are associated with the minimum cost and maximum performance to be achieved (Alabdulkarim et al., 2015; Liu & Grussing, 2014). In order to achieve efficient maintenance and renovation, some factors such as people or labour, equipment, monitoring system, service inventory or material and service level (performance indicators), and cost need to be scrutinised (Alabdulkarim et al., 2015). Maintenance and renovation also have to be based on an assessment of building condition. Some buildings, particularly those located in disaster areas, or specific buildings that have specific functions, need risk-based maintenance (Suwnansri, 2014).

3. Operational Cost Reductions

   There are potential savings on expenses based on the operating expenditures of the building. According to Kaganova (2010), operating expenses can be reduced by 10 – 15%. Bragg (2010), suggesting a concept to reduce operational costs by implementing the 5S steps, which are sort, straighten, systematise, scrub and standardise. The process of sorting activities involves reviewing all of the cost items and selecting the costs for daily operation and disposal of unnecessary items. Straighten means repositioning of all furniture and equipment for better access and flow of activities. Scrub leads to cleaning the workplace physically. Systematise means building the schedule for maintenance or cleaning the building, and standardise means incorporating the overall 5S into the organisation standard and monitoring the results of programs. Berk and Wiley (2010), confirmed that the effort to reduce cost covers two important steps after developing a cost reduction team, which are identifying and ranking organisation costs and assessing the necessity of each cost. Identifying and ranking all the organisation's current costs

can be done by comparing costs to other organisations in similar industries at the same level. Having higher costs might have greater cost reduction opportunities. Assessing necessity means evaluating each cost as unnecessary, necessary or nice to have. Unnecessary and nice to have may include potential items to be eliminated.

According to these definitions of asset optimisation strategy, there are goals of the asset optimisation as a strategy: (1) optimum benefit; (2) optimum costs, resources or risks; and (3) efficient repair or maintenance and finally, (4) improving public services. *Optimum benefit* means the capability of an asset to generate optimum function or benefits in their performance. *Optimum costs or risks* indicate minimum operational costs or losses, and reduce the number of resources being used. *Efficient repair or maintenance* implies the ability of planned maintenance to optimise economic life and improve asset performance in the most efficient way. Indeed, since the government is a public service provider, those benefits will contribute to *improving public services*.

For the land and building as an unseparated property, the term optimisation is the process to find the best solutions from a set of options (Nguyen et al., 2014). Therefore, optimisation is the iterative improvement process to achieve an optimal solution and the selected approach has to consider unfeasible factors such as environmental issues (Baños et al., 2011).

2.3. Key Elements of Developing Asset Optimisation Strategy

Developing an asset optimisation strategy requires considering deliberatively key elements to achieve the main goal, which is efficient asset management and attaining optimum benefits of asset optimisation. As a strategy, asset optimisation is a long term direction for an organisation to deal with its resources in fulfilling stakeholder expectations (Johnson et al., 2008). This strategy incorporates the key elements, including financial resources, natural environment and stakeholder expectations (Haynes & Nunnington, 2010).

Key elements become important in developing an asset optimisation strategy because the main goal of asset optimisation will only be achieved when the elements of strategy have been fully recognised and measured. Additionally, the good

performance and reliability of each key element should be connected to the level of the main goal of asset optimisation in particular, and asset management in general. An example is the asset data in the land and building optimisation development that have to be accurately maintained. This data indicates the starting point of strategy; without accuracy and reliability of data on land and building, an asset manager will not able to develop good planning, proper measurement and types of strategy to optimise the assets. Table 2.1 shows seven key elements of land and building, which emphasises the different perspectives of the authors in defining an element that has a significant influence in developing asset optimisation.

2.3.1. Asset Data

Good quality of data can contribute to developing a strategy process. The characteristics of good quality data of asset are validity, reliability, completeness, and relevance (Redman, 2001). The validity of asset data means data should be recorded and used in relevant requirements including correct application and forms. Reliability of assets data connects to the consistency of the updating process and accessibility data of assets. Completeness reflects the matching of data against the information needs of the asset. Relevance means the ability of data to answer the purposes for which it is to be used.

In the public sector, the importance of good quality asset data allows integrating control of public assets, such as performance evaluation and monitoring, asset valuation and asset demand assessment and forecasting (Halfawy, 2008; Kaganova, 2010; O. Kaganova & Nayyar-Stone, 2000). The quality of data also becomes an important element in supporting an appropriate decision-making process for reducing operating costs, improving asset utilisation and improving property asset condition (Grubisic et al., 2009; Lu, 2011).

Table 2.1 Key Elements of Developing Asset Optimisation Strategy from Previous Literature

No.	Key Elements of Developing Asset optimisation	Schuman and Brent (2005)	(Kaganova, 2010)	Grubisic et al. (2009)	Campbell et al. (2010)	Deix et al. (2012	Warren (2010)	Grussing & Liu (2014)
1.	Asset Data		Classifying Asset	Reliable information on public asset	Asset classes		Asset data	Building element classification
2.	Asset Maintenance and performance monitoring system	Asset maintainability and reliability	Condition performance monitoring	Evaluating Public asset maintenance	Efficient Maintenance	Optimised maintenance (innovative)		Key performance index
3.	Asset Layout	Actual accessibility			Detailed Design (assets)		Region of location of land	
4.	Budgeted fund		Budgeting	Budgeting				Budget and Estimating cost
5.	Stakeholders' requirement			Public need fulfilment		Stakeholders' requirement		
6.	Natural Environment		Natural disaster			Environment objective	Environmental risk	
7	Skilled asset manager	Human Reliability	Professional skill	Professional asset manager	Leadership	Experienced assets operator	Property Professionals	Building manager

Data on land consists of location, size, amenities, history of the owner, history of environmental aspects such as flooding or erosion, the surrounding area of land, the value of land and land use information. An asset manager can include future planning of land in accordance with the natural environmental change to achieve the highest and best use of land. Public asset registry is another example of an asset database to represent greater transparency.

Building asset data can be done, through developing essential information with regards to the assets, in three main steps: asset detail, financial detail and assessment condition of an asset (Campbell et al., 2010; Jolicoeur & Barrett, 2005). The asset details cover the type, replacement value, size, age projected and remaining lifespan of assets. The financial details of assets list the financial aspects of the property such as annual operating cost, improvement cost or even annual revenue in per square basis. The assessment condition of an asset consists, and is not limited to, the cost recovery percentage and condition rating. Alternatively, some recommendations related to the property can be attached as additional information on assets within this assessment condition.

2.3.2. Asset Maintenance and Performance Monitoring System

The asset maintenance and performance system evaluate the performance of property for asset owners, asset managers, and occupiers. This system also informs requirements of continued assessment and planned maintenance of building or development of land.Nik Elyna et al. (2011), assert that an asset manager is responsible for establishing a structured model for property performance measurement purposes, identifying basic characteristics and outlining the strategy for effective performance. The purpose of performance measurement is to optimise availability and reliability and maintain the operability at an acceptable cost level. The purpose of performance of a governmental office building may lie in meeting public interest by considering critiques, discussion, and aspirations (Ammons, 1995). Adding these purposes, comparative performance measurement could be done by comparing the organisations own historical performance or that between governmental organisations (Holzer & Julnes, 2008).

A maintenance program of a building is involved with maintenance requirements such as resource requirements (material, labour, and fund), the decision to repair or replacement (renovation or restoration) and schedule of maintenance. According to (Campbell et al., 2010), an asset manager can optimise maintenance by using resources efficiently, scheduling maintenance jobs properly and deciding on the priority for maintenance. Maintenance of building also strongly connects to the performance of physical construction. Planned maintenance, repair, and renovation can affect the performance of the building and reduce the risk, as shown in the key performance index (Liu & Grussing, 2014; Schuman & Brent, 2005). An innovative maintenance and monitoring system can produce performance indicators for group or individual assets. A land maintenance program includes procedures to prevent land degradation and to improve land use (Verburg et al., 2009). Land maintenance is important, not only to ensure the optimal function of the land but also to increase the value of the land (Brown et al., 2014).

Asset performance measurement through a monitoring system becomes the key to asset management because measurement provides the required aspects that need to be properly managed or optimised. As stated by Deix et al. (2012b), 'if you can't measure it, you can't manage it'. Having a good quality of performance monitoring system on building and land also contributes to improving asset knowledge to support asset management objectives (Lloyd). Asset performance monitoring can be developed for individual or groups of land and building under the specific system. This specific system enables the selection of appropriate maintenance based on the availability of technical data and deterioration of land and building.

2.3.3. Asset Layout

Asset layout becomes a key element of an asset because it connects to the optimal functions or usage and efficient maintenance as well as the level of comfort to users. The layout of a building is associated with the allocation function of each space of the building. Building layout not only links to the placement of equipment but also occupants movements. Research by Dzeng et al. (2014), shows that the layout of the building is one important aspect in defining building performance. Schuman and Brent

(2005), highlighted that the layout of a building is associated with the accessibility of maintenance activity. In this aspect, Hastings (2010) suggested some possible consideration in relation to the building layout, in that some process hazards such as fire, explosions, and toxicity have to be properly located in regards to the site workers, nearby residents, the location of the control room and access to emergency facilities. Another aspect of the layout of the building has been stated by Athienitis et al. (2015), in that the space allocation or building design affects system energy in achieving an excellent indoor environment. The building design also assists in determining a building's life cycle performance in term of energy consumption and life-cycle cost (Kovacic & Zoller, 2014).

In terms of land, the layout of assets is respective to the location and region where the land lies. The uniqueness of asset location from one region to another region provides a different effect on a property in terms of climate or disasters. (Warren, 2010a), explained that the optimisation of assets depends on how easily the location of assets can be reached by customers. This concept measures the homogeneous demand on assets in the range of location and the optimisation driver of the asset.

The layout of the building incorporates the accessibility in supporting the movement of occupants and proper access for external users or customers. Building layout also respects the space shape and dimension, the number of floors, facilities and other on-site facilities including parking area and landscape (Bao et al., 2013). In a parcel of land where there are buildings, facilities, roads, parking lots or landscape, layout of land incorporated with the arrangement and configuration of different buildings can impact on their amenity, function and accessibility, so that the proper arrangement and allocation of using the land space is critical to creating land and building value (Kim & Sohn, 2002).

2.3.4. Budgeted Fund

Financial aspects in terms of budgeted funding is a key element in all stages in the asset life cycle, from acquisition of land and building, operation and maintenance costs and renovation or replacements of assets. The budgeted fund under a specific scenario is also associated with the performance of assets to indicate the achievement of

efficiency or profitability. According to Shivalingappa (2014), in budgeting, analysing risk or cost in asset optimisation can be used to link between the amount of money spent on the targeted performance.

The connection between the land and building performance and financial aspects will also link to the quality of public services. Improving these performance indicators connects to the financial aspects such as operating cost, maintenance costs or natural environment. Financial aspects in terms of cost can bridge the gap between actual performance and the performance required for optimum public services. Moreover, the accuracy in estimating a budget plan can also minimise the stoppage of asset operations in providing public services.

The financial aspect also becomes the other performance indicator when utilisation of land and building is of promising a financial benefit. For example, for leased land and/or building, the budgeted fund element tends to match the cost of operation and maintenance of such land and building against its revenue (Pagiola et al., 2003).

2.3.5. Stakeholder's Requirements

In the public assets of land and buildings, stakeholders are defined as a specific or general group of people affected by the planning, operating, maintenance and disposal of public land and/or buildings, directly and/or indirectly (Stefan Deix et al., 2012). The stakeholders can be individuals, communities, social groups or organisations. For example, stakeholders in government or public building might include people who live in or near the building. These also can be the internal stakeholders, such as employees and management, and external, such as customer, suppliers, local authorities/councils, services, and neighbours. Each stakeholder has different characteristics, therefore, analysis of their requirements is important. Understanding stakeholders can generate knowledge about their behaviour, intentions, interrelationships, interest and the influence they have brought to bear on the decision-making process or in developing a strategy (Brugha & Varvasovszky, 2000).

The level of stakeholder satisfaction in governmental office buildings reflects the ability of the building in fulfilling comfortability needs of employees and managers,

therefore, involving these stakeholders in developing building optimisation is reasonable. The optimisation will require a trade-off between competing interests among stakeholders (Memmah et al., 2015). Stakeholders also play an important role in evaluating optimisation to meet the best asset allocation, efficiency and the expected utility of assets (Stefan Deix et al., 2012; Jarraya & Bouri, 2013), and the various stakeholders mean the various points-of-view, specifically when they are experts and/or professional (Gall et al., 2015).

The role of stakeholder perception in the asset decision-making process is also important. Optimum asset allocation will be achieved when all stakeholder objectives are considered rigorously during the decision-making process (Jarraya & Bouri, 2013). Effective asset management is achieved by the alignment between objectives, intervention, and management of diversified stakeholders with different interests. In developing public land and strategy, therefore, consistency of strategic policy goals and interest of multiple stakeholders should be defined deliberately (Schraven et al., 2011).

2.3.6. Natural and Built Environment

The natural environment is one of the important key elements in developing the asset optimisation strategy. This environment corresponds to the climatic variability, weather patterns that sometimes result in extreme weather events and natural disasters such as flooding, extreme rainfall, drought, and increase in temperature. These events in single or groups have different impacts, therefore different adaptations or strategies are required. The built environment corresponds to the physical land and building that had been created by human. Changes in the natural environment might be caused by human activities including how to build the building and utilise the land. Developing a strategy to mitigates the negative impacts of natural disaster events and how the internal built environment to reduce the impacts on assets are part of the optimisation strategy. These environmental factors also influence the effectiveness of optimisation strategy directly, therefore understanding of the internal built environment creates awareness in customising the design of efficient and sustainable building including energy efficiency, based on the climate and its effects are essential in optimisation

strategy development process(Meadows & Bennett, 2009). On the other hand, asset managers need to be prepared due to the potential impacts of disasters on assets (Warren, 2010a). Comprehensive understanding of the location and position of land or land and buildings are one of keys for identification of vulnerability level of the assets due to extreme weather conditions (Arndt et al., 2012; Huibregtse et al., 2016; Rowan et al., 2013).

In addition, the design of physical structures, including the selection of building material, the usage of renewable energy, low carbon emissions, and other environmental protection programs, will help to reduce the further negative impacts of both the early deterioration of physical assets and disruptions during operational of assets.

In respect to the role of government, the asset owner or asset manager has a responsibility to develop strategic management and implement strategic goals in an integrative manner connected to the natural environmental elements (Frolov et al., 2010; Lutchman, 2006; Rayner). This concern means the asset owner is required to build and measure awareness of the released policies, in regards to the negative impact on the environment or neighbourhood. It also includes some efforts to prevent pollution of the natural environment, utilises renewable energy and other policies. Therefore, the strategy of asset optimisation is to be aware of environmental issues. So, it should be able to reduce environmental problems such as pollution, waste disposal, and issues related to carbon emission.

It is also revealed empirically, disasters have a macroeconomic impact through physical, economic and institutional development, and it is vital for authorities to take into consideration, policies for the short, medium and long-run (Ibarrarán et al., 2009), as well as the level of energy consumption as part of environmental performance (Gaterell & McEvoy, 2005). A research study done by Arndt et al. (2012), concluded that the environment, such as climatic disasters was one of the potential variables reducing economic growth, particularly in developing countries, that could impact in developing a robust asset optimisation strategy.

Land and building are vulnerable assets to the natural environmental impacts because they are associated with location (Martens et al., 2009). This vulnerability aspect has placed land and building into the assets that could not be detached from natural environmental factors including climatic events (S.-L. Huang et al., 2011; IPCC, 2012). Consequently, land and building optimisation have to sufficiently measure the impacts of natural environment issues (Frese, 2003; Yong et al., 2010), and at the same time should be aware of environmental impacts such as renewable energy, low carbon emissions, and waste management and pollution. This comprehensive strategy enables the strategic approach to assets with respect to the environment and vice versa.

2.3.7. Skilled Asset Managers

Skilled asset managers become one of the keys to developing and establishing the asset optimisation strategy. The role of the asset manager is not only to develop strategic planning but also to maintain its program to achieve the objectives. An asset manager also inherits an asset and may struggle to meet the standard of quality, safety and cost objectives and ensure that all systems are manageable (Campbell et al., 2016). As part of human resources, an asset manager has a role to avoid potential failure in minimising operational and maintenance costs, particularly in the execution stage, concerning either quantity or quality, or both. Wijnia et al. (2006), implied that human resource policies play a significant role in reducing costs due to asset replacement failure, through the preventive program in the staff recruitment policy.

The human capital, or human resources notably for human-based assets, is composed of knowledge, capabilities, and expertise that cause the organisation to be managed or mismanaged (Herling & Provo, 2000). Lack of human capital management tends to increase costs, not only the cost of handling failures, but also the cost involved to develop knowledge and experience. The skilled asset manager needs to understand asset life cycle issues of assets, technological skill, and economic analysis to build an asset strategy. Additionally, the asset manager has to extend their skill in the leadership field (J. Campbell & Barnett, 2010). Table 2.2 shows the description of each key element, as was mentioned above.

Table 2.2 Key Elements of Asset Optimisation

No.	Findings: Key Elements of Asset Optimisation	Description
1.	Asset data (AD)	Asset registry, ownership, construction detail, the cost of procurement, property value, location detail, amenities, current usage, transactional data (history of ownership)
2.	Maintenance and performance monitoring (MPM)	The maintenance schedule, maintenance resources, condition of the property, technical deterioration, the special requirement (if any)
3.	Asset layout (AL)	The pattern of land and design space of land, landscape, number of floors, on-site facilities, parking lots
4.	Budgeted fund (BF)	Budgeted costs of maintenance, capitalised expenditure or renovations
5.	Stakeholder' requirement (SR)	External and internal users and their important interest such as comfort temperature, cleanness, tidiness and standard facilities, lighting, accessibility
6.	Natural and Built Environment	The awareness of the internal built environment aspect such as low carbon emission and renewable energy. This aspect also includes the awareness in anticipating environmental factors such as disastrous/climatic events and contribution of the organisation regarding this issue.
7.	Skilled Asset Manager (SAM)	Human resources and other supporting aspects to improve the skill and expertise of asset managers to achieve the main goal of asset optimisation

2.3.8. Summary

All these key elements in asset optimisation (data, fund, monitoring system, layout, stakeholder, natural and built environment and skilled asset manager) need to be considered when developing an asset optimisation strategy. Asset data provides accurate and detailed data to manage assets in terms of availability and maintainability. Asset maintenance and monitoring systems provide information regarding the degree or level of an asset in delivering services. The budgeted fund and environment are the constraints of how asset optimisation or efficiency can underpin a budget and natural disruptions of physical assets. Stakeholder satisfaction includes the overall performance of assets in providing services where stakeholders can feel and evaluate them. The importance of environment and budget on asset optimisation and human resources capability in the asset management area are illustrated in Figure 2.2.

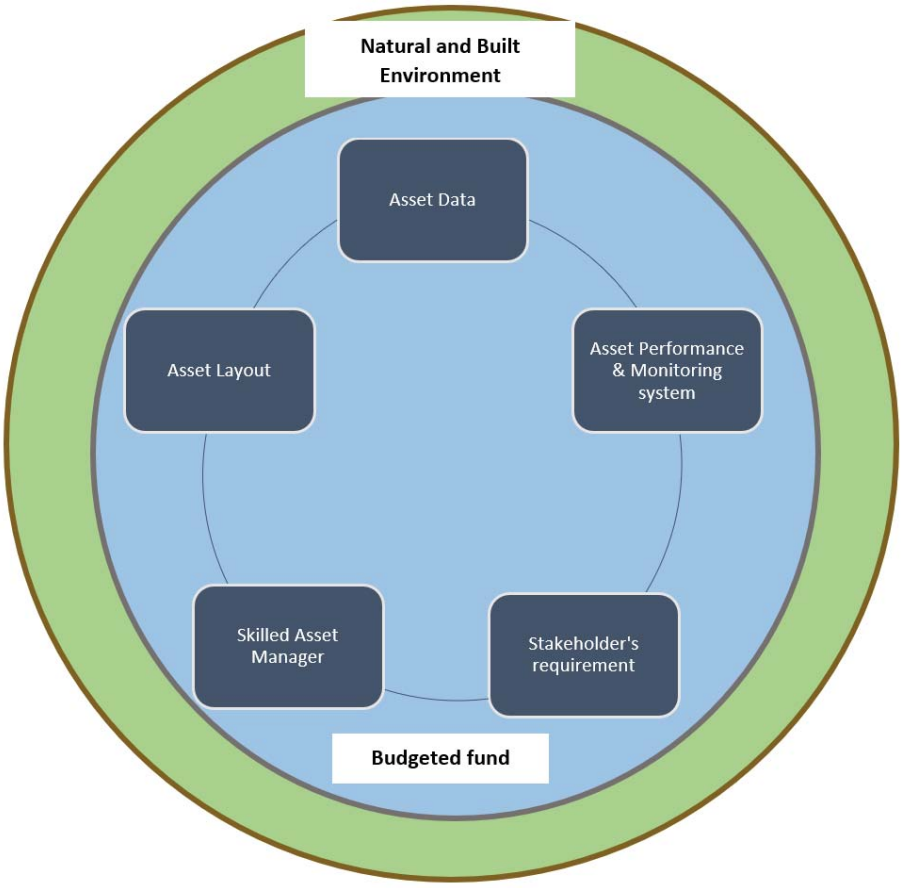


Figure 2.2 Key Elements of Asset Optimisation
(Source: (Kaganova, 2010)

2.4. The Benefits of Implementation of an Asset Optimisation Strategy (AOS)

An asset optimisation strategy (AOS) has several advantages to the performance and value of an asset, risk management, financial aspects, and the quality of services. In achieving these advantages, AOS employs a number of examples of decisions such as planned maintenance, timely refurbishment, and asset utilisation. The asset optimisation strategy may generate other benefits out of the following descriptions. The following benefits of AOS mainly relate to public land and buildings.

2.4.1. Optimum Benefits in Asset Value and Asset Performance

Asset optimisation as an organisational strategy has the ability to increase benefit through improving the value of assets and asset performances. Asset value can be increased and asset performance can be improved through asset optimisation, which

is the implementation of planned maintenance on an asset (Eti et al., 2006). Regarding the value of a public building, Tunde (2010), stated that public buildings have value because they benefit the users, improve living standards, and increase the expected income or appreciation value. Moreover, the value of the building will potentially increase if there is a feasible alternative use in the near future (Viljoen, 2003). Therefore, utilisation as one of asset optimisation strategy will definitely increase the value of land and building because utilisation creates alternative usage (Tunde, 2010). There are available methods to calculate the value of the property. As stated by Lundström and Lind (1996), the value of a building can be calculated by determining the total replacement costs, deducted by depreciation due to aging, functional deficiencies and obsolescence.

Considering key elements of the optimisation strategy, the benefit from AOS in the form of increasing value has to be affordable according to the financial aspect, meaning the budgeted fund. This financial aspect consists of the cost of maintenance, operational cost, or cost of renovations (Sharam et al., 2016). In other words, the implementation of AOS potentially increases the value, if in the financial aspects of the budgeted fund view is affordable.

The AOS can also improve the performance of buildings. This performance improvement can be achieved by implementing planned or efficient maintenance or refurbishment. Liu and Grussing (2014), and Hegazy et al. (2010) mentioned that an efficient maintenance program includes preventive and reactive maintenance. Energy-efficient design, increasing employee productivity, and increasing level of stakeholder satisfaction are indicators of improving building performance (Ali et al., 2015; Jolicoeur & Barrett, 2005; Omrany & Marsono, 2016). According to Grubisic et al. (2009) and S. Deix et al. (2012), the performance of building connects to a key element of asset optimisation, which is stakeholder requirements. The effectiveness of AOS in improving building performance, therefore, can be proved by achieving stakeholder satisfaction. Improving asset performance impacts on increasing employee productivity and at the same time can achieve stakeholder satisfaction. This demonstrates the optimum benefit of asset optimisation.

2.4.2. Optimum Asset Risk Management

The AOS can also improve the risk management of the asset. In asset life cycle management, some of the risks occur during the operation and maintenance stage, such as employee errors and fraud (Dionne, 2013). Louisot et al. (2014), assert that the risk management process comprises risk identification and risk assessment, which are diagnostic of exposures; risk treatment, which is the handling of risks including implementation of risk management program; and risk monitoring or review, which is involved with the effective measuring of risk treatment in order to define further actions or treatment programs.

The roles of AOS decisions in risk management is at the risk identification stage (Woodhouse, 2015). In so doing, the sources of hazards such as natural hazards, mechanical breakdown, and utility outage can be recognised early. Additionally, the role of the AOS program at the risk treatment stage is to implement efficient maintenance as a form of treatment. However, the achievement of this benefit depends on how well the system is providing valid and updated information related to the asset condition (Grubisic et al., 2009; Liu & Grussing, 2014; Schuman & Brent, 2005). It requires asset maintenance and performance monitoring system. The whole process of improving risk management to minimise asset risks, and how this process has been determined by the asset maintenance system (as one of the constraints), is proven to be of minimal risk when the asset risk is well managed.

2.4.3. Efficient Repair or Maintenance (Delay or Reduce Capital Expenditures)

Capital expenditure generally has a major impact on organisation funds or cash flow for the year, no matter the type or size of the organisation. Delaying or waiving capital spending as the crucial financial outflow also reflects the role of asset optimisation in maintaining financial stabilisation. Plant asset procurement and asset refurbishment or renovation are examples of capital expenditure for the building. The decision on the proper time to conduct asset refurbishment or renovation is one of the roles of AOS (Woodhouse, 2010), as illustrated in Figure 2.1, where refurbishment can increase the value of the building and extend its economic life. Refurbishment as capital expenditure is also one of the techniques to optimise the building (Hegazy et al., 2012).

If the building has a longer economic life, it means a budget that is going to be used as the next capital expenditure can be delayed. Therefore, it can be re-engineered for more productive or further opportunity such as expanding capacity (McAdam & McCarron, 2002).

However, the decision to conduct refurbishment to achieve the optimum benefit of AOS depends on the availability of budget. In some cases, refurbishment or regular maintenance of an asset also depends on the natural environment, for example, the event of a disaster (Warren, 2010a). In this sense, the benefits of AOS can improve the efficiency of asset repair or maintenance in the form of reducing or delaying capital expenditure. Nevertheless, this can be gained under the condition of the budget and natural environment as two of the key elements (constraints) of AOS.

2.4.4. Improving the Quality of Public Services

One of the obligations of a government institution is to provide good quality of services supported by public assets and facilities. The highest performance building or other assets, therefore, become a necessity in meeting public expectations (Jolicoeur & Barrett, 2005). The AOS can create benefit in terms of improving the quality of public services through implementation strategy decisions that can improve asset performance, such as planned efficient maintenance and refurbishment. In this maintenance program, there are basic principles to assure the whole life performance of assets, named life cycle analysis, clear procedures of maintenance and well-thought-through design (Shabha, 2003).

Public service improvements can also be granted by the asset's safety and reliability (Sudha Rani et al., 2015). According to Livingston (2015), attaching high safety and reliability to assets is more valuable in improving the quality of public services. While Cohen et al. (2006) wrote that an AOS decision can create safety and reliability either during peak or low season of service requisition. This availability of services is only viable if the assets are achieving their best performances.

The effectiveness of public service improvements can be proven by the level of satisfaction of the key element, which is stakeholder requirements (Grier, 2002). If the

provided public services have the ability to fulfil the need of internal stakeholders such as employees and managers, and external stakeholders such as customers and suppliers, this means that public services have met stakeholder expectation. Increasing the level of fulfilment of public needs indicates the improvement of public services. Hence, the optimum benefits of public assets can be achieved.

2.5. Process of Developing Asset Optimisation Strategy

A vision and mission are standard and critical elements of organisational strategy as a foundation for establishing organisational strategies and starting points of an organisation's strategic planning, including asset optimisation strategy. If vision provides a direction of the organisation for the next 10 years, the mission serves foundational guides in attempting organisational objectives. A strategy is a process of developing objectives and the organisation's mission. The strategy is also important, to focus organisational efforts and resources to achieve organisational objectives. Therefore, developing a strategy such as an asset optimisation strategy can create an ability to capture opportunities or benefits of assets, respond to barriers and use organisational resources and time efficiently. Developing a strategy means also defining tools to assess organisational performances based on internal and external perspectives (Warren, 2010a). The balanced scorecard (BSC) is one of the strategic tools in developing an asset optimisation strategy. However, before employing this strategic tool, it is necessary for an organisation to select the approach to measure the significance level of strategic objectives and project each key element in the key performance indicator (KPI). This approach deals with the discipline of multi-objective analysis.

2.5.1. Steps of Developing an Asset Optimisation Strategy

There are at least four approaches to developing an optimisation program that corresponds to the building performances and sustainable building in particular, such as a computer simulation optimisation approach (Caldas & Norford, 2002; Prianto & Depecker, 2003; Sun & Reddy, 2006; L. Wang et al., 2007), sensitivity analysis (Flager et al., 2009; Heiselberg et al., 2009; Pang et al., 2012; Sanchez et al., 2014), expert-based optimisation (Hamdy et al., 2013; Roy et al., 2008; Shaikh et al., 2014) and the generally accepted approach, which is numerical simulation and mathematical

optimisation (Ascione et al., 2015; Eisenhower et al., 2012). The design of the optimisation approach led to use over the 5 years from 1996 to 2005, but the use of the multidisciplinary approach tended to increase after 2003. The multidisciplinary approach combines multi-objective optimisation algorithms with parametric design and is enriched with decision making or relevant expert feedback. According to Roy et al. (2008), the major reasons for selecting a mathematical approach in the optimisation approach including algorithm is due to the interaction between variables in the features of real-life optimisation problems and comfort with using the optimisation techniques. However, the challenge of the optimisation approach is the qualitative nature of objective functions (Roy et al., 2008).

Some previous research on optimisation in various types of assets and approaches over the period 2007 to 2017 has been revealed in this research, as demonstrated in Table 2.3. This table shows that only 2 of 27 research works utilised the non-mathematic approach in solving the optimised solution. In this research, the approach to optimisation is multidisciplinary, where it is a combination between quantitative approach through survey and how to use the data from a survey that is mainly in numbers, it then proceeds to the validation process, which is interview and test case. The selection of this multidisciplinary approach is also due to the multi-objective analysis process in accordance with the alternatives and goals of optimisation on assets.

Developing strategy, as Johnson et al. (2008) and Haynes and Nunnington (2010) stated, includes three main steps: strategic position, strategic choices, and strategy in action. The strategic position concerns the identification of internal capacity including resources and competencies and external factors including stakeholders that impact on strategy (McAdam & McCarron, 2002). In the strategic position phase, all key elements of the strategy are scrutinised objectively corresponding to the entire organisational situation, including some derivatives of key elements that may be strength or weakness (internally), and opportunities or threats (externally).

Table 2.3 Some Previous Approaches to Optimisation

No.	Year	Optimisation Object	Approaches / Methods	Objectives of optimisation
1.	2007	network of building construction cost	Monte Carlo simulation and fuzzy linear programming	Optimal cost maintenance (Boudemagh, 2007)
2.	2007	Mining sector	Math	Optimal links the geological, operational and economic dimension (Whittle, 2007)
3.	2009	urban mix	Math (equation)	Optimal industrial mix in city size(Burnett, 2009)
4.	2011	commercial building	Math probability	Optimal Fatality risks and cost-effectiveness (Stewart, 2011)
5.	2011	Structural optimisation	Math (linear and non-linear programming)	cost effectiveness (D. Frangopol, 2011)
6.	2011	Maintenance optimisation	Risk Wise software	cost efficient way for operational excellence (Cane, 2011)
7.	2011	Smart facilities	Cost, risk, benefit analysis	Utilities optimisation (Chakraborty & Quail, 2011)
8.	2011	infrastructure assets	Integer, linear programming	life cycle analysis network level decisions (Elhakeem & Hegazy, 2011)
9.	2011	Efficient building design	Math, algorithm	Neural Network Design (Zemella et al., 2011)
10.	2011	Infrastructure (road, bridge)	Math, algorithm	Maintenance plan to meet stakeholder satisfaction (Deix et al., 2012)
11.	2012	Infrastructure assets	Integer, Linear programming	Maintenance and repair timing (Elhakeem & Hegazy, 2012)
12.	2013	Sustainable building	Quantitative survey	Rating tool named AdaptStar (Conejos, 2013)
13.	2013	Building industry	Building information model (BIM) and model building and building energy simulation (BES)	Energy management building (Costa et al., 2013)
14.	2013	Building energy system	Math, algorithm	optimal configuration of the building energy system (Džiugaitė-Tumėnienė & Medineckienė, 2013)
15.	2013	Agricultural Land	Geospatial information on current land-use and crop-yield	land-use optimisation strategy (Koh et al., 2013)
16.	2013	Efficient building	Math, algorithm	Energy efficient building (investment) (Malatji et al., 2013)
17.	2013	Industrial system	Math, dependant performance degradation	Maintenance plan (Rasmekomen & Parlikad, 2013)
18.	2013	Asset management system	Multivariate asset management topography (MAMAT)	Investment and return (Bam & Vlok, 2014)
19.	2014	Land use system	Math, linear programming	Optimal land use (Delgado-Matas & Pukkala, 2014)
20.	2014	Power transformer	Weibull distribution method	Optimal operational and maintenance costs (Suwnansri, 2014)
21.	2014	Sewerage management	Genetic algorithm (GA)	Optimal total expenditure (Ward et al., 2014)
22.	2014	Infrastructure assets	Failure distribution, scoring n qualitative method	Optimal Renewal and strategies (Shivalingappa, 2014)
23.	2014	Sustainable land use	Modified SA Algorithm	Optimal Land use (zoning) (Xia et al., 2014)
24.	2015	Buildings' envelope	Constrain evolutionary algorithm	Optimal Building shape (Caruso & Kämpf, 2015)
25.	2015	Buildings' shape	Regression analysis	Efficient architecture (Fallahtafti & Mahdavinejad, 2015)
26.	2016	Land use	Genetic Algorithm	Optimal land use
27.	2017	Bridge	Probabilistic life cycle optimisation	Bridge life-cycle performance and cost (D. M. Frangopol et al., 2017)

There are some examples of techniques in figuring the current strategic position, such as political, economic, social, technological, environmental and legislative (PESTEL) analysis; strength, weakness, opportunity, and threat (SWOT) analysis, and balanced scorecard (BSC) analysis. SWOT analysis has been used widely to link internal and external factors that influence the observed strategy (i.e. asset optimisation strategy). This tool can formulate the initial strategy of an organisation and identify the current situation and future directions (Manteghi & Zohrabi, 2011). As a tool, SWOT is limited as it only provides alternatives without prioritisation, leaving the decision-maker to still need additional analysis based on alternatives. This limitation also exists in the PESTEL analysis, which relies on the quality of external information that is sometimes restricted or costly. In developing a strategy of asset optimisation, it requires the balanced perspectives of the internal and external organisation, in order to achieve optimal benefits.

Strategic choice is options for a strategy in which particular direction and method would be followed (McAdam & McCarron, 2002). The strategic choices comprise and are not limited to differentiation, diversification or market penetration. One of the methods that provide these options is Porter's generic strategy, which has three fundamental proposals in developing a strategy: differentiation strategy cost leadership and focuses (Campbell et al., 2010). The organisation can choose one of three fundamental proposals to concentrate on, or a combination of them, to create competitive advantages (Allen & Helms, 2006; Hlavacka et al., 2001; E. Kim et al., 2004; Manteghi & Zohrabi, 2011). Adoption of Porter's generic strategy in the public sector is not recommended because it needs some adjustments, according to past experience and passive-reactive approach (Hlavacka et al., 2001). Therefore, implementation of this generic strategy has to consider a contingency situation and adapt to the changing market circumstances continually (Hlavacka et al., 2001).

Strategy in action is concerned with the selected strategy being executed properly in terms of development processes of strategy, organisational structures, capabilities and resources, and some issues related to the strategy implementation (McAdam & McCarron, 2002). Within this phase, some process for ensuring strategy in working

practice is undertaken. According to McAdam and McCarron (2002), the successful strategy is about how the strategy is to be made in the appropriate way by the right persons.

The balanced scorecard (BSC) is selected in this strategic process because it integrates strategic position, strategic options, and strategy in action processes. This strategic tool combines the approach and functional management system to monitor the performances in balance condition, financially and non-financially (Franceschini et al., 2013). There are four perspectives to assess the current strategic position, namely, stakeholder, financial, internal process and learning and growth perspectives. The BSC connects the strategic position analysis and strategic choice process in terms of perspectives and key performance indicators. The strategy in action is indicated by the target of performance for each key performance indicator (KPI). Compared to PESTEL, SWOT, and Porter's generic strategy, BSC is not only a more integrative strategic tool but also reliable and simple in the development strategy process. Because of this, the BSC becomes the selected strategy tool in developing an asset optimisation strategy. The advantages of BSC make it the most influential performance measurement due to significant aspects in developing a strategic management tool (Taylor & Baines, 2012), setting organisational priorities (Bloomquist & Yeager, 2008), and its capacity as a motivational tool that can influence personal motivation through linking the performance measurement and rewards (Decoene & Bruggeman, 2006). As a strategic tool, BSC is relevant to improve productivity and at the same time, the performance of the asset, and can also be managed through its financial and non-financial aspects.

2.5.2. The approach of Developing of Asset Optimisation Strategy

The four perspectives of BSC have a weight that represents the level of importance of each perspective in contributing to the achievement of the main objective (Kaplan. & Norton., 2001). There are many alternatives that can be operated in weighing these perspectives by employing the multi-objective technique, which is the process of optimising systematically and simultaneously a collection of objective functions (Marler & Arora, 2004). These alternatives are presented in Table 2.4.

Table 2.4 Various Approaches to Multi-Objective Analysis

No.	Technique	Description	Objectives
1.	A multi-objective optimization approach (Diakaki et al., 2008)	A method with great potential for the solution of various and complicated decision problems, within the one or more limited conditions.	To find the maximum possible number of alternatives that can be achieved
2.	Pareto optimal (weakly Pareto optimal, Properly Pareto Optimal	Feasible criterion, A point is Pareto optimal if there is no other point that improves at least one objective functions	To seek the single final point of solution
3.	Efficient and Dominance	efficiency typically refers to a vector of design variables in the design space, whereas dominance refers to a vector of functions in the criterion space	To find the most admissibility or non-inferiority
4.	Global criterion method	All objective functions are combined to form a single function with no correlation to preferences, a weighted global criterion is a type of utility function in which method parameters are used to model preference.	To find the best solution from the weighted preferences
5.	Weighted sum method	Determining weight based on the relative importance of objectives. The different objective functions are ordered by importance. The least important objective receives a weight of one, and integer weights with consistent increments are assigned to objectives that are more important.	To find the most importance objective based on the weight
6.	Goal Programming	Defining goal for each objectives function, utility function is model led with goal programming format and always provide a Pareto optimal solution	To find the optimal solution
7.	Multi attribute utility theory	Identifying what is important (hierarchy), identify relative importance (weights), identify how well each alternative does on each criterion (score) can be linear or nonlinear	To measure the level of importance
8.	AHP	Quantifying relative priorities for a given set of alternatives on a ratio scale.	To measure intangible criteria along with the tangible ones through a ratio scale. In AHP, ratio scale between one and nine is used to give the relative preference between two alternatives.
9.	Genetic Algorithm	Involving unique formulations that are solved using standard optimization engines (single-objective optimisation method). It converges to global solution rather than local solution	To find the set of optimum set of solution points
10.	SMARTER (simple multi-attribute rating technique exploiting rank (Robert and Goodwin 2002)	Measuring how well each alternative does on each dimension. Technique the decision-makers places the criteria into an importance order: for example 'Criterion 1 is more important than Criterion 2, which is more important than Criterion 3,	To find rank (order) based on distribution method

The advantages of AHP compared to other methods in assigning a weight is the type of input data. The input data in AHP is based on the people's perceptions as an 'expert'. DGSAM in this research is the main source of expertise perceptions in asset management. Thus, selecting AHP in terms of the source of input data is relevant and suitable. Additionally, AHP also has the ability in dealing with the problems of unstructured multi-criterion and multi-objectives (Ishizaka & Nemery, 2013). AHP is able to resolve this problem during the process of classifying alternatives and hierarchy into the group. In terms of process and operation, the AHP is simple and applicable in the asset optimisation strategy and able to support the evaluation of alternative policies or projects (Saaty, 2008).

However, AHP is prone to fail to produce a final result if there is no consistency in comparing between variables involved. Consistency means variables should be homogenous and relevant, and far from a dissimilar variable. Consistency also means the relationship between variables and should be based on the same criteria that support each other. Therefore, between one and another variable, the level of contribution to the main goal can easily be known.

Steps of AHP Implementation

In order to achieve the objectives of BSC as a strategic tool and to minimise inconsistency in the implementation of AHP, there are five steps in defining multi-objectives and criteria in the asset optimisation strategy, as shown in Figure 2.3 below.

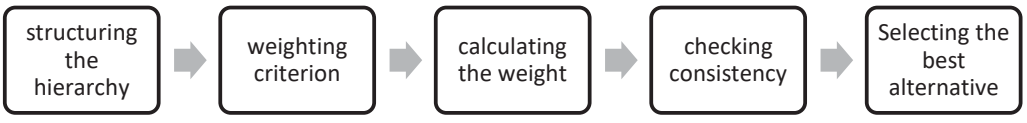


Figure 2.3 Steps of AHP Implementation

1. Structuring the Hierarchy

Hierarchy means the structured groups that are ranked based on the level of importance or another criterion (Robert S Kaplan & Norton, 2004). Selecting these criteria refers to the significant level of each element or variable to the main goal of

asset optimisation strategy. Within this process, the main goal can be broken down into criteria and sub-criteria.

2. Weighting Criteria with Scoring

This process is assigning the weight of the level of each criterion and sub-criterion. In order to assign the weight, valuation of each is based on the pairwise between criteria. As above-mentioned, the accuracy of the AHP depends on the weighting process and comparison. The comparison between criteria is in Table 2.5.

Table 2.5 Scale of Comparison (Saaty, 2008)

Score	Degree of preference
1	Equal importance
3	Moderate importance of one factor over another
5	Strong or essential importance
7	Very strong importance
9	Extreme importance
2,4,6,8	Compromise values
1/3, 1/5, 1/9	Inverse comparison

The output of the weighted criteria is K matrix:

$$K = \begin{bmatrix} k11 & k12 & k13 \\ k21 & k22 & k23 \\ k31 & k32 & k33 \end{bmatrix}$$

Where, $k11$ = score of comparison between criterion 1 with criterion 1
$k12$ = score of comparison between criterion 1 with criterion 2
…

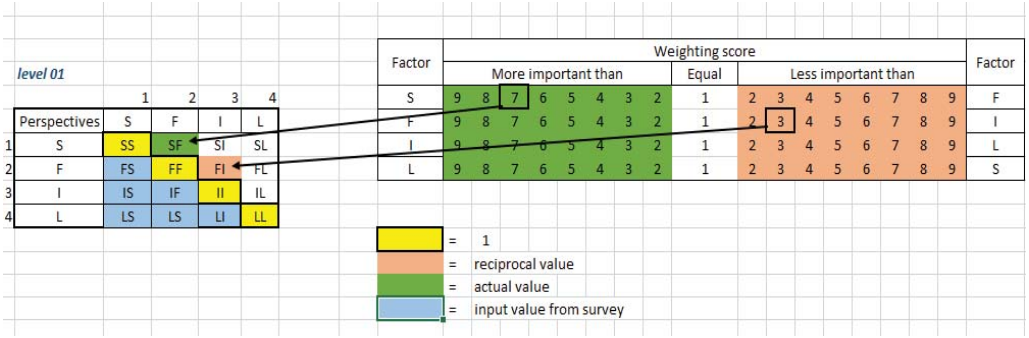
kij = score of comparison between criterion i with criterion j

kii = 1

kij = kji^{-1}

The pairwise level 01 as in Table 2.6 below:

Table 2.6 Pairwise of Level 01



The input of pairwise is based on the participant's perception during the survey. It will consist of 6 (six) questions, based on the pairwise of the objective of stakeholder (S), Financial (F), Internal process (I) and Learning and growth (L).

The pairwise level 02 consists of the pairwise of objectives to find local priority and global priority of each perspective, as illustrated in Table 2.7 below.

Table 2.7 Pairwise of Level 02

		S1	S2	S3	S4	S5	F1	F2	F3	I1	I2	I3	I4	I5	I6	I7	I8	L1	L2	L3
1		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
2	S1	S1S1	S1S2	S1S3	S1S4	S1S5	S1F1	S1F2	S1F3	S1I1	S1I2	S1I3	S1I4	S1I5	S1I6	S1I7	S1I8	S1L1	S1L2	S1L3
3	S2	S2S1	S2S2	S2S3	S2S4	S2S5	S2F1	S2F2	S2F3	S2I1	S2I2	S2I3	S2I4	S2I5	S2I6	S2I7	S2I8	S2L1	S2L2	S2L3
4	S3	S3S1	S3S2	S3S3	S3S4	S3S5	S3F1	S3F2	S3F3	S3I1	S3I2	S3I3	S3I4	S3I5	S3I6	S3I7	S3I8	S3L1	S3L2	S3L3
5	S4	S4S1	S4S2	S4S3	S4S4	S4S5	S4F1	S4F2	S4F3	S4I1	S4I2	S4I3	S4I4	S4I5	S4I6	S4I7	S4I8	S4L1	S4L2	S4L3
6	S5	S5S1	S5S2	S5S3	S5S4	S5S5	S5F1	S5F2	S5F3	S5I1	S5I2	S5I3	S5I4	S5I5	S5I6	S5I7	S5I8	S5L1	S5L2	S5L3
7	F1	F1S1	F1S2	F1S3	F1S4	F1S5	F1F1	F1F2	F1F3	F1I1	F1I2	F1I3	F1I4	F1I5	F1I6	F1I7	F1I8	F1L1	F1L2	F1L3
8	F2	F2S1	F2S2	F2S3	F2S4	F2S5	F2F1	F2F2	F2F3	F2I1	F2I2	F2I3	F2I4	F2I5	F2I6	F2I7	F2I8	F2L1	F2L2	F2L3
9	F3	F3S1	F3S2	F3S3	F3S4	F3S5	F3F1	F3F2	F3F3	F3I1	F3I2	F3I3	F3I4	F3I5	F3I6	F3I7	F3I8	F3L1	F3L2	F3L3
10	I1	I1S1	I1S2	I1S3	I1S4	I1S5	I1F1	I1F2	I1F3	I1I1	I1I2	I1I3	I1I4	I1I5	I1I6	I1I7	I1I8	I1L1	I1L2	I1L3
11	I2	I2S1	I2S2	I2S3	I2S4	I2S5	I2F1	I2F2	I2F3	I2I1	I2I2	I2I3	I2I4	I2I5	I2I6	I2I7	I2I8	I2L1	I2L2	I2L3
12	I3	I2S1	I3S2	I3S3	I3S4	I3S5	I3F1	I3F2	I3F3	I3I1	I3I2	I3I3	I3I4	I3I5	I3I6	I3I7	I3I8	I3L1	I3L2	I3L3
13	I4	I4S1	I4S2	I4S3	I4S4	I4S5	I4F1	I4F2	I4F3	I4I1	I4I2	I4I3	I4I4	I4I5	I4I6	I4I7	I4I8	I4L1	I4L2	I4L3
14	I5	I5S1	I5S2	I5S3	I5S4	I5S5	I5F1	I5F2	I5F3	I5I1	I5I2	I5I3	I5I4	I5I5	I5I6	I5I7	I5I8	I5L1	I5L2	I5L3
15	I6	I6S1	I6S2	I6S3	I6S4	I6S5	I6F1	I6F2	I6F3	I6I1	I6I2	I6I3	I6I4	I6I5	I6I6	I6I7	I6I8	I6L1	I6L2	I6L3
16	I7	I7S1	I7S2	I7S3	I7S4	I7S5	I7F1	I7F2	I7F3	I7I1	I7I2	I7I3	I7I4	I7I5	I7I6	I7I7	I7I8	I7L1	I7L2	I7L3
17	I8	I8S1	I8S2	I8S3	I8S4	I8S5	I8F1	I8F2	I8F3	I8I1	I8I2	I8I3	I8I4	I8I5	I8I6	I8I7	I8I8	I8L1	I8L2	I8L3
18	L1	L1S1	L1S2	L1S3	L1S4	L1S5	L1F1	L1F2	L1F3	L1I1	L1I2	L1I3	L1I4	L1I5	L1I6	L1I7	L1I8	L1L1	L1L2	L1L3
19	L2	L2S1	L2S2	L2S3	L2S4	L2S5	L2F1	L2F2	L2F3	L2I1	L2I2	L2I3	L2I4	L2I5	L2I6	L2I7	L2I8	L2L1	L2L2	L2L3
20	L3	L3S1	L3S2	L3S3	L3S4	L3S5	L3F1	L3F2	L3F3	L3I1	L3I2	L3I3	L3I4	L3I5	L3I6	L3I7	L3I8	L3L1	L3L2	L3L3
Number of questions :		18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	171

= reciprocal value
= input from survey

Total number of question for level 02 is 171 questions

On Level 03 the highest score of a criterion will be selected as the best activity to improve the key performance indicator. The level of weight in each level means the degree of contribution to the main goal of the asset optimisation strategy. Based on the first and second most important priority, the initiative strategy can be improved through the highest score of KPI.

3. Calculating the Weight

Calculation of weight can be done after the eigenvector is found from the matrix of criterion. The eigenvector associated with a degree of priority from one criterion over the other criteria. The step to calculate the eigenvector is:

1. Squaring the criteria matrix means K^2
2. Summing each row of K^2 matrix, or Si = $\sum_{j=0}^{n} k.i.j$ = ki0 + ki1 + kin, where i = row of i
3. Normalising (N) to find the eigenvector:

$$N = \begin{bmatrix} n1 = \frac{S1}{\sum_{i=1}^{n} Si} \\ n1 = \frac{S2}{\sum_{i=1}^{n} Si} \\ n1 = \frac{S3}{\sum_{i=1}^{n} Si} \end{bmatrix}$$

Therefore, after normalisation, the priority of the criterion will be found as the highest number between n1 or n2 or n3.

In order to find the best alternative, steps 1 to 3 can be done.

4. Checking the Consistency

Consistency is the key to finding the best and accurate solution. According to (Saaty, 2008), consistency ratio (CR) is CR<0,1, or in other words, inconsistency is only a maximum of 10%. Where the CR = CI/RI,

RI is a random index:

N	1	2	3	4	5	6	7	8	9	10
RI	0	0	0.58	0.9	1.12	1.24	1.32	1.41	1.45	1.49

$$\text{CI} = \frac{\lambda^{max-n}}{n-1}$$

Where CI = consistency index

λMax = the highest Eigen number for matrix =$\sum i = 1 = Ki.Ni$

Ki = weighted of matrix K column i.

Ni = Eigenvalue of matrix row i

2.6. Development of an Asset Optimisation Strategy in Indonesia

2.6.1. Application of BSC as a Strategy Tool in Public Sector in Indonesia

One of the existing regulations that reveal governmental endeavour is related to the implementation of the Balanced Scorecard (BSC) as stated in the Minister of Finance Regulation number 467/KMK.01/2014 (MoF, 2014). According to this decree, measuring the performance of governmental activities including asset management is based on the BSC. The Directorate General of State Asset Management (DGSAM) has implemented the BSC in terms of financial accountability, program products or output, the standard of quality in service delivery, key performance indicators and client satisfaction. The current use of BSC has been framed by the organisational vision, which is managing governmental assets professionally and accountable to serve the nation.

The consideration of adopting the BSC in the public sector as a nonprofit organisation, according to Niven (2003) is due to increase the awareness in improving performance and need to measure it. This application is to emphasise the financial accountability means how funds were spent, concern with the quality of service delivery, client satisfaction and how all of the key areas of measurements are assessed in key performance indicators (KPIs). The core of the BSC is the strategy itself, regardless of the level of organisation and type of organisation (R.S. Kaplan, 2002).There is an apparent distinction between the public and nonprofit organisations-BSC that is in place the mission as the top of the strategy. In the public sector, the customer is not as defined as in the private sector. In the private sector, customers mean the shareholder

as capital providers who monitors the results based on the financial perspectives. However, in the public sector, the customers are not only who pays the taxes, but also constituents, legislative body, group of customers and social community, etc. The concern is when the mission is achieved, it will be most likely satisfy the disparate group of customers.

There are four Perspectives of BSC that have been implemented in the strategic map of Echelon 2, and it represents the responsibility of DGSAM as a governmental asset manager (see Figure 2.4). These perspectives are:

a. Stakeholder perspectives
b. Customer perspectives
c. Internal perspectives
d. Learning and growth perspectives

Each perspective reflects organisation priorities and culture (Decoene & Bruggeman, 2006). Placing the stakeholder as the top hierarchy means stakeholder has the strategy objectives, priority and performance measurement to compare to the others. DGSAM has also distinguished the stakeholder and customer as the separated perspective. It allows for different strategic objectives and performance measurements. The impact of this separation is not the excessive consideration in external perspective, but it may cause in missing another perspective due to four perspectives concept. In fact, the financial perspective is missed out. This matter has been argued that the adoption of BSC is also encouraged by the fact that there is no organisation that can accomplish the customer needs without financial resources, regardless of its status. Meaning that there is no completed balanced scorecard without financial status (Niven, 2003). This aspect in the private sector is clear, but in government or public sector may be arguable. However, the facts that when the government service is delivered with the great efficiency to achieve the mission, most likely it will attract the funder for investment, or at least will meet the social communities need and satisfy them.

Empirical BSC literature concerns on success or failure of implementation have not been examined, however, the success factor when it is in the public sector according to D Northcott and Ma'Amora (2012) can be identified as the commitment of top management, service excellent enforcement, clear organisation strategy and missions

and links to the incentive schemes. Some suggestions have been raised for BSC in the public sector that it is not very specific because the BSC can be equally implemented as in the private sector. Some countries have applied the BSC in the public sector in various area of services including and not limited to transportation in Turkey (Canitez et al., 2018), sport services in Granada (Bolivar et al., 2010), health sector (Behrouzi et al., 2014; Grigoroudis et al., 2012), and waste sector in Portugal (Mendes et al., 2012).

A well-designed BSC describes the strategy through objectives and measures it. The selected measurement should link from various ways to accomplish the improvement in customer outcome as is reflected in customer perspectives (Niven, 2003). These are the cause and effect relationship from the performance drivers of other perspectives which include learning and growth, financial and internal process. Assessment of the implementation of BSC in public sector confirms that the power of BSC is to link the measures to the organisational strategy map and the role of strategic alignment and management control in the BSC (Hoque, 2014; Malina & Selto, 2001)

2.6.2. Implementation of Strategy map of BSC

Developing a strategy map of BSC means outlining the objectives, measurement, initiatives in accordance with the strategic objectives link with each perspective (Robert S Kaplan & Norton, 2004). In the public sector, translation perspective and its objective require to be done to clarify the nature of the nonprofit oriented organisation, and to minimise the possible issues and to ensure the precision in performance measurement (Cugini et al., 2011; Niven, 2003). The translation of each perspective then is followed by its objectives. Customer perspective in the public sector context requires adjustment between customer and shareholders and adjustment on how to add value for the customer, society, and stakeholder. The public sector organisation customer may expect the best solution as part of customer understanding (Tapp, 1995) and the type of required service or product.

The internal process perspective for the public sector should be able to determine the process to add value continuously to the customer, society, and stakeholders. In order to be excellent in the internal process, it can focus on technology and human capital

(Kaplan & Norton, 2001; Schobel & Scholey, 2012). This focus may lead to developing a current process or build new processes, additional resources may also need to be added, in short, and long term processes such as new transparency or positive image of organisation (Bolivar et al., 2010; Carolina Elena Leyton & Joan Carles Gil, 2017).

Learning and growth perspective in public and private context places the importance of the human capital role and infrastructure to achieve the objective and support the outcomes, such as required skill and competency for present and the future, accessibility of organisational information and organisational system, culture and environment (Mendes et al., 2012; Niven, 2003). Finally, the financial perspective of public sector organisation constructs cost reduction and efficiency; also utilisation (Behrouzi et al., 2014) and how to maintain budget efficiency and deliver the service within the budget (Schobel & Scholey, 2012). Compared to the private sector, the strategy map from a financial perspective is to maximise profit, according to Kaplan and Norton (2001), public sector organisation can be adapted by rearranging the scorecard and placing the customers including constituents and stakeholder at the top of the hierarchy. The main objective of the financial perspective and its measurements refers to the accountability of the budgetary fund and provide necessary means for the growth of other perspectives (Mendes et al., 2012). One of the applications of BSC in public sector concerns the operative budget covering operational expenses within the short term period and the strategic budget that links to the long term period. These two budget resources should be designed to monitor in achieving the strategic goal in BSC (Bolivar et al., 2010).

2.6.3. Limitation of current BSC in Indonesia and Its Impacts

The first step of an asset optimisation strategy is a strategic position. In this particular step, the scrutiny process of the recent implementation of asset management is taken. Investigative step to assess drawbacks and advantage of the strategy is done. In the Indonesian context, the adopted strategy to optimise assets is implemented by the Ministry of Finance, whereby the Balanced Scorecard (BSC) becomes one of the strategic tools and performance measurements of the Directorate General of State

Asset Management (DGSAM) or Direktorat Jenderal Kekayaan Negara (DJKN) as the governmental asset manager. The DGSAM has established BSC in developing a strategy for asset management (2014). This strategic tool allows the DGSAM to optimise governmental assets to achieve an organisational vision, which is professional and accountable to manage governmental assets as the nation's wealth.

However, evidence revealed that the numerous number of underutilised and unregistered assets may affect the current adoption of BSC as a strategic tool. According to (Khomba, 2015b), BSC may not be applicable in societies such as in France, where the top-down approach is developed at a senior level and then cascades down to the lower levels. The lower level, therefore, has no opportunity to contribute to improving strategy, or in other words, this BSC concept is not an integrated tool. BSC also has limitations in terms of prioritisation and strategic approach development and perspective. Among these aspects, a manager has no options to decide the most important and less important in improving low or under target performances. Another limitation of the BSC is the ignorance of the multi-stakeholder-centred approach. This means that only a profit-motivated organisation is maximised and other important stakeholders, such as government and communities, are disregarded (Khomba, 2015b). Starting from this particular point, in a DGSAM context, the examination of key elements of asset optimisation in BSC implementation become the focal point of a current asset optimisation strategy.

Additionally, still connected to the key elements, especially natural environment aspects, the current DGSAM BSC has not aimed at environmental aspects as one of the perspectives. Therefore, it has a lack of consideration of natural environmental aspects, such as flooding that frequently occurs in areas of the DGSAM regional office including in Semarang (Harwitasari & van Ast, 2011; Marfai & King, 2008), adapting building structures or budgets for maintenance has not yet been prepared, while this BSC has been adopted (2014). Some of the governmental offices' regional and operational levels are prone to climate disasters including flooding, sea-level inundation, and heavy rainfall. Based on this situation and evidence, the modified BSC can be proposed to improve the current asset management strategy.

2.6.4. The Existing Key Elements of Asset Optimisation Strategy in Indonesia

The fundamental aspect of the implementation of asset management in Indonesia started in terms of regulation, as indicated by the Republic of Indonesia Regulation Number 38 in the year 2008, which is an amended regulation of the Indonesia Regulation Number 6 in the year 2006, on the management of central and regional government assets. These regulations have been amended through the Indonesian Regulation Number 27 in the year 2014. The implementation of this main regulation is ruled in the Regulation of Minister of Finance of Indonesia, number 109/PMK.06/2009 on the guidance of preparation of inventory, valuation and report of government assets. The following paragraphs are limitations on the key elements of asset optimisation that currently exists in Indonesia, from different aspects of discussion including legal, completeness reliability and relevance aspects. These aspects are key indicators in measuring the performance of each key element. One key element may have more than one performance indicator. It will then be followed by the proposed improvement in order to be more effective as the key performance indicator of developing strategy. The summary of the limitation on key elements is illustrated in Table 2.8.

Table 2.8 shows the limitation on all key elements to develop an asset optimisation strategy. It is crucial to adhere to the causes and how to overcome these weaknesses in order to minimise the impacts. However, as the implementation of asset optimisation is a statutory strategy, therefore, most of the supporting action has to be underpinned by the governmental legislation (Hood et al., 1998). However, it still has a good chance to improve for better asset management.

The limitation on asset data consists of incomplete information related to land or building that can produce an inaccurate decision. Asset classification informs the circumstances of an asset in terms of the primary function for which a building or construction is intended to be used. However, some buildings tend to have an additional function in generating revenue (Humas, 2015). The ground reasons for not disclosing these are not because the related regulations do not exist, but because the enforcement of regulations is minimum (BPK, 2015).

Table 2.8 Limitation of Key Elements and Its Impacts

No.	Key elements (Based on asset optimisation strategy)	Limitations *	Impacts
1	Asset data	1. There is not enough data on asset classification such as idle, underutilised, normal usage) 2. There is not enough data related to potential or in generating government revenue	1. Minimising number of underutilised assets is not effective and efficient 2. Lost opportunity to generate income
2	Asset layout	1. Asset layout is unavailable 2. Layout optimisation level land and/or building is not available	1. Optimised land and building layout cannot be achieved 2. Over-budget 3. Potentially reduce worker's productivity 4. Reducing stakeholders' satisfaction in meeting client expectations
3	Asset maintenance and monitoring system	1. System to monitor asset maintenance is unavailable 2. Maintenance based on the physical observation	1. Budget planning is ineffective and inefficient 2. Reducing stakeholders' satisfaction due to stoppage of service delivery or declining quality of service
4	Budgeted fund	1. There is no middle or long term budget for refurbishment or renovation 2. There is no budget forecasting for natural environment factors	1. Budget planning is ineffective 2. Potential deficit in budget
5	Stakeholder's requirements	Stakeholder satisfaction level and evaluation on asset (land and building) are unavailable	Lack of improvement in stakeholder satisfaction
6	Natural environment	Hazardous neighborhood and potential disastrous climatic or environmental factors are unavailable	1. Interruption in providing service 2. Increasing risks such as health, financial risks 3. Increasing maintenance costs 4. Immature capital expenditure
7	Skilled asset manager	Innovations and improvement of asset management and asset strategy is limited	1. Inefficient asset management 2. Unreliable planning and control on asset

* Source: (BPK, 2015; Kemenkeu, 2015)

In the related regulation, such as the Regulation of Minister of Finance of Indonesia number 71/PMK.06/2016, the idle public asset has to be identified, tracked, reported, administrated and managed properly to support government function and to provide government revenue. This regulation also has the responsibility to optimise public building and provide the ideal standard of the governmental building for budgetary planning purposes. Additionally, the regulation of the Minister of Finance of Indonesia number 57/PMK.06/2016 states that public assets such as land and building have the opportunity to generate non-tax government revenue through a lease scheme. This regulation amended the Regulation of Minister of Finance of Indonesia number 33/PMK.06/2012. Consequently, the classification of assets and the opportunity to generate revenue has to include the performance measurements as the additional key indicators.

The similar situation has persisted on the asset layout where the related regulation has been released as a foundation of the asset layout to optimised office building and facilities. Asset layout is ruled in the Minister of Finance Regulation (PMK) Number 7/PMK.06/2016, as an amendment to the Minister of Finance Regulation (PMK) Number 248/PMK.06/2011 on the standard of goods and standards of governmental asset needs of the land and/or building. The inclusion of the asset layout in the key performance indicators, therefore, is critically needed (Kemenkeu, 2015).

The limitation on asset monitoring and maintenance systems occur because of the absence of regulation to endorse the monitoring and maintenance of assets. Moreover, the periodic monitoring of assets is five-year bases, as stated in the regulation of the Minister of Finance of Indonesia number 52/PMK.06/2016 that sets the five-year control of government assets in accordance with the public interest, the public service performance of government assets, government asset condition, financial and other utilisations. This regulation also relates to the stakeholder requirement where the evaluation of stakeholder satisfaction in terms of assets is conducted within five years and this will be too late to improve performances.

The budget fund element sometimes becomes a barrier because of the absence of putting the natural environment as one of the key elements, consequently, the budget

to prepare for the disaster events has not been set up. According to the policy direction of the governmental budget in 2017, the natural environment in terms of global climate change is one of the government priorities in the period of 2018 to 2020, hence, the involvement of the natural environment factors as one of the key elements, and as a key performance indicator, is reasonable.

2.6.5. Key Findings of the Limitation of Current BSC in Indonesia

The practical aspects of asset optimisation in Indonesia can be found in progressing governmental regulations in relation to assets management. As the vision of asset management in Indonesia is that of professional asset management, this means that Indonesia is expecting to modernise its public asset management (Humas, 2015). The modern asset management is conducted by the government with clear responsibility and accountability for their actions to the public (Grubisic et al., 2009; Stewart, 1989).

1. Four Perspectives and Balanced Concept

The absence of the financial perspectives means that the current strategy sets the performance according to the non-financial aspects. This may due to the argument that the non-financial perspective leads the performance measure when it focuses on the long term value-added creation. However, without the financial perspective also indicates less priority in defining the shareholders' satisfaction. In the government perspective, the financial aspects are important to provide a way forward based on the cost, emphasising strategy or improving financial management including how to manage budget and funding (Sloper et al., 1999). Moreover, the financial perspective for non-profit organisation focus to capture more of the stakeholder interests including the drivers of performance in operational excellence and budget efficiency (Sharma & Gadenne, 2011). As stated by R.S. Kaplan and Norton (1992), one of the arguments in the BSC is balancing between financial and non-financial aspects, which also means finance has to be acknowledged as the focal perspective. The suggestion from Kaplan and Norton (2001) when BSC turns into the public sector organisation can be adapted by replacing the customer as the top of the hierarchy. However, past literature reveals that the adaptation or modification of BSC to suit the public sector organisation has no significant problems (Griffiths, 2003; Kaplan. & Norton., 2001; Northcott., 2012).

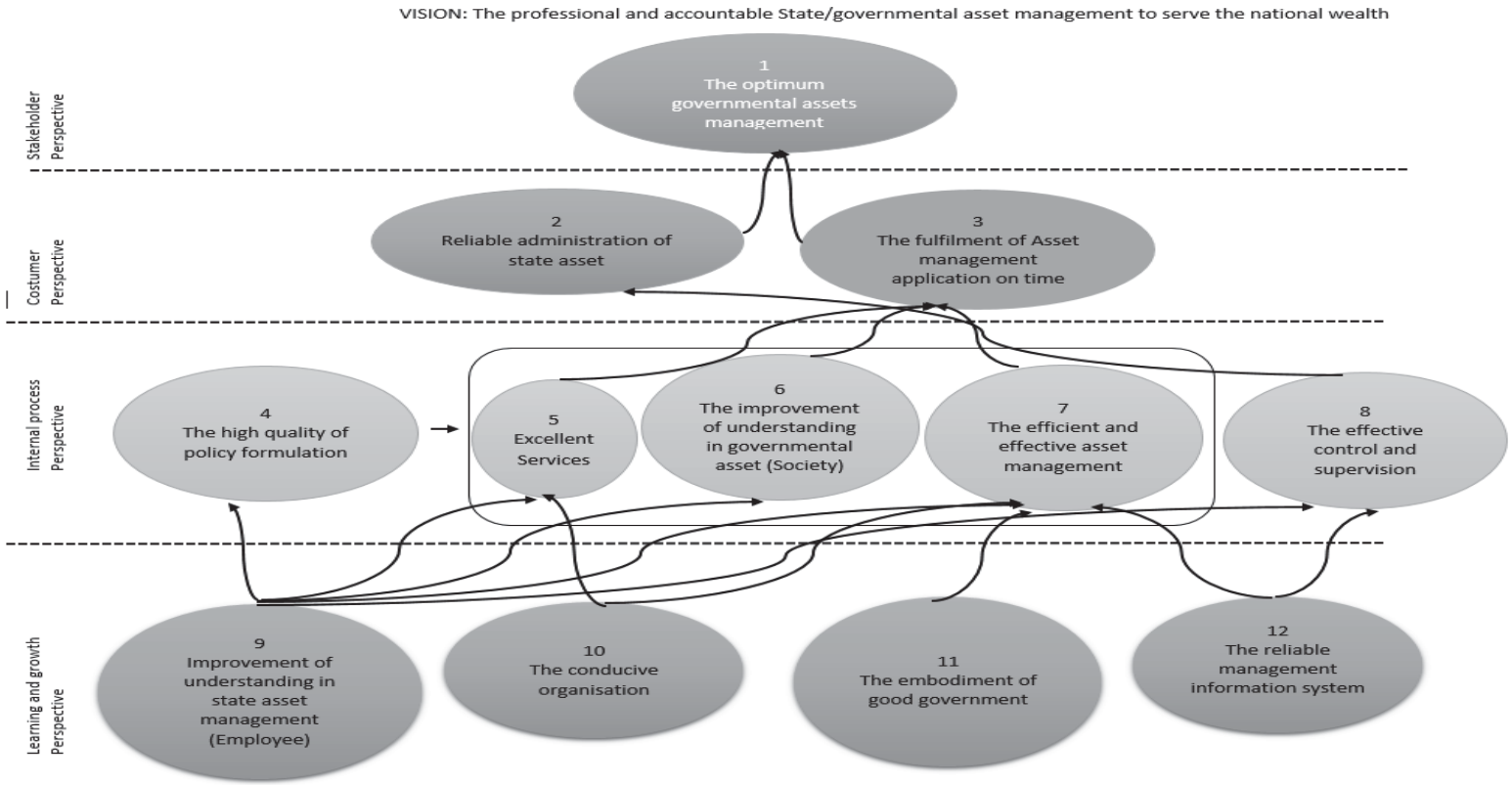


Figure 2.4 Current Strategic Map of Echelon 2 level of DGSAM

Source: Guide Book of Management Performance-Based Balanced Scorecard in the Ministry of Finance Republic of Indonesia 2010

Figure 2.4 shows the current strategic map of asset optimisation as in BSC based on four perspectives, namely, learning and growth perspectives, internal process perspectives, customer perspectives, and stakeholder perspectives. Each perspective has strategic objectives (SO) to be achieved using the key performance indicators. The absence of the financial perspective might result in less concern of the financial aspect and it potentially disturbs the objectives of strategy in general.

2. Strategy Objectives (SO)

There are SO's on each perspective which shows the goal of the performance measurements. The top hierarchy is the customer perspectives where the SO of this perspective is to achieve optimum asset management. The customer perspective has objectives to accomplish the reliable state asset administration and to serve the asset management on time. In the internal process perspective, some objectives such as the achievement of the high quality of policy formulations, the excellent services, the improvement of understanding in governmental asset management, the efficient and effective asset management and the effective control and supervision. Under the learning and growth perspective, the strategy has objectives for an employee in improving understanding of asset management and constructing the conducive organisation. In this perspective, there are also other strategic objectives such as conducive organisation, the embodiment of good government and reliable management information systems. The customer perspective has SO associated with the clients' satisfaction in regards to the DGSAMas the asset operator of governmental assets. The stakeholder perspective has SO that indicates the stakeholder side of the Ministry of Finance of Republic Indonesia as the asset owner. The stakeholders consist of other departments, governmental organisation, institutions, bodies of the Republic of Indonesia.

In the context level, the implementation of this BSC however still have drawbacks in achieving an internal process perspective, as it has been indicated that 57.74% or AUD 97.67 billion of the total assets have not been registered and more than IDR 6.71 trillion/AU$ 0.7 billion is underutilised (BPK, 2015). These drawbacks will be

examined further in the BSC implementation in the test case as part of this research methodology.

3. Avoidance of The Overlapping and Repetition Among the Perspectives

To summarise, the limitation of adopting key elements in the existing BSC at DGSAM is that there are missing and overlapping elements. These are asset data and asset layout that contribute to the accomplishment of goals in the internal perspective, which comprises the accountable administration and control of the asset. The natural environment is another key element that has not been considered. As a consequence, recognition in terms of policy or program on this aspect is limited. The overlapping of learning and growth perspective and financial perspective has also occurred that caused less focus on these perspectives. Learning and growth should be an independent perspective to measure the employee skill, satisfaction, productivity and the availability of information and alignments. On the other hand financial perspective for non-profit organisation focus to capture more of the stakeholder interests including the drivers of performance in operational excellence and budget efficiency (Sharma & Gadenne, 2011). Since one of the arguments in the BSC is balancing between financial and non-financial aspects (Saaty, 2008), it also means finance has to be acknowledged as the focal perspective. The overlapping is indicated by the unnecessary repetition when splitting the customer and stakeholder as different perspectives. In the quality management context, treatment of customer and stakeholder could be similar (Olander & Landin, 2008), as the customer is a sub-group of external stakeholders. Therefore putting customers as part of stakeholders will include internal and external parties (customers). These missing and overlapping elements consequently will raise different indicators in the performance measurement.

2.6.6. Proposal for Strategy Map Modifications

Table 2.9 shows the proposed additional key elements of asset optimisation into current BSC based on the literature review. The financial perspective is one of the perspectives that are proposed, as the concept of BSC is a balance between financial and non-financial perspectives (R.S. Kaplan & Norton, 1992). As the governmental organisation, implementation of BSC at DGSAM has to consider the financial aspects

(Pagiola, 2002), which are generating revenue from available resources including land and buildings. Moreover, the government budget is one of the indicators of good asset management (Kaganova, 2010). Therefore, omitting the financial perspective means ignoring an important aspect of government asset management. The financial perspective represents not only the governmental budget but also the ability of an organisation to generate income. On the other hand, the stakeholder perspective in BSC represents all internal and external users including customers. Therefore, measuring performance in terms of stakeholders and customers as a separate perspective is repetitive and not efficient.

Table 2.9 shows the current DGSAM key indicators that have not included key elements of asset optimisation yet. The absence of these key elements has affected the current asset management as indicated in the above mentioned, such as underutilised and unregistered assets. There is only one strategic objective in the stakeholder perspective, which is optimum asset management. In this sense, optimum asset management has to be the main objective of the whole process of asset management. Therefore, it needs to be supported by other strategic objectives based on the four perspectives (Kaplan. & Norton., 2001). Therefore, as mentioned in Table 2.9, the proposed strategic objectives in the stakeholder perspective are the key elements of stakeholder requirements and natural environment fulfilment. This perspective connects to the internal and external parties of the organisation and can include government, clients, society, and neighbours. Requirements of stakeholders have to be considered and fulfilled in this perspective. The neighbours' natural environment also has to be considered carefully, because the government as a stakeholder is concerned about the natural environment as part of its global responsibility and sustainability.

Table 2.9 Proposed Key Elements for Current BSC

No.	Perspectives Based on BSC	The BSC Perspectives Adopted by DGSAM	DGSAM Strategic Objectives	Proposed Key Elements to Frame Additional KPIs
1	Stakeholders Perspectives	Stakeholder perspectives	Optimum asset management (1),	Stakeholder requirement, Natural Environment
2	Financial Perspectives	-	-	Budget fund
		Customer perspectives	Reliable administration of state asset (2) and Fulfilment of asset management application on time (3)	-
3	Internal process perspectives	Internal process perspectives	The high quality of policy formulation (4), excellent service (5), The improvement in understanding of the governmental asset (Society) (6), the efficient and effective asset management (7), The effective control and supervision (8)	Asset data Asset Layout Asset maintenance and performance monitoring system
4	Learning and Growth perspectives	Learning and growth perspectives	Improvement in the understanding of state asset management (Employee) (9), the conducive organisation (10), the embodiment of good government (11) The reliable management information system (12)	Skilled asset manager

Source: (Franceschini et al., 2013) and (MoF, 2014)

Additionally, because customer perspectives have been represented in the stakeholder perspective, this perspective is proposed to be omitted. Financial perspectives then become one of four perspectives replacing customer perspectives. Therefore, the optimum budget is an objective strategy in the financial perspectives, or in other words, the key element of the budgeted fund is considered as an important element in the optimisation strategy.

The current BSC at DGSAM in the internal perspective has not considered the important aspect of an asset such as data, in the strategic objective. It has dealt with the policy formulation (4), excellent service (5), improvement in understanding in the governmental asset for society (6), efficient and effective asset management and effective control. The role of asset data, asset layout and asset maintenance and performance monitoring are significant to reduce underutilised assets and unregistered assets. Moreover, performance monitoring is associated with the quality of public services. As a consequence, these elements have been proposed to complete the current internal perspective as additional strategic objectives.

Continuing this idea, the learning and growth perspective has deliberated the improvement of understanding in state asset management. This understanding is only how to build better knowledge as an operator of the asset, not as a manager. However, asset manager capability needs to be improved for a better quality of policy, asset planning and optimisation of assets. Therefore, the strategic objective needs are proposed to be modified into competitive and reliable human resources in order to capture the skilled manager as one of the key elements. This modification consequently will be followed by additional key performance indicators (KPIs).

Putting the Key elements into the Strategic Objectives (SO)

Strategic objectives articulate the vision and mission of the organisation through strategic themes. As the key element is a strategic theme, the strategic objectives need to be achieved using specific measurement, which is a key performance indicator (Quezada et al., 2009). Articulating the key element into the strategic objectives, the proposed additional strategic objectives are as in Table 2.10.

Table 2.10 Putting Key Elements into Strategic Objective

Perspectives	Key Elements	Strategic Objectives
Financial	Budgeted fund	Optimum Budget
Stakeholder	Stakeholder requirements	Stakeholder Satisfaction
	Natural Environment	Natural Environment Fulfilment
Internal	Asset Data	Accountable Administration and Control of Asset
	Asset Layout	
	Asset Maintenance and Performance monitoring	
Learning and growth	Skilled asset manager	Competitive and Reliable Human Resources

The proposed strategy map based on the key elements as the main frame for asset optimisation is shown in Figure 2.5.

The main objective of asset strategy based on the vision of DGSAM is to achieve optimum asset management. The asset optimisation strategy has mainly been represented by the Directorate of State-owned Assets which has four strategic objectives (SO) based on each perspective. The Stakeholder perspectives consist of SO Stakeholder satisfaction and natural environment fulfilment. This SO is framed by key elements of asset optimisation, which are stakeholder requirements and natural environment. SO optimum budget represents a key element budgeted fund from a financial perspective; SO accountable administration and control on assets represent key element asset data, asset layout, and asset maintenance and performance monitoring. The four SOs have a key performance indicator (KPI) where the achievement of the strategic objective relies on the level of achievement KPI. Skilled human resources are part of learning and growth perspectives, which are competitive human resources.

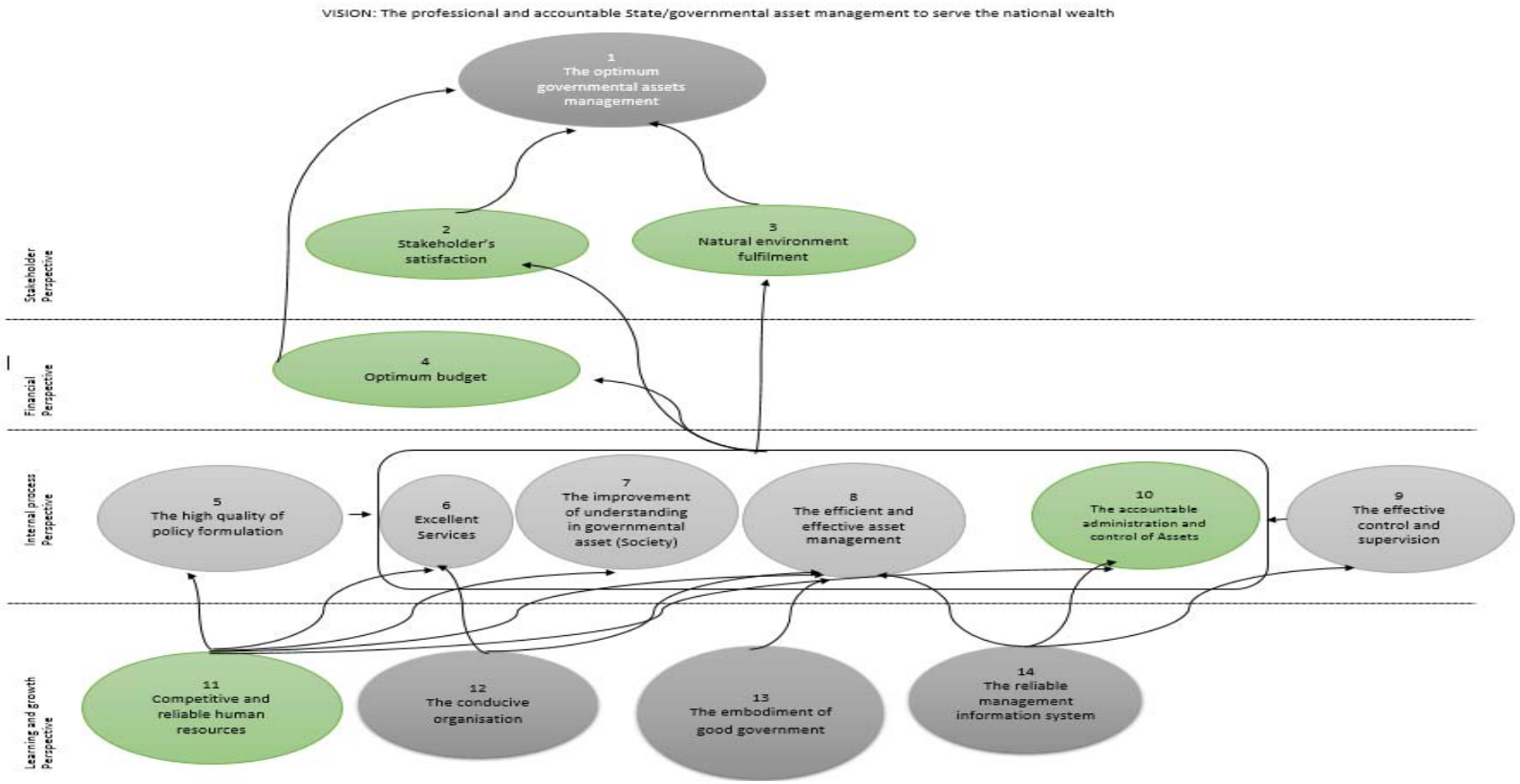


Figure 2.5 Proposed Strategy Map for Asset Optimisation Strategy of Echelon 2 level of DGSAM

*Note: the green circles indicate additional strategic objectives based on the key element

2.6.7. Key Performance Indicator (KPI) of Modified BSC

The role of the key elements of asset optimisation is to frame the BSC to achieve the organisation's goals. In this research, the implementation of BSC in terms of measurement and targets will focus only on the additional key elements as part of the objectives of each perspective. As mentioned in Figure 2.5, the objectives of each perspective then need to be measured using the key performance indicators. Currently, the DGSAM has measured and implemented KPIs of internal perspectives except for the SO of accountable administration and control of assets. Therefore, this goal will be examined in this research. The accountable administration and control of assets are an interpretation of asset data and asset layout of key elements. Asset data requires the availability of basic data of land and buildings, including asset classification and function, land ownership and boundaries, and value of land and building as asset data indicators. Total maintenance costs, physical condition index and functional index are indicators of asset maintenance and the monitoring system. Asset layout has building density and efficient land index as key indicators. Other SO such as the high quality of policy formulation, optimum governmental receivable management, and effective control and supervision will not be examined in this research. Because it connects to the other business process of DGSAM besides asset management, it is not in the scope of this research. It is also in the learning and growth perspective which are SO of the reliable management information system and conducive organisation. However, for SO of competitive human resources, this research specifically examines the interpretation of the key element of skilled asset manager into the KPIs. These key performance indicators of each key element are shown in Table 2.11

Table 2.11 Key Performance Indicators (KPIs) of Strategic Objectives Based on Key Elements

Strategic Objectives (SO)	**Stakeholder Satisfaction**	**Natural Environment Fulfilment**	**Optimum Budget**	**The Accountable Administration and Control of Asset**			**Competitive and Reliable Human Resources**
Key elements	Stakeholder's requirement	Natural Environment	Budgeted fund	Asset Data	Asset maintenance and monitoring system	Asset layout	Skilled Asset Manager
Measurement of Key Element (Key Performance Indicator)	Number of complaints	Compliance indicator	Sum of deviation of the planned budget	The availability of basic data	Total Maintenance expenditure	Building density	Improvement of understanding of asset management
	Customer Satisfaction index	Pollution prevention indicator	Percentage of operation and maintenance costs of the total cost	Land ownership and boundaries	Physical Condition Index	Efficient land use mix	Number of training and certification
		Eco-efficiency indicator	Cost-effectiveness ratio	Value of land and buildings	Functional Performance Index		Level of employee satisfaction

Source : Rodríguez Bolívar et al. (2010), Booysen (2014), Dias-Sardinha and Reijnders (2005), Farran and Zayed (2012), Hajkowicz (2008), Davis (2016) Halkos and Bousinakis (2010), and Jin et al. (2013).

A. Key Element: Stakeholder Requirements

1. Number of Complaints

The performance indicator of stakeholder requirements comprises the number of complaints and customer satisfaction index, both from internal or external stakeholders. The number of complaints indicates that stakeholder's response corresponds to the asset to evaluate whether they have received what they need from the assets; at the same time, it guides the organisations or asset owners to improve the performance of assets (Davis, 2016; Jin et al., 2013). According to Patrus et al. (2013), the number of complaints is one of the approaches to sustaining an organisation in the long run. In order to gather the complaints, some organisations or asset owners can provide the stakeholder feedback via survey online or offline, or from the front line office (Di Pietro et al., 2013). The number of complaints can be addressed by aspect but is not limited to general building satisfaction, acoustic quality, air quality, cleanliness, lighting and thermal comfort (Goins & Moezzi, 2013).

2. Customer Satisfaction Index

Customer satisfaction index (CSI) connects to the level of quality of services (Turkyilmaz et al., 2013). Measuring the CSI can be confirmed by conducting a survey of the stakeholders, internal or external (Morgeson et al., 2013). Increasing the number of CSI includes increasing customer satisfaction, or in other words, how the asset can contribute to creating value for customers or stakeholders, both internal and external (Kaplan. & Norton., 2001).

B. Key Element: Natural and Built Environment

Performance Indicator of natural environment achievement depends on the challenge facing the organisation (Epstein & Spiegel, 2001). It can be in the form of compliance with relevant regulations, pollution prevention, and costs for disaster prevention including training and disaster handling, and eco-efficiency ((Dias-Sardinha & Reijnders, 2005; S. D. Johnson, 1998).

1. Compliance Indicator.

Compliance with relevant regulations, such as general codes of conduct for buildings and land regulation, is related to the natural environment. This aspect includes no violation of substantive and procedural environmental matters (Dias-Sardinha & Reijnders, 2005).

2. Pollution Prevention Indicator.

This indicator includes the prevention of waste or building emissions, reduction of resources use and minimisation of environmental impacts, and following the standards of environmental management (Dias-Sardinha & Reijnders, 2005).

3. Eco-efficiency Indicator.

This indicator consists of reduction of resources and minimisation of environmental impacts in building operation, and products or services. It also includes the following standards related to natural environmental management (Dias-Sardinha & Reijnders, 2005).

C. Key Element: Budgeted Fund

The aspects of asset optimisation that connect to the budgeted fund are forecasting the cost of procurement and cost of maintenance and operation (planned budget) or capital expenditure. Evaluation of budget corresponds to asset performance to indicate the achievement of optimisation strategy and can be defined by the ability of amounts of money in cultivating performance improvement (Farran & Zayed, 2012; Hajkowicz, 2008). There are three analyses to measure the performance of budget in contributing to the asset optimisation strategy.

1. Sum of Deviation of Planned Budget

This key indicator defines how the expenses are being executed according to the budget plan and help to identify some deviations. The deviation from budget plan needs to be analysed as to what caused a difference, to prevent a similar situation in the future. The target of this deviation is minimum. This means that the executed expenses cannot be exceeded, or under the budget plan, some corrective action needs

to be implemented including a correction in defining the assumptions during the forecasting stage.

2. Percentage of Operation and Maintenance Cost of Total Cost

Operation and maintenance cost becomes the focus of the total cost, to control costs incurred corresponding to the target performance and budget plan. The goal of measuring this indicator is to assure the incurred maintenance and operation budget is used more efficiently, so the costs can be minimised and performance can be improved. The proportion of maintenance and operational cost indicates the level of resources that have been spent on operation and maintenance (Al-Najjar et al., 2007).

D. Key Element: Asset Data

There are four key performance indicators (KPI) for the establishment of asset data in the BSC. Each KPI of asset data means the achievement level in various units. Most of the measurements in this data are by proxy, where the measurement is represented by other indirect achievements (Saaty, 2008).

1. The Availability of Basic Data of Land and Building.

   The administrative data on land and building consists of all information and aspects that are critically important to the asset managers to enable them to manage and achieve the optimum assets (Rindova et al., 2010)

   Data on the individual asset on land and/or building consist of:

   a. Size of land
   b. Number and size of the building
   c. Year of construction
   d. Predicted economic life
   e. Location
   f. Current function or use

In order to extend the relevance of land and building data to meet the needs of an asset manager or decision-maker, the indicator of the availability of basic data can be measured in percentage. The total of items of information on the total basic data is 6

(from a to f). So, if only 5 items are met, this means the KPI of availability of data is (5: 6) x 100% or 83 %. The ideal target for this indicator would be that 100% is met.

2. Percentage of Public Land and Building that have Valued.

The value of land and building is necessary to establish procurement, sale, lease or compulsory acquisition, insurance. The land value indicates the economic use of land and other factors that can influence the value. Many countries use the land acquisition price as the value of land and the presence of land value will also contribute to developing the real estate market (R. Amirtahmasebi, 2015). In asset management view, the value of land and building supports asset managers or decision-makers to measure the associated costs of operation, maintenance and reparation, to preserve decline in value and be aware of factors that can reduce the value.

3. Legal Ownership and Boundaries

The fundamental aspect of land and buildings is ownership and boundaries. Land ownership not only provides government confidence in maintaining the records of the land but also underpins policy-making and program delivery functions such as land administration, land use management and regulation (Rindova et al., 2010). The indicator of clearness of the legal aspects for governmental land can be defined from the land certification (Griffith-Charles & Sutherland, 2013; Holden et al., 2010). The boundary of land informs the marks placed that are acknowledged legally and confirms where land is actually located and not subject encroachment by the owners of adjoining lands. In order to avoid disputes related to land borders, they might be relayed on to the registered surveyor (Wilson, 1994). However, relying on the global positioning system (GPS) may become one of the options to digitise the coordination of land as a legal system.

In order to indicate the performance indicator of achievement for legal ownership and boundary of public land and buildings, it can be found by dividing the numbers of land holdings and building that have been certificated, by the total number of landholdings and buildings that have to be certificated.

E. Key Element: Asset Maintenance and Performance Monitoring System

1. Total Maintenance Expenditure

Monitoring of land and building performance has a role in providing a control tool related to the maintenance program and the level of performance of land and buildings. Maintenance of land and building includes all costs related to all repairs, maintenance and renewal actions to maintain land and building in working order. It includes preventive and reactive maintenance costs (Eti et al., 2006; Shivalingappa, 2014). The indicator of achievement of a maintenance program can be defined by the expression of: (Total Maintenance Expenditures: M2 of the area has been maintained). The expression of this indicator will be in $/M2.

2. Physical Condition Index (PCI)

The measurement of performance of land and building can be measured by knowing the performance index of the asset (Cuganesan & Lacey, 2011; S. Deix et al., 2012). The formula to measure the performance index, as expressed by condition index, is to compare the actual condition of the land and building to the required land and building condition. This indicator ensures alignment of asset condition to meet service delivery needs, where Physical condition index = Actual condition less Required Physical Condition.

- If the PCI = 0, the physical condition is the required condition
- If the PCI < 0, the physical condition is less than the required condition
- If the PCI > 0, the physical condition is more than the required

3. Functional Performance Index (FPI)

Another performance indicator for land and building is functional performance index (FPI) that measures the alignment of functional performance to meet service delivery needs (Artz et al., 2012; Jiao et al., 2017; Deryl Northcott & Ma'amora Taulapapa, 2012). This measurement includes some issues related to the fit-out capability, the capacity of the building, and level of amenities to ensure the efficiency of the operation. The formula of FPI is functional performance index = actual functional performance, less required functional performance.

- If the FPI = 0 the functional performance is the required condition
- If the FPI < 0, the functional performance is less than the required condition
- If the FPI > 0, the functional performance is more than the required condition.

F. Key element: Asset Layout

1. Building Density

Building density as gross density is the density of a specific site that consists not only of buildings but also the land that is occupied by local facilities, such as open space, and road facilities (Booysen, 2014). The level of density can be defined by the gross floor area ratio (FAR), which is the ratio between the total gross floor of buildings and the total size of the site (Forsyth, 2003; Lin et al., 2010; Steemers, 2003; Tröger, 2015). The optimum density cannot be achieved, so the role of government in adjusting and reviewing the FAR minimum continually is important and it has to consider implementing zoning (Joshi & Kono, 2009).

2. Efficient Land Use Mix

This indicator of land and building layout reveals how efficient the use of land is to develop buildings, roads and open space (Tan et al., 2015). Mixed-use or integrated land-use sites become one of the affordable lands uses because this offers benefits in terms of economy, quality of life and the environmental aspect (Ewing & Dumbaugh, 2009; Robb et al., 2008). The indicator of economic benefits is generated from the ability to appeal in the marketplace and be more efficient in land use (Bennett et al., 2006; Grant, 2002). In improving the quality of life, integrated land use also reduces the dependence on public transport and relies more on walking and cycling (Younger et al., 2008). Additionally, it will also potentially reduce greenhouse gas emissions due to reduce congestion (Ewing & Rong, 2008; Love & Arthur Bullen, 2009).

The level of efficiency of mixed-use of land can be achieved by providing a balanced condition between offices and other amenities (Anders, 2004). According to (Delisle & Grissom, 2013), based on the filtered summary of 78 articles, the percentage of

usage of land for accessibility is around 5.5% and amenities including landscape can be allocated to around 14.1% of total land, whilst 9.8 % of total land can be allocated as financial return purposes.

G. Key Element: Skilled Asset manager

The indicators of achievement in human resource factors are an asset manager connected to the level of available skill and expertise. The measurements of a skilled asset manager are the improved understanding of asset management, the amount asset management training or professional certification in asset management made available for employees, and employee satisfaction about hardware and software provided by the organisation (Wu, 2012).

1. Improvement in the understanding of Asset Management.

This KPI is important in measuring human resources in innovation and establishing efficient asset management including policy formulation ability (Cuganesan, 2006). The understanding of levels of asset management can be measured through the experience and learning process in relation to the relevant jobs and asset management itself (Ucbasaran et al., 2010). Therefore, it is understandable that the duration of time spent on asset management jobs provides more experience and understanding.

2. The Amount of Asset Manager Training or Professional Certification

This accounts for formal training and education provided in improving knowledge, capability, and self-confidence for the asset manager (Garavan et al., 2012).

3. Employee Satisfaction with the Organisation's Facilities, Hardware, and Software.

This KPI allows employees to improve their productivity and contribution to the organisation to achieve organisational goals (Halkos & Bousinakis, 2010), as it reduces stress and internal problems regarding daily jobs. The measurement of satisfaction level can be gathered through an internal survey, using the designed questionnaire (Markos & Sridevi, 2010).

In order to link between KPI and achievement of the objective of asset optimisation strategy, the definition of performance has to be proportionally defined. Performance is associated with results or outcomes as compared to the budget or target, trend or other types of the benchmark. Performance assessment can be based on time or period, effectiveness, which is actual results, efficiency in terms of how the results were achieved, financial or non-financial (Gunasekaran et al., 2004). Additionally, the performance also can be assessed at many levels of organisation, department or individual employee or at the level of the whole organisation.

The performance achievement degree is represented by KPIs. KPIs become critically important because the success of the strategy depends on them. In order to prove the connection between the KPIs and the success of a strategy, the KPIs of key elements and the objectives of key elements in the frame of the organisation's vision need to be linked.

2.6.8. Alternatives to Public Asset Optimisation.

Public asset policy alternatives to obtain the optimum benefit may start from the public service orientation, law and legal transformation, efficiency and effectiveness improvement as well as transparency along the hierarchical chain, both in local and central government. This policy adopts modes of change or innovation to public land and building based on the product or service orientation (Garcia et al., 2002). There are some innovation modes as transforming or replacing entire existing facilities (radical innovation), upgrading the organisational skill and competency to the existing market (architectural innovation), changing only organisational skill or competency (incremental innovation) and developing the existing product or service without building new or discontinuity (Jing & Osborne, 2017; Sundbo, 1997) .

These modes inspire some alternatives of public asset optimisation such as improving asset performance and value through renovations or refurbishment (Rasiulis et al., 2015; Užšilaityte & Martinaitis, 2010), maintain assets efficiently (Mattias & Kristina, 2018; Ashish Shah & Kumar) and utilise it based on the financial viability and cultural outcomes (Ngwira, 2016). In selecting these optimisation alternatives as one of the

asset management policy, alternatives should consider transparency, cost-effectiveness and efficiency and sustainable service delivery (Ngwira, 2016). The following paragraphs describe each alternative and its requirements for further options of asset optimisation.

1. Optimisation through the improvement of performance and value of assets.

Improvement performance activities on the building and land create the additional value of the asset through physical improvement such as renovation. The decision on performance improvement in many cases is in line with the decision to refurbish buildings and to consider the energy-saving measure compared to the cost of demolishing and also the expected cost of maintenance and operating after renovations (Morelli et al., 2014). However, the improvement of building to promote energy efficiency or to reduce the detrimental environmental effect brought by high energy consumption requires high capital investment in the initial stage (Chua & Chou, 2011). According to Seshadhri and Paul (2017), the performance of the building is overall the cumulative effect of physical, functional, and financial attributes of the building. Physical performance means the quality of the structure, building fabric, heating system, lighting, durability, etc. Functional aspect concerns the correlation of building with the users or occupants in regards to the layout, safety, communication, etc or matching between the design and the functions. Financial performance relates to the capital costs, life cycle costing and other financial aspects as a result of physical and functional performance achievement. All of these performance measurements become the resources of optimisation of building (Seshadhri & Paul, 2017). Meadows and Bennett (2009), suggested the performance improvement relates to the balancing environmental to reflect the physical performance, economic or financial performance and social considerations as the functional performance.

The approach of improving the building performance building according to (Shohet & Nobili, 2016) and is added by (Ciarapica et al., 2008) in order to be more effective, can be selected after considering cost reduction and increase efficiency, competitive advantage and flexibility in the workspace. The selection of priority building depends

on the building usage, operation of building, infrastructure and technical structure (Junghans, 2013). This means that improvement of building improvement requires the data of buildings, the user requirements as expressed in the building usage, the budget availability as it refers to the identification of improvement area of technical structure and capacity of the future improvement operator.

2. Optimisation through maintaining asset efficiently

Land and building maintenance can prevent the collision, minimise the health and safety hazards and minimise unnecessary expense, providing users, customer or stakeholder satisfaction of buildings (Anthony & Lai, 2013). This alternative becomes one of the strategic options when maintenance is incorporated with the future changes in technology, organisation policy and life cycle costs (Ruparathna et al., 2018). Therefore, it is essential to develop the scenario corresponding to the current data, budget, environmental restrictions, and stakeholder requirements. The initial stage to build the planning maintenance commences with the assessment process. The assessment includes the method of assessment configures not the only condition of building but also to assess the defects (type, intensity, and extent), formulate maintenance activities and estimate the costs (Straub, 2003). In addition, estimating costs of maintenance needs sufficient information to make the fact-based maintenance expenditure. Some considerations that may help to build optimal and efficient maintenance according to Hopland and Kvamsdal (2016) are as follows:

- Scheduled maintenance is effective to develop the efficient maintenance cost, particularly when the fund is limited and to avoid the discontinuation of services.
- The optimal strategy maintenance plan depends on the trade-off between the rate of accelerating deterioration and actual interest rate, meaning that payment of maintenance expenses in the future will be cheaper than making it today when the maintenance needs to increase.
- It is necessary to collect complete information on building (data) and it should be specific for each property because a different property may have a different depreciation rate.

3. Optimisation through asset utilisation scheme.

The utilisation of public land and building is one of the entrepreneurial programs to seek new income stream. Utilisation also becomes one of the methods to cover partial costs of delivering public services and at the same time can fill unusable space, spread the financial risk with other partners. Utilisation for the existing building such as sharing the underground parking garage, renting the unused meeting rooms, corridor space for vending machines or ATM machines, or cell tower, are examples of how utilisation can be made. While, utilisation for land means readjustment and optimisation of land use pattern through land development for unused land, in particular, spatial rearrangement usage, urban renewal and reconstruction (Hong et al., 2014). Some literature suggest that consideration behind the utilisation of public land and building appear due to the policy to steer economic development and benchmarking the price of properties in surrounding location (Adams et al., 2008; Begg, 2002; Gibb & Hoesli, 2003; Hodgson, 1998; Ploegmakers et al., 2013). However, some argue that government authorities may start to adopt private-like style firms where efficiency, productivity, and accountability should reflect for serving the financial interest of the community (Du et al., 2018; Els, 2018; O. Kaganova & Nayyar-Stone, 2000; Seo et al., 2018).

Options of public asset utilisation can be for more intensive usage of space in building such as mixing the usage of building (Mattias & Kristina, 2018), or initiative for revenue-generating of public assets (O. Kaganova, 2006), such as renting the space or private sector involvement to utilise public assets (Els, 2018).

2.6.9. Prioritisation of Strategic Objective Using AHP

The four perspectives of BSC have a weight that represents the level of importance of each perspective in contributing to the achievement of the main objectives (Kaplan. & Norton., 2001). The level of importance is developed in the hierarchy. Hierarchy means the structured groups that are ranked based on the level of importance or another criterion (Robert S Kaplan & Norton, 2004). It is the pathway to building the prioritisation of SO according to the significant level of each element or variable to

the main goal of asset optimisation strategy. Within this process, the main goal has been broken down into criterions and sub-criterions. Table 2.12 shows the hierarchy of the BSC using the AHP.

Table 2.12 Hierarchy in Implementing BSC Using AHP

Perspectives	**Strategic Objectives (Level 1)**	**Key Element**	**Measurement (KPI) (Level 2)**
Stakeholder Perspectives	Stakeholder satisfaction and natural environment fulfilment	Stakeholder requirements	(S1) Number of complaints
			(S2) Customer satisfaction index
		Natural environment	(S3) Compliance Indicator
			(S4) Pollution Prevention Indicator
			(S5) Eco-efficiency Indicator
Financial Perspectives	Optimum budget	Budgeted fund	(F1) Sum of deviation of the planned budget
			(F2) Percentage of operation and maintenance costs of the total cost
			(F3) Cost-effectiveness ratio
Internal process perspective	The accountable administration and control of assets	Asset data	(I1)The availability of Basic data
			(I2)Asset Classification and function
			(I3) The up to date asset value
			(I4) Legal aspect clearness
		Asset layout	(I5) Optimum space of land
			(I6)Optimum space of the building
		Asset maintenance and monitoring system	(I7) Reliable maintenance system (I8)Reliable performance monitoring
Learning and Growth perspective	Competitive human resources	Skilled asset manager	(L1) Improvement of understanding
			(L2) Number of training and certification opportunities
			(L3)Employee satisfaction level

Selection of AHP as the prioritisation tool has reasons, such as

- In resolving the multi-criteria decision making, AHP is one of the complementary tools that potentially fit the complexity and weakness of BSC by assuring the prioritisation strategies for strategy execution and more effective in executing the strategic plan (Aleksander et al., 2018; Bentes et al., 2012; Huang et al., 2011)
- In the government sector where the causal relationship between inputs and outputs (objectives) and at the same time the specific alternatives should turn to reflect the complex, dynamic and budget restriction, adoptingAHP can assist the decision-maker in selecting a preferred alternative to this situation (Greenberg & Nunamaker, 1994).
- The AHP can complete the implementation of BSC by establishing the strategy that considers all-important relevant criteria to achieve the goal and in order to achieve sustainable organisation where the customer's satisfaction and viable cost structure are important (Perez et al., 2017).

Figure 2.12 shows that level 01 of the hierarchy is the objectives of the optimisation strategy as the first criterion is based on the four perspectives and the key elements that contribute to achieving the main goal, which is optimum asset management. Level 02 is the key performance indicator of each objective that is based on the performance measurement of each objective as the sub-criterion. The pairwise process in this level is only within the same objectives, pairwise among objectives with different criteria is not logically accepted and the comparison between objectives in this level is pair wised separately. Level 03 is the rating after knowing the weight and ranking to choose alternative actions. The actions would be in the form of activity to improve the ranked KPIs. The highest score of KPIs has the highest priority to be chosen.

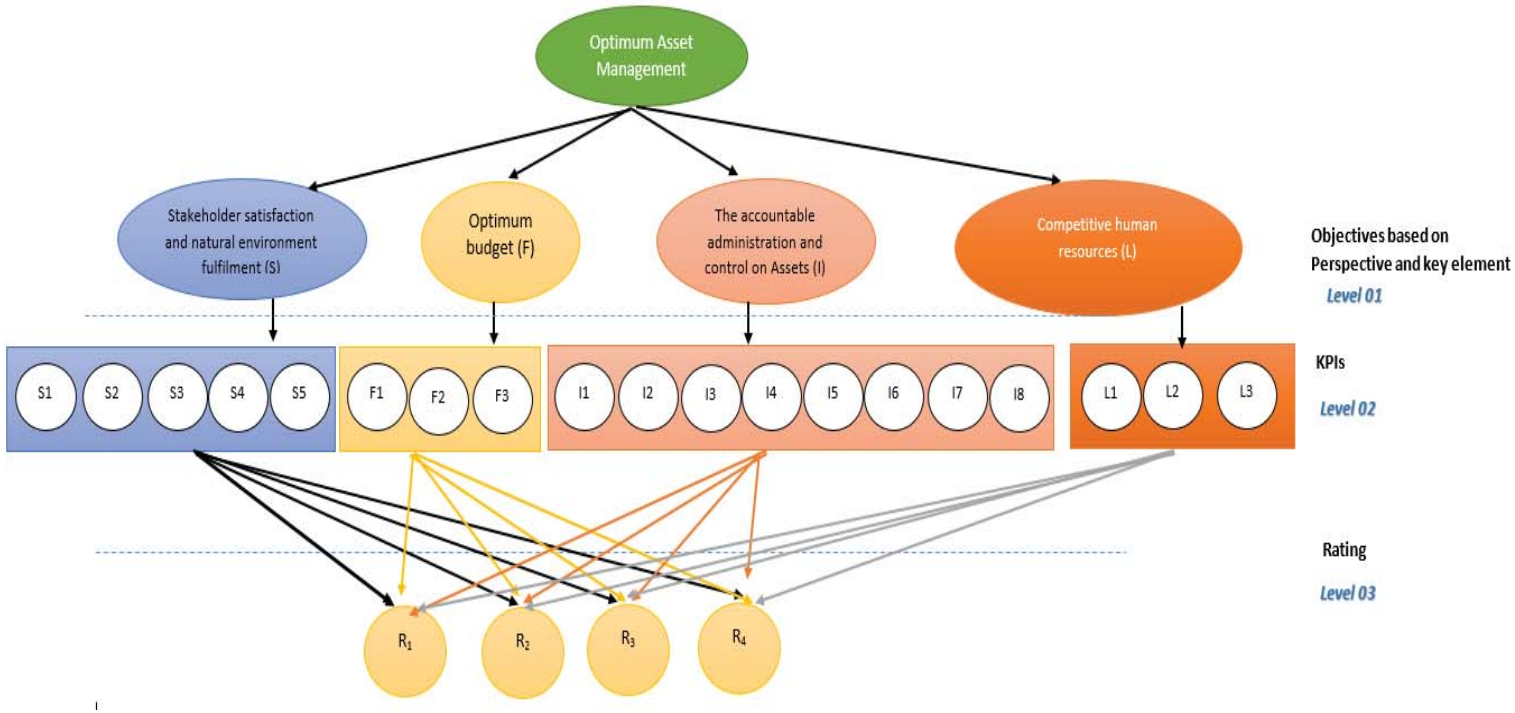


Figure 2.6 Hierarchy of Asset Optimisation Strategy

Research-related asset optimisation and developing a strategy using AHP in Indonesia was introduced by Sundari and Ma'rif (2013), to address the best usage of land based on the characteristic of the land. Implementing AHP assigns the attributes or sub-attributes into the hierarchy by using a ratio scale and pairwise comparison (Saaty, 1990). Implementation of BSC using AHP minimises subjectivity particularly in assigning the weight of each perspective in contributing to the main goal of asset optimisation.

2.7. The framework of Asset Optimisation Based on CREAM, Australia, the UK, the USA and Malaysia

Development of a generic strategy for asset optimisation in the public sector in Indonesia deals with practical references after deliberating the essential aspects of optimisation. These reflective references can help to recognise some strengths and weakness, but also can confirm the difficulties and barriers from lessons learned. Therefore, references could provide benefits to establish an improved and better strategy. The strategy from the government or public sector alone has not been sufficient enough without comparing it to that of the private sector. In some cases, the outcome of performance management of public sectors is somewhat less efficient than that of the private sector (Hvidman & Andersen, 2014). The differences between private and public sectors potentially exist in knowledge management (Shahriyar et al., 2010), risk assessment (Kousky & Kunreuther, 2018) and in other aspects such as bureaucratic organisational and managerial style (Boyne, 2002). Therefore, the concept of corporate real estate management (CREAM) as the role model of private asset management has been selected as one of the reflective references, to be compared to those of the public sector of the State of Queensland Australia (Local), the United Kingdom and USA and Malaysia (Federal). The comparison between local and federal governments in this thesis is important to promote the generic strategy to be applicable to both levels.

1. The current implementation of asset optimisation in the State of Queensland, Australia

State of Queensland, Australia was selected as the representative of the local practice in asset management. Implementation of strategy in optimising public infrastructures has been introduced in Queensland, Australia, through prioritising investment and delivery. The objectives of this strategy are to set the infrastructure prioritisation and clear vision to grow the State. The strategy for infrastructure planning is in the form of the State Infrastructure Plan (SIP). As the investment decision, SIP assesses alternatives before an investment decision is made. Following challenges, such as the criteria to articulate the objectives of investment, are also required to be addressed:

- Productivity
- Population change
- Consumer expectations
- Climate change
- Natural environment
- Domestic economy
- Changing technology
- Regional liveability

The main focus of the SIP is to address all of these challenges. Consequently, the direction of strategy and also alternatives to strategy underpin these challenges as well. According to SIP documentation, the alternative strategy consists of:

- Reform: means the amendment of the current institution or structure that can influence the changing of culture, control, standards, and service delivery model
- Better use: means improving the performance of service through improving facilities or technology enhancement (refurbishment program).
- Improving existing: means improving the performance of service at a lower cost.
- New: means build the new asset and replacing the more capital-intensive asset.

The assessment of the implementation of alternatives of investment strategy in optimising infrastructure involves the business case of each project decision (individual) and other important aspects such as financial cost, economic and social benefits, risk consideration and the most critical thing, the governmental budget.

2. The asset optimisation strategy in corporate real estate management (CREAM).

CREAM as the private or general governance of asset management is important in reflecting the institutional strategy towards the good organisation (Abbott, 2012). (G. Johnson, 2008) suggests the framework of asset management for the implementation of strategy in the corporate real estate asset management as a process with three main stages:

- Strategy position
- Strategy choices
- Strategy in action

In the strategy position, there are key aspects to define the organisation's position by analysing the role of four important aspects: environmental aspects (external), internal resources and competency of the organisation (external), expectation and purposes (stakeholder) and culture (external). Strategy choices depend on the organisation's mission, culture, market, and resources or refer to the result of the strategic position itself. Some alternatives to the strategy that can be selected are as follows (Nourse & Roulac, 1993):

- Occupancy cost minimisation
- Capture real estate and value creation for business
- Facilitate and control service delivery.

Strategy in action brings the implementation of a strategy that may require changing management programs, working practices and sometimes shifting the culture. According to (Haynes & Nunnington, 2010), the measurement of strategy achievements can be evaluated based on significant areas such as cost, efficiency, utilisation, and quality. These concrete measures help an organisation to monitor the positives and negatives of an organisation portfolio and to help formulate strategic decision making.

3. The Strategy of Asset Optimisation in the UK Public sector Asset management.

The fundamental framework in optimising public land and building in the United Kingdom was initiated by Michael Lyons in his report to the Chancellor of the Exchequer: Towards Better Asset Management of Public Sector Assets (SeymourJones, 2017). This report offered a series of recommendations for the United Kingdom (UK) Government to shape a better land and building management by minimising costs, better patterns, identification and disposal of surplus assets, greater co-ordination and co-operation, improving the skills in managing assets and knowing how to create contribution to the public from the asset programs. The programs can be selected such as asset renovation and asset utilisation. This concept also introduced how to obtain the optimum value of land and building to meet the public interest as one of the governmental obligations.

There are five key elements in optimising public assets, such as land and building according to (Howarth, 2006) as supported by (SeymourJones, 2017). Some necessary skills should be embedded to achieve the intrinsic component of strategic thinking and financial management of optimising assets. These skills indicate the important element to improve and optimise assets and also can make robust asset planning and strategy (White & Jones, 2012). The skills in asset management also indicate that for the important element of building a strategy of asset optimisation in the public sector, the skills or key elements are:

- Asset Data: This consists of asset registers, size, borders, and legal documents. As a skill, this element covers asset data management, accuracy and type, and scope of data analysis.
- Performance of assets and stakeholder requirements: This element is associated with the skill to measure the performance of assets, benchmarking and also how to manage stakeholders as the direct or indirect users of assets.
- Strategic planning: This element connects to the ability to build strategic thinking, business and service drivers, management plan, risk management and sustainability of assets.

- Financial Element: The skill that relates to this aspect includes how to manage resources, cost of operation or maintenance, whole-of-life cost, operational and capital expenditures and also financial analysis options of asset utilisation.
- Leadership element: The ability to manage professional staff in asset management and capacity to improve asset managerial skill is strongly related to this aspect.

There are some programs or alternatives to optimise the land and building and further prioritisation based on the elements considered. According to the RICS (White & Jones, 2012), some alternatives to the land and building programs consist of:

- Acquisition and new buildings
- Refurbishment and maintenance of the existing assets
- Disposal of surplus assets
- Innovative procurement

The Strategy of asset optimisation of land and building in the public sector in the UK also acknowledges the asset performance measurements using the balanced scorecard. The performance of assets is more focussed on the efficiency, effectiveness, and economy is balanced and weighted according to the organisation's strategic objectives. The measurement of property performance consists of and is not limited to:

- Cost and cost of control of operation and maintenance of assets;
- Space utilisation
- User and stakeholder satisfaction
- Environmental sustainability
- Risk management including health and safety

4. The Framework of asset optimisation in the USA

Optimisation of public sector assets in the USA was triggered by the report of the Government Accountability Officer (GAO) in 2003, due to some outstanding risks attached in asset management such as excessive underutilised assets, deteriorated facilities, lack of data on assets and its reliability, high-cost leased property, budgetary

disincentives, and lack of strategic government focus on property issues. These problems not only have governmental financial implications, but also national significance, health and safety, productivity and government public image. Based on this report, the series of asset management problems became the President's Management Agenda in 2004. One of the relevant agenda items to the asset optimisation reformation was to improve effective asset management by establishing the Agency Senior Real Property Officer (SRPO) (White & Jones, 2012). Practically the SRPO is assisted by the Senior Real Property Council to develop and implement an asset management plan including establishing the performance measurement of assets. The reformation of asset management to optimise assets is based on the Office of Management of Budget (OMB). The general strategy of asset optimisation is therefore based on the implementation of efficient asset management. The current implementation of OMB indicated the key elements in optimising public assets consist of:

- Asset Data. The first priority of establishing effective and efficient asset management is asset identification based on the owner, management of ownership and also the location of assets to identify who will manage it efficiently. In this aspect, it includes the controller of assets.
- Financial or budget for the asset. It is the second most important aspect to improve the quality of operational aspects of public assets. This aspect also becomes one of the efficient level indicators.
- Asset Manager Capacity. Authority of an asset, to address the priority established which is also related to the management of stakeholder. Therefore, in this case, the existence of the stakeholder is essential. The capacity of the asset authority to control the assets is also significant.
- Current rule and regulations. Pursue the goals and deadlines, refers to the asset management plans, including compliance with the environmental aspects.

According to the executive order (EO) number 13327, February 4, 2004, five major measurements of asset performance are:

- Cost of assets consists of the cost incurred associated with the life-cycle of assets, cost related to the acquisition of real property by purchase, condemnation, exchange, lease or otherwise. Cost of an asset also includes cost and time required to dispose of assets and financial recovery of federal investment, cost of operation and maintenance, environmental costs and compliance activities
- Change amount of vacant federal space (underutilised assets)
- The realisation of equity value in Federal real property assets
- Opportunities for cooperative arrangements with commercial real estate community
- Enhancement of productivity through the working environment.

Refers to the EO document and the Federal annual report also considering the performance maintenance, especially costs incurred. There are some implemented programs to optimise public property as follows:

- Asset utilisation: condemnation, exchange, lease, and other schemes to obtain financial benefits
- Asset improvement or refurbishment including environmental restoration and compliance activities
- Asset maintenance programs such as operation, securitisation and utility services of unoccupied properties;
- Asset value improvement to obtain the realisation of equity value.

5. The Strategy for public asset optimisation in Malaysia

Malaysia has adopted a Total Asset Management Manual (TAMM) in optimising public assets, specifically in managing federal assets. However, for the assets of local authorities and statutory bodies, there is no compulsion to implement it. The implementation of TAMM is the approach to optimising public assets was initiated by the National Asset and Facility Management (NAFAM) 2009 convention (Shahrizal Mohammad Idris, 2010). As a process, TAMM highlighted that effective asset management is able to optimise excellent service, achieve financial savings, obtain the

best economic benefit, reduce the underutilised assets and the cost of the asset and focus on the accountability and performance of assets (Yusof, 2013). The Strategy for asset optimisation is based on the implementation of TAMM which consists of four key elements:

- Governance: this element covers the responsibility and control of implementation strategy and evaluation.
- System and Process: this includes asset identification, the operational approach of TAMM, the performance measurement and reporting mechanisms
- Technology: in this aspect, the development of monitoring systems and the role of research and development are essential
- Human Resource: this aspect consists of qualification of the asset manager, competency development as well as reward and punishment procedures.

The achievement of the best performance of assets in TAMM implementation is defined as effective asset management as follows:

- Level of optimisation of asset usage and maintenance
- Financial saving and reducing demand for new assets;
- Minimising costs of asset operation
- Economic return through evaluation of life cycle costing
- Affordability of decision and report on performance as proof of accountability.

Alternatives for optimisation of land and building as immovable assets have been nominated by TAMM and are not limited to:

- Efficient operation and maintenance of the asset
- Asset performance evaluation
- Refurbishment or renovation
- Asset Disposal

The summary of the comparison of the strategy references on asset optimisation is illustrated in Table 2.13.

Table 2.13 Comparison of Asset Optimisation Strategy based on CREAM and Four Countries

Parameter	CREAM	USA (Federal)	UK (Federal)	Australia (Local)	Malaysia (Federal & Local)
Leading Strategy /documents	-	Executive Order (EO) 13327	A Report to the Chancellor of the Exchequer: Towards Better Management of Public sector assets by Sir Michael Lyons in 2004	State Infrastructure Plan (SIP)	Total Asset Management Manual 2009
Key elements	- environmental aspects (external), - internal resources and competency (external), - expectation and purposes (stakeholder) - culture (external)	- Asset Data - Financial or budget for - Asset Manager Capacity. - Current rule and regulations.	- Asset Data, - Performance of assets and stakeholder requirements - Strategic planning, risk management and sustainability of assets. - Financial Element - Leadership element	- Productivity - Population change - Consumer expectation - Climate change - Natural environment - Domestic economy - Changing technology - Regional liveability	- Governance - System and Process - Technology - Human Resource

Parameter	- CREAM	- USA (Federal)	- UK (Federal)	- Australia (Local)	- Malaysia (Federal & Local)
Programs	- Occupancy cost minimisation - Capture real estate and value creation of business - Facilitate and control service delivery	- Asset utilisation: - Asset improvement or refurbishment - Asset maintenance program - Asset value improvement	- Acquisition and new builds - Refurbishment and maintenance of the existing assets - Disposal of surplus asset - Innovative procurement	- Reform, - Better use, - Improving existing, - New, means	- Operation and maintenance asset efficiently - Asset performance evaluation - Refurbishment or renovation - Asset Disposal
Performance measurement	- cost, - efficiency, - utilisation achievement - quality of service	- Cost of assets - Change of underutilised assets - The realisation of equity value - Opportunities for cooperative arrangements - Enhancement of productivity	- Cost and cost of control of operation and maintenance of assets; - Space utilisation - User and stakeholder satisfaction - Environmental sustainability - Risk management including health and safety	- financial cost, - economic and social benefits, - risk consideration - governmental budget	- Level of optimisation of asset usage and maintenance - Financial saving and reducing demand for new assets; - Minimising costs of asset operation - Economic return - Affordability of decision and report

*Source: author compilation

2.8. Key Findings on Comparison of Asset Optimisation Strategy.

The comparison of Strategy for asset optimisation, based on the CREAM and some practical strategies of Australia, the UK, the USA and Malaysia, provide the framework for the **important elements** in asset optimisation that underpins the internal and external stakeholders as the group of people who need to be fulfilled in their interests, which also includes their culture and expectation. **Elementary data on assets** is also the key to optimisation which includes the ability to apprehend the internal resources by reliable systems and technology. The important element includes **natural environment aspects** as forms of awareness about the surrounding environment, climate change and also current rules and regulations regarding this aspect. **A skilled asset manager** as a reflection of professional and competent human resources also becomes an essential element to build better strategy and conduct good governance in asset optimisation. Finally, the **budgeting aspect** is also important as the key foundation of financial affordability, where the optimisation is running under this factor.

The comparison also highlights the various **alternatives of an optimisation program** to gain the benefits of asset optimisation financially and in optimum usages. The alternatives consist of a value creation program, asset utilisation, asset refurbishment, and efficient asset maintenance program and asset disposal. Some of the programs suggest building new assets to achieve the goal of fulfilling public interests.

The performance indicator as to the key to the evaluation of asset optimisation also can be drawn from the comparison where most of the indicators of success refer back to the program that has been chosen. It can be financial aspects, that means a number of benefits (revenue or cost-saving) in currency or economic return, quality of services have been achieved, environmental sustainability index, management of risk and enhancements has been reached.

These parameters such as key elements that also includes internal and external (natural environment), various programs of asset optimisation to implement the strategy and

the performance measurements contribute significantly to develop the comprehensive asset optimisation strategy.

2.9. The Strategy for Asset Optimisation in public sector in Indonesia

The current limitation of asset optimisation in Indonesia has been presented including the role of this research to modify the existing BSC in providing a real improvement of current asset management and asset strategy. This modification proposes an alignment process between the BSC as a strategy tool and the key elements of asset optimisation. In order to provide a better contribution, this research requires a methodology to gather the perception of asset managers or asset operators to evaluate the current situation in an asset management sense through interview and test cases. To achieve significant improvement in BSC, it needs asset manager perceptions to know the level of significance of the key performance indicator of each element. It can be fulfilled through a survey that is compatible with the AHP analysis process. Therefore the design of the survey has to be on a scale of importance to score the KPIs and weight them. The adoption of an Analytic Hierarchy Process (AHP) in implementing a balanced scorecard (BSC) elaborates these key elements, then weights them to determine the priority. This priority order will be the fundamental and empirical aspects of a generic asset optimisation strategy. The inherent barrier will be more elaborated in the test case to find empirical evidence as an important frame in building a robust asset optimisation strategy for Indonesia.

Lesson learned from the comparison of the strategy of CREAM and four countries provide support to develop a comprehensive framework strategy. This comparison also contributes to strengthening the key elements, programs, and performance measurement aspects to create a robust asset optimisation strategy.

Chapter 3. Research Design and Method

3.1.Introduction

The aim of this research design and method is to outline the overall approach to answer research questions using an efficient and inclusive research plan. The research design can articulate a rational approach using an accurate formulated plan as it evokes the expectation of research (Schwartz-Shea & Yanow, 2012). It also involves a decision-making process of selecting a data collection method and analysis, as well as relevant justification. The method for data collection consists of one or more specific techniques to answer the research question, therefore, focusing on the process of research design (Evans et al., 2014). This research adopted two data collection methods, which are survey and interview.

In order to achieve the aim of research design and method, this chapter is divided into several sections, beginning with the research problems, research gaps, as well as research questions, aims, and objectives, in order to describe the trigger, area, and goals of research investigation. The following section explains research philosophy, design, and triangulation in order to demonstrate the adopted interpretive research, mixed-method and how this method integrates to process the empirical data. The last part of this chapter describes the adopted data collection methods, data analyses and validation process to develop the strategic framework.

3.2.Research Problems

Understanding the research problem is important prior to developing the research design and method. This research was triggered by a considerable problem in asset management in Indonesia that shows lack of an asset optimisation strategy to promote efficient asset management. It has caused high cost in asset maintenance and operation, perpetuating unregistered land and non-productive public assets as well as the loss of opportunity to contribute to the national economy. Therefore, understanding the steps in the development of asset optimisation, especially for land and buildings, which

includes an understanding of key elements and inherent barriers in asset optimisation, is necessary.

In order to establish a proper strategy to optimise assets (land and buildings), understanding the currently used strategies and tools can provide the initial framework in developing a strategy for optimisation. The Balanced Scorecard (BSC) has been applied in managing the organisation of DGSAM in general. Therefore, the perspectives, strategic objectives and key performance indicators (KPIs) as BSC basic instruments have been settled in a general organisational view. This research attempts to utilise the existing BSC in implementing the optimisation of assets. Consequently, some modifications and adaptations are required. The first modification step deals with key elements. The key elements in asset optimisation have to be transformed into strategic tools to build a robust optimisation strategy. The BSC provides goals, objectives, and targets prioritising projects based on the four perspectives (financial, stakeholder, internal, learning and growths). The next critical problem is how to adapt the key elements of asset optimisation based on those perspectives and to prioritise the key elements according to their level of significance.

3.3. Research Gaps

Existing BSC in asset management based on the 467/KMK.01/2014 has been scrutinised in the preliminary research. The findings of this investigation step generated the gaps to be addressed and guided by the research questions. These gaps consist of the steps to reengineering the perceptions within the BSC followed by strategy objectives and the measurements of the strategy itself. The proposal of the strategy map has also been conceived as the fundamental steps for further research. However, the applicable strategy after the modification remains questionable to be answered and how this strategy, in turn, results in the optimisation of assets.

Finding the key elements in building a strategy of optimisation is another crucial research gap that needed to be fulfilled in this research. Moreover, it also required a supplementary process in obtaining the optimum strategy. This further process

evolved the strategy step and tool for implementation. This process and how the gap will be answered is included in the asset optimisation strategy using the modified BSC.

The BSC has four perspectives in establishing a strategy and has functioning measurements as key performance indicators (KPIs). Starting from these four perspectives, this research classified seven key elements based on the perspectives in achieving strategic objectives (SO). The research gap is how to determine the weight of each SO as a reflection of the key element to the achievement of the goal. Further investigation is to determine why one key element is more important than others and how to prioritise this element in a rational and accepted way. In the implementation stage, the challenges and barriers have also to be addressed. Therefore, the contribution of this research is an asset optimisation strategy that consists of the steps in developing strategy, prioritisation of the key elements in BSC perspectives including validating the strategic tool as a base of optimisation strategy. Additionally, this strategy is also fulfilled by overcoming the challenges and describing the applicable recommendations.

The Research Question, Aim, and Objectives

It is important to ensure the research method has the ability to answer the research questions prior to finalising the method, including the provision of rationale fundamental to the research itself. The adopted method in this research started with the objectives. The following passages explain the research proposition drawn from the literature review:

Research questions:

1. What is the generic asset optimisation strategy for public land and buildings in Indonesia?
2. How can this strategy be adopted for public assets in Indonesia and what are the inherent barriers in implementing the strategy?

Research aim:

To develop a robust asset optimisation strategy for the public sector and to adopt this strategy for the public sector in Indonesia, particularly for public land and buildings.

Research objectives:

1. To identify and examine the key elements essential for developing an asset optimisation strategy for the public sector in Indonesia.
2. To identify inherent barriers to developing an asset optimisation strategy for Indonesia.

Key elements in identification are involved with the selection process, consideration and need a large sample and to be most effective, therefore the most appropriate method to achieve the objectives of this research is a survey. Key element examination in this research means how to prioritise one key element over other key elements considering the organisation resources. Therefore, the survey also should be able to answer the prioritisation issue as well. Inherent barriers and other recommendations can also help to build robust asset optimisation and this objective can be achieved by conducting in-depth interviews. Finally, the test case was selected to validate that the strategy requirements have been met. The details of further reasons for choosing the method in this research is described in Table 3.2.

3.4. Research Philosophy, Design, and Triangulation

This research adopted interpretive philosophy research, whereby the basic belief is that research aims are a multiple reality and socially constructed. This interpretive research is a set of interpretive paradigms consisting of positivist and post-positivist. In this sense, selecting interpretive research provides the most accurate prospect to answer the research satisfactorily (Blaikie & Priest, 2017). This also means that multiple interpretations of human experiences or realities are possible, and people have the ability to make conscious choices. The interpretive research implies that common sense or natural attitudes guide people in everyday life, conversation,

concepts and written records of situations, and are embedded in the literature and universal in the understanding of people (Yanow & Schwartz-Shea, 2015).

Interpretive research involves multiple designs to achieve research aims and objectives or in answering the research question (Vaishnavi & Kuechler, 2015) or integrating the qualitative and quantitative-mixed method to provide a better understanding, which cannot be concisely attained using a single approach (John W Creswell, 2013; Morse & Niehaus, 2009; Shannon-Baker, 2016; Watkins & Gioia, 2015). The mixed-method as a combination of the qualitative and quantitative method was conducted by implementing the survey and in-depth interviews to gather participant perceptions. The quantitative method was applied in analysing data from the survey and interpreting participant opinion, then scoring and weighting the result, whereas, the qualitative method was utilised to process data from in-depth interviews.

The mixed-method is suitable in this research because firstly, the quantitative method is appropriate in this research to extract asset managers or asset operators' views in defining the key factor to building a proper strategy for asset optimisation by conducting the survey. Within the key elements, each element has a different level of importance, therefore, needs to be prioritised. One of the tools that have the ability to set prioritisation, is the analytical hierarchy process (AHP). Secondly, the qualitative method is appropriate in analysing in-depth interviews of respondents, in which the result of prioritisation of key elements is required to be validated and explored based on the respondent's views, perspectives or options. The motives, reasons, patterns, and meanings behind the respondent opinion have to be carefully considered before drawing the conclusion. Therefore, qualitative analysis was also selected.

Finally, in order to complete the previous mixed method of data collection and analysis, this research employs the test case. A test case is one of the analysis processes to implement the projected strategy of asset optimisation to become the final strategy. The adoption of test case also serves to test the strategy thoroughly by setting an individual test case for each pattern of the strategy. This pattern is the framework skeleton, which has the key performance indicators (KPIs) of each key element.

Additionally, the test case also conforms to the barriers and recommendations derived from the strategy. By having the test case, some barriers, resistance, and difficulties can be recognised to enable the implementation of the strategy. This process is important to investigate the existing phenomenon using multiple evidence within the ordinary context (Yin, 2013).

To highlight the process of data collection, data analysis, and the test case, and in order to avoid bias and convey an accurate understanding of reality, a triangulation process was applied in this research. Triangulation is important in terms of improving productivity in conjunction with building a theoretical framework and integrating different perspectives (Jick, 1979; Willig & Sainton-Rogers, 2010). The application of the triangulation concept is started firstly, by selecting a survey to gather participant opinions and then validation using the in-depth interview. Strategy development started from the literature review as a conceptual research step, called the initial strategy. Survey results then improved this initial strategy to be validated in the interviews. The final strategy was generated from a test case. The test case analysis was the final step in developing a robust generic strategy, as the final result of this research.

3.5.Theoretical Framework

The literature defined that asset optimisation has significant elements containing implicit goals and techniques, and promising benefit implementation of asset optimisation. The goals and benefits of asset optimisation depend on how to manage key elements as essential factors to be considered during the strategy development process. Key elements of land and building optimisation were identified through the process of understanding the findings, limitations, evaluations, and arguments of previous research and the current implementation of asset optimisation of certain countries. The key elements consisted of:

- Asset data (AD)
- Maintenance and performance monitoring (MPM)
- Asset layout (AL)

– Budgeted fund (BF)
– Stakeholder requirement (SR)
– Natural and built environment (NE)
– Skilled asset manager (SAM)

The literature review process outlined the definition and advantages of asset optimisation as the important aspects of implementing optimisation as a strategy. These aspects need to be adopted and adapted in the BSC perspectives in order to be implementable and academically accepted.

This research attempted to align the key elements into the BSC perspectives and adopt the key elements by a prioritisation process. In doing the prioritisation, this research employed the analytic hierarchy process (AHP) in weighing the degree of importance of the key elements. Figure 3.1 described the transformation of key elements into perspectives in BSC associated with the strategic objectives.

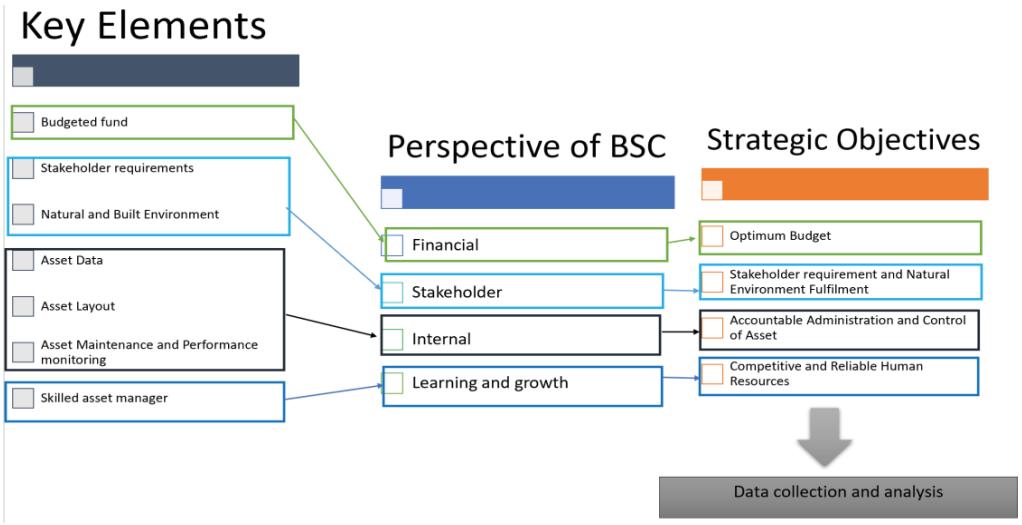


Figure 3.1 The linkage of perspectives of BSC, key elements and strategy objectives.
Source: Author and Adapted from (Khomba, 2015a)

The key elements based on the perspectives of BSC were transformed into the 'big four' elements in the strategic objectives (SO) (Figure 3.1). Therefore, the identification of key elements in the survey was used to investigate the 'big four'

elements. In this research, the analytical hierarchy process (AHP) is selected to measure the level of contribution to the SO. However, the output of AHP was insufficient to build the strategy. For this reason, a contextual understanding of where the strategy was going to be applied had to be sufficiently observed to explain the barriers, for a better recommendation solution. The step followed to fulfil this objective was in-depth interviews and case studies used as the triangulation process in order to cross-check and complete the empirical process. The research aim and objectives, as well as the adopted method in this research, are summarised in Table 3.1.

Table 3.1 Research objective and adopted method

Research aim	Research objectives	Methods
Developing a robust asset optimisation strategy for the public sector and adopting this strategy for the public sector in Indonesia, particularly for public land and buildings	To identify the key elements for asset optimisation in the public sector in Indonesia To identify inherent barriers of asset optimisation in Indonesia	1. Survey 2. In-depth interview 3. Test Case

3.6. Translation of data collection tool from English

The language of the survey and interview was translated from English to Bahasa Indonesia. This approach is acceptable as the translation process was accompanied with the equivalent and sufficiently established standard or by utilising the existing standard such as Indonesian dictionary- Kamus Umum Bahasa Indonesia and implementing the human-level natural language to avoid potential bias (King et al., 2011). This means that all terms, idioms, and vocabularies that have been used in the original survey have been translated into Bahasa Indonesia, which is very common, universal and relevant to the respondent background and to avoid multi perceptions. In order to assure the translation is smoothly understood, a pilot survey was also conducted to draw on the language input.

3.7. Data collection and Analysis

The implementation of the selected research method was set under the instruments of research as listed in Table 3.1. The research instrument is a tool to obtain information relevant to the research (Wilkinson & Birmingham, 2003). Research methods, instruments, and techniques were then systemised into the research process, referring to the objectives of the research. Two data collection methods that have been adopted in this research were survey and in-depth interview. Additionally, to complete and finalise the strategy, data analysis was then implemented in the mini cases for two selected buildings as the test case. Table 3.2 described the adopted method in this research and was completed with some justifications.

Table 3.2 Adopted method of data collection and justification

Method	Description	Reasons for selecting method
Survey	One of the alternatives is to examine a sample of people in accordance with their behaviour, attitudes or background related to certain issues (Bryman, 2016). This quantitative method produces numerical data and measurement variables (Punch, 2003). It also gathers information from a sample of entities to construct quantitative attributes of the larger population (Groves et al., 2009).	1. This method can be addressed to achieve research objectives in identifying key elements as variables, in the opinion of survey respondents. 2. This method is more effective, in capturing a large array of knowledge, perspectives, and experience of the asset manager in regard to the asset management aspect, than another method in an economical way. 3. This method has a high possibility to suggest relations between the variables or ranking among them.
In-depth interview	Asking purposeful questions and listening to answers to address the research question and objectives (Saunders et al., 2016).	1. This method can validate the result of the survey. 2. Provide more in-depth data to be analysed based on the respondent perspectives individually but convergent. 3. Provide help in developing ideas that might not be formulated from the research question or objectives.

Test Case Selection and Justification

Selection of test case as the additional tool for analysis is to help the understanding of the strategy that corresponds to the actual and complex situation using the few case examples. So this step is definitely not part of the data collection method. But, it has an essential role to support the proposed strategy to be more reliable, relevant and

applicable. The test case also supports the easing of problems when there is an unclear situation between the phenomenon, perspectives or opinion, and context (Yin, 2013).

3.7.1. Survey

The survey is one of the data collection methods that examine the sample of respondents around their perspectives in terms of key elements and priority in asset optimisation strategy. This examination process was in questionnaire form. Within this survey, respondent information was gathered to construct the quantitative attributes that correspond to their opinions. The organisation of this survey paragraph started with the design of the survey to describe the form, type, and theme of questions. The paragraph was then divided into two main forms of survey, web-based, and paper-based. Each type of survey consisted of processes informing the survey, selection, and recruitment of respondents and delivering the questionnaire process. The sub-sections illustrated the survey protocol, survey stages 1 and 2, survey analysis and finally, the survey's contribution to the strategy development.

3.7.2 Survey Design

The survey was designed in two forms; web-based and paper-based. The web-based or online survey applied official software provided by QUT. The online survey was conducted for respondents living in Jakarta, Semarang, and Surabaya. The paper-based or offline survey was conducted in Semarang only. The total target of these two surveys was 131 respondents, consisting of participants from the three big cities. Jakarta was selected to represent a large city, more complex in expectations in term of the quality of buildings, where the participants are working and living. Surabaya and Semarang represent a regional situation where the volume of work is relatively stable and distributed among weekdays in comparison to that of Jakarta. This may affect the viewpoints of the key element of optimum land and buildings. Thus, the survey accommodated the perceptions of people who live in both large metropolitan and medium city situations.

The type of survey used was a closed-ended questionnaire used to identify key elements of asset optimisation and then measure the significance level of each element.

The survey topic suggested refers to the research problem. This survey underpinned the BSC perspectives, being stakeholder, financial, internal process and learning and growth perspectives. Each perspective incorporated the key elements as the KPIs. Key elements of this research were transformed into four of the BSC perspectives. The key elements were used to measure the level of significance of each element. In order to perform an analysis based on the AHP, there were 18 scales for the AHP question. The type of data from the survey was ordinal data. Therefore, the measurement of the variables of asset optimisation was in an ordinal data scale. The questions of this survey can be seen in Appendix 1.

3.7.3. Web-based Survey

The web-based survey or online survey utilised a specific link provided by QUT consisting of a dashboard and customised content named *Key Survey*. This survey link was sent to the respondent's email address so they could access the survey question by a single click. The online survey commenced by sending emails to 150 respondents, to achieve the target of 131 respondents in the period from 19 May to 18 August 2017.

3.7.4. Pilot Survey

The pilot survey is a pilot test of the web-based survey. This type of survey was created as a small scale preliminary step. The aim of the pilot survey was to check the level of comprehensible questions, to know whether the interpretation of respondents is in the same vein and to assure appropriate responses and choices. It would also measure the time taken to complete the survey. In this research, a pilot survey was sent to five respondents, who reside in Jakarta, Semarang, or Surabaya. The email was sent on 15 May 2017 and the last feedback was received on 18 May 2017.

Most feedback was related to the number of questions and the content question itself. The content of the survey was not commonly used because of the AHP scale and more than 45 questions were asked in the pilot survey questionnaire. After feedback, some modification of the survey's design was made. The issue of it being such a lengthy survey was addressed by cutting the number of questions without significantly interfering with the themes of the survey. The content and format of the survey were

then modified to reduce multi-perspectives and bias. In addition, the simplification of language used became another corrective action to address the difficulties of understanding or multi-perceptions.

3.7.5. The respondent selection process of web-based survey

The focus of the survey was to investigate the level of significance of key elements based on the respondents' opinions. It required good quality of questions (Thwaites Bee & Murdoch-Eaton, 2016) to be sent to the appropriate respondents. Referring to the focus of this research, a purposive sampling strategy was selected, where respondents were selected based on:

- Location in Jakarta, Surabaya, or Semarang
- Current job position in organisation and role in asset management. Position level consists of a top, middle and lower manager and staff or operators in the government or private sectors. Role in asset management consists of asset authorisation, asset optimisation advisor, asset operator, and staff. Additionally, in the role of asset management, it included the users of public land and/or buildings. The private sector is composed of the property market players as a buyer or seller of land and buildings.

The purposive respondents were derived from those who had the following criteria:

- External stakeholder (ES) including customers or clients. This group included users or people who received benefits and functions of public buildings and have perceptions relating to the performance of the buildings over at least six months. Included in this group were practitioners from the real estate fields. This group has a property view of the market as well as value sense. The highest and best-used assets in their perception, contribute to deciding the best alternatives in optimising land and building.
- Internal stakeholders (IS) refers to employees who are living in the building. Their responses would be affected by the building and the experience of environmental

issues relating to weather, temperature, energy and the general fit-out of the building. The employees have worked inside the building for more than six months

- Asset or facility manager (AM) who technically has the responsibility for the maintenance and operation of the building. An asset manager who was selected for this survey was from various levels of leaders in DGSAM. The top leader of DGSAM was represented by echelon two. Middle leaders were from echelon three or the head of the operational office or head of sub-directorate. The lower leaders were represented by the head of the section in central, regional or operational offices.
- Has an academic background with at least an undergraduate or bachelor's degree.
- Asset authority (AA), responsible for the allocation, procurement and disposing of government assets. One of the criteria of asset authority is that he/she has held the position for a minimum of six months.

The profile of the organisation as the position of the respondent corresponds to the optimisation strategy and can be defined as follows:

1. Directorate General of State Asset Management (DGSAM) is the asset manager of public sectors in managing public assets that are owned by the central government.
2. Asset managers have responsibility and experience in the perspective of the key elements of asset optimisation because they are involved in the life cycle process of asset management.
3. The staff of DGSAM not only have practical knowledge in implementing asset optimisation but also have a role as internal stakeholders, one of the key elements of AOS.
4. Lembaga Manajemen Asset Negara (LMAN) is one of the arms of DGSAM that has a special duty to implement the public asset optimisation program for public land and building (MoF, 2015). Therefore, issues related to the asset optimisation, either in concept or implementation, are strongly relevant.

3.7.6. Approaching, Recruiting and Sending the Questions of a Web-based Survey

The researcher conducted four steps of approaching and recruiting the respondents of a web-based survey in order to convince them to participate in the survey:

Step 1: Sending the invitation email as the initial and non-formal approach to the respondents. This email contained brief information and objective of the survey, benefit of participation and the impact of their opinion in improving current asset management. This process was undertaken on 19 May 2017. In this first step, the researcher sent the invitation by email to 150 email accounts as an attempt to achieve the target of 131 respondents. The email accounts of respondents from DGSAM and LMAN (total of 120 out of 150 respondents) were provided by the human resources department of DGSAM. The remainder of 30 email accounts were collected from the staff of DGSAM Regional Office in Surabaya and Semarang, who intensively interacted with the auction participants (sellers or buyers of the auction) and the municipal government of Semarang and Surabaya. The composition of 150 respondents referred to their respected role, level of management and organisation.

Step 2: Sending the email to deliver the survey questions. The second email contained the link to the survey, provided by QUT. In this step, the respondent single clicked the link to find the questions and submitted online accordingly. The link to the survey could be accessed by a respondent at any time to edit opinions during the survey period if they wished. This online survey was closed by 10 August 2017.

Step 3: Sending the first reminder through email and WhatsApp messenger. This step aimed to remind the respondent to complete and submit their responses accordingly, considering the time limit and the importance of their perspectives. The WhatsApp messenger was used as additional media, to remind the respondents infrequently accessing the email. This messenger application could also be used to deliver the link to the survey. Therefore, respondents could also access the online survey via smartphone. The contact number of the respondents having the WhatsApp messenger application was provided by the human resources department of DGSAM. This step was completed by 10 June 2017.

Step 4: Sending the second reminder and appreciation to those participating in the survey. This step was undertaken via emails and short messages on WhatsApp. The aim of this step was to deliver the second reminder and convey appreciation for the respondents' participation in the survey. This step was followed up by a phone call during the field trip period and ended by 10 August 2017.

3.7.7. Paper-based Survey

The paper-based survey is a printed survey and given to the respondents in paper form to fill out. The type, theme, and the number of questions were identical to those of the web-based survey. The aim of this method of survey was to achieve the target number of respondents. This survey was only conducted in Semarang to collect opinions of respondents from the municipal government and auction participants (sellers or buyers at the auction) from Semarang.

1. Respondent Selection Process of Paper-based Survey

The respondents of the paper-based survey were selected based on their intensities of consultation and cooperation in asset management with the regional office of DGSAM in Semarang. The selection of respondents was technically facilitated upon consideration of the staff from the Regional Office of DGSAM in Semarang who are knowledgeable about local respondents' background. There were two categories of respondents in this survey; municipal government as a representative of the government sector and auction participants as the representative of the private sector. Both sectors were selected based on their roles and experiences in asset management or the property market. The minimum requirement of the respondent's experiences was six months.

2. Recruitment Process and Questionnaire Distribution

The recruitment process of respondents from the municipal government and auction participants was undertaken initially by phone call. The short meetings with respondents were conducted to explain the benefit of the survey and how to fill out the questionnaire. The paper-based survey was distributed to respondents at the end of the

meeting and the feedback was collected two days after the meeting. A total of 30 questionnaires were distributed to both sets of respondents.

3. Survey Protocol

Prior to starting the survey, the survey protocol had been put in place. The objective of constructing a survey protocol is to frame the process and guide every step of the survey to satisfy the survey objectives. The contents of this protocol helped to clarify, for survey respondents, the type of questionnaire and how the survey would be conducted within the timeframe. The survey etiquette also ensured that data collection and analysis were consistent, reliable and appropriate to address intended research objectives. Table 3.3 showed the survey protocol as guidance in conducting the survey including the proposed analysis.

Table 3.3 Survey protocol

Section	Contents
Aims	Identification of key elements of asset optimisation strategy is based on the perspectives of the asset manager, the asset operator, the rule drafter, rule advisor, budget planner, authority, stakeholders and asset users.
Objectives	1. To identify the key elements of asset optimisation 2. To identify the significance of each key element contributing to the strategic objectives
Sample size	Targeted respondents of 131 consisting of the asset manager and stakeholders of government buildings that reside in Jakarta, Semarang, and Surabaya
Design of survey study	Multiple choice AHP questions, using 18 scales consisting of 18 questions of key elements (6 questions) and alternatives of strategy (12 questions)
Method	Web-based (online): 120 emails were sent and 30 paper-based forms were delivered There are two stages: 1. Survey stage 1 (captured at least 50% of the target of respondent) 2. Survey stage 2 (captured 100 % of the target of respondent)
Analysis of survey data	Utilising AHP based excel

Source: adapted from Maimbo et.al, (2005)

4. Stage 1 and Stage 2 of the Surveys

The surveys undertaken in this research consisted of two stages (Stage 1 and Stage 2) considering the extensive appraisals in terms of the number of respondents who returned their feedback online. Stage 1 of the survey articulated that 62 respondents in the AHP process were important resources for the in-depth interview. One of the questions in the in-depth interview is referred to the Stage 1 survey result. Consequently, the preliminary analysis of this stage had been finished prior to commencing the interview. The main objective of the survey was not only to identify the key elements but also to measure contribution in terms of the achievement of strategic objectives (SO). The respondents of the survey were the asset manager, the asset operator, the budget planner and authority, rule drafter and advisor as well as external parties or users. The target of the survey was 131 respondents, consisting of the participants from Jakarta, Semarang, and Surabaya. One hundred and fifty emails containing a link to the online questionnaire and 30 paper-based questionnaires were delivered to respondents from those three cities. The flow of activity and timeline of the survey are shown in figure 3.2:

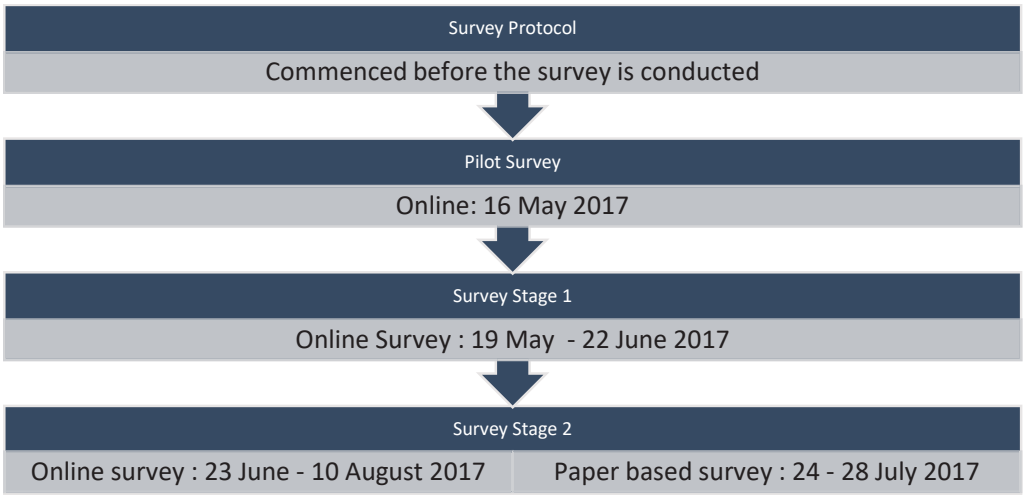


Figure 3.2 Time frame of survey activities

3.7.8. Analysis of Survey Data

The analysis of Survey Data in Stage 1 was based on one category of participants. The questions in Stage 1 were about the weight of the key elements as criteria in AHP and

the alternative of optimisation strategy. Each alternative of optimisation strategy has a degree of contribution to the main goal, which is optimum asset management.

Processing of AHP using Microsoft Excel was introduced by Perzina and Ramík (2014), to progress the AHP analysis for a single respondent. Microsoft excel provided a free feature, named Decision Analysis Module for Excel (DAME) that allows the users to solve multi-criteria decision problems instantly. However, for multiple respondents, the DAME requires some extra steps to process each decision maker's opinion. These steps are proportional to the number of respondents. T For this reason, this research applied Microsoft Excel manually to accommodate the opinion of 129 respondents.

The implementation of AHP's calculation using Microsoft Excel has been achieved. In this software, the value option for pairwise criterion or variants is provided in columns (in scales two to nine) to indicate the higher value is more important or ½ to 1/9 indicates the criteria in the column is less important than in the row. In this research, the opinion of 129 respondents was averaged to obtain the single input for the pairwise process, accordingly, the geometric mean (GEOMEAN) was implemented.

There are four main steps in processing the AHP in the Microsoft Excel program:

- Calculation of weighted criterion
- Calculation of weighted alternatives or variants based on the criterion
- Ranking of alternative or variant
- Improvement of an inconsistent matrix using the Orcon tool system (Microsoft Excel-based program) to ensure the final CR before proceeding into a further analysis is acceptable (means $\mathrm{CR} \leq 10\%$).

Transforming Key Elements Resulting from the Analytical Hierarchy Process (AHP) into Perspectives of Balanced Scorecard (BSC)

Upon transformation of the key elements into the perspectives of BSC, the weighted criterion (key elements) then was able to figure out the level of significance of each key element in contribution to the accomplishment of the strategic objectives (SO).

This means that each key element had a specific percentage (based on ranking) towards SO. In other words, AHP helps to undertake priority arrangement of key elements to achieve the SO. Accordingly, the performance measurement of key elements was able to be revealed after the key elements were broken down into the key performance indicators (KPIs) leading to the calculation of the scorecard.

3.7.9. The Contribution for Development of Strategy of Asset Optimisation

The result of the survey in Stage 2 contributed to the development of the asset optimisation strategy through the weight of alternatives with respect to the key elements. The overall priority of alternatives was obtained by summing the weight of the key elements contributing to the alternatives with respect to the criterion. Figure 3.3 described the result of Stage 2 in the development of the strategy.

Based on figure 3.3, the AHP pairwise comparison process produced the contribution of each key element to the optimum asset management as the global goal. It also informed that the level of contribution from the element of 'stakeholder requirement and natural environment fulfilment' is Q*. In relation to the BSC, this level of contribution becomes the percentage in computing the KPIs to the main goal. Similarly, the Q* of contribution was from the element of 'optimum budget' and Q* of contribution was from the element of 'accountable administration, control of the asset' and 'competitive human resources respectively' respectively.

Regarding the development of the framework of asset optimisation strategy, the level of contribution means the level of significance for decision-makers to select the highest contribution as the first priority. On the alternative level, the highest-ranking of contribution was the most favourable decision to be chosen, which was to maintain assets efficiently.

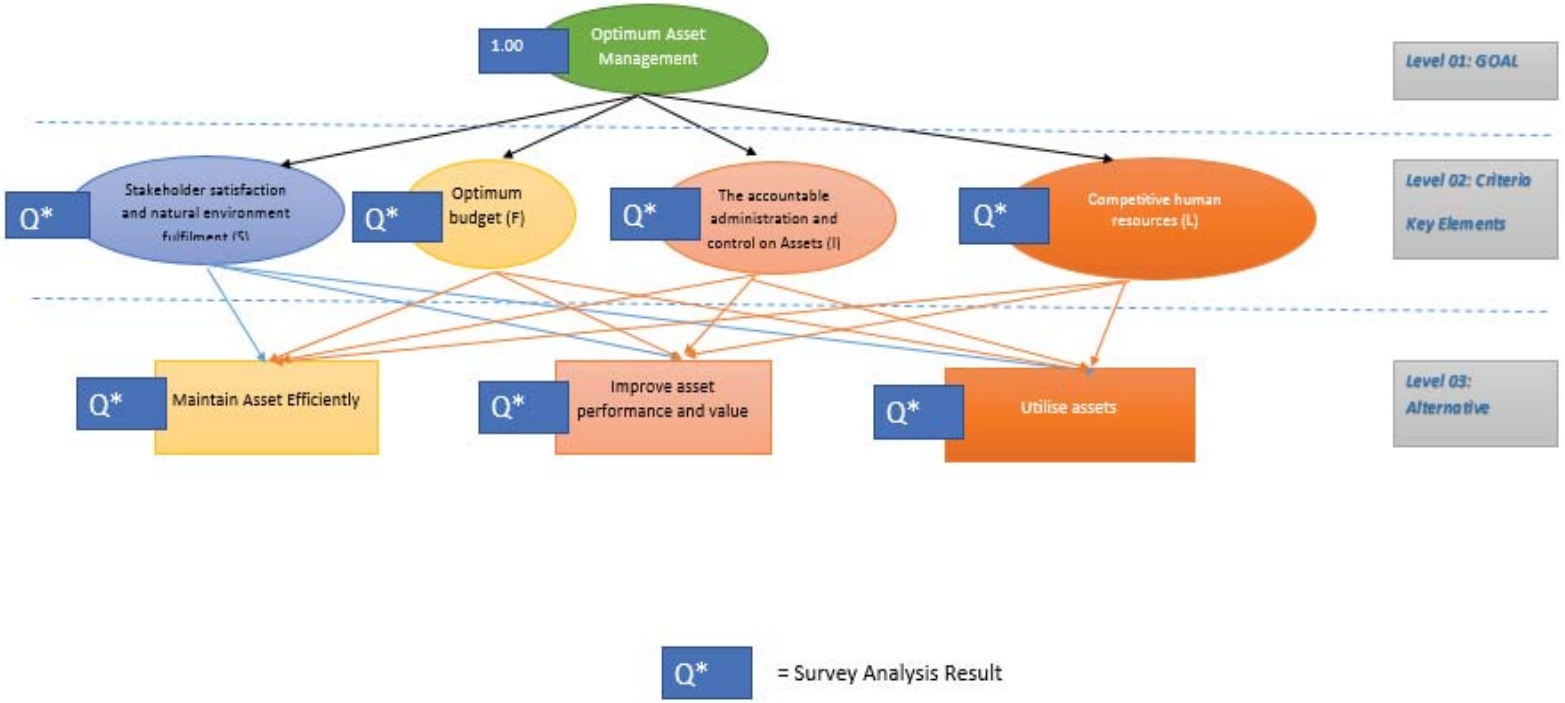


Figure 3.3 Level of contribution each key element and weighted priority of alternative (Based on the result of survey Stage 1)

3.8.In-depth Interview

A technique of the data collection process in qualitative research is an in-depth interview. This technique was accomplished by interviewing a small number of respondents in intensive individual approaches. The interview in this thesis is the further step, upon having the results of a survey in Stage 1. It had been selected to obtain the context of the research problem and facilitate the researcher in analysing the results of the survey and give the researcher new insights into the spectrum of asset optimisation. The interview was conducted by using open-ended questions that brought about rich data and enhanced the insight of asset optimisation.

3.8.1. Objective, Design, and Feature of In-depth Interview

As the previous passages mentioned, the objective of an in-depth interview is to validate the results of the survey Stage 1 and enhance the insight of the key elements of asset optimisation based on perspective and experiences of the top leaders. The interview was designed for a face-to face-interview to capture the understanding from each participant and to maintain the openness in expressing their perceptions. The questions of the interview also became a tool to explore the barriers and the recommendations from the policymaker perspectives. The topics of the interview questions were related to key elements of asset optimisation and their priorities in achieving the organisation's goals, alternatives of asset optimisation, and barriers in the implementation of asset optimisation as well as some recommendations. The questions of the in-depth interview are listed in the details in Appendix 2.

The original design of the interview script is in English, however, practically all the scripts have been translated based most of the interviewee's background, which is Indonesian. The interpretation process also provided concepts, issues, and illustrations relevant to the respondent background to avoid bias and to capture the original perception.

3.8.2. Selection of Respondent for In-depth Interview

The participants of the interviews were selected based on their current role in asset management and positions in the decision-making process considering the

organisational structure and job descriptions of DGSAM and LMAN. The respondents' experiences and perspectives are important in this interview. The criteria for the interviewees were determined as follows:

- Being a top or middle manager in a public asset management organisation
- Having a significant contribution to rule drafting
- Having experience for at least five years in asset management
- Having an educational background, at least a bachelor degree
- Having contributions in conceptualising and establishing an asset optimisation and management system.

3.8.3. The Recruitment Process in In-depth Interview

Based on the determined criteria, the first approach was achieved by sending emails followed by sending WhatsApp messages. The contact number of the respondents were provided by the department of human resources of DGSAM. The subsequent phase, once the participant agreed, was to propose an appointment. The interview questions and consent forms were sent to the interviewees electronically to set accurate responses and prepare the data well.

The detailed appointment including time and venue confirmation was set for each interviewee. The main challenge at this point was the frequently changing schedules of the interviewees, mostly key persons from the DGSAM central office, which caused delays and re-scheduling of interviews. There was even one interview that took two days to be accomplished. The interviews were conducted in Jakarta and Semarang. The analysis of in-depth interview led to reliable results using content analysis. The analysis of in-depth interviews consisted of five steps as follows:

1. Data preparation. In this step, six files of the interview script from six respondents were imported into the QSR NVivo 11 for coding and further steps.
2. Developing unit analysis. There were six-unit analyses developed in this step as a structure of content analysis, which were key elements or factor of optimisation, the most important factor, best alternatives, barriers,

recommendations, and implementation of asset optimisation using the current strategy tool.

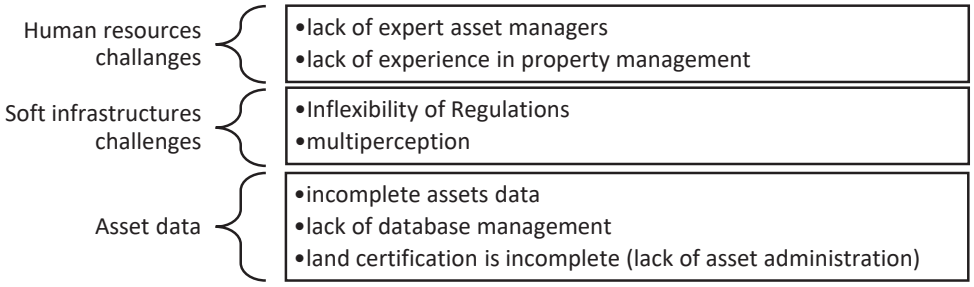
3. Developing a coding theme and checking the consistency. A coding theme was developed as guided by QSR NVivo11 software. There were 6 nodes representing six coding themes created. Each code was checked, and no major adjustments were made.
4. Coding all text. All texts were carefully examined and coded under 6 themes (from 6 nodes) without new themes emerging.
5. Drawing Conclusions.

The process of transcribing and coding should be done correctly (Roller, 2015) to ensure the accuracy and completeness analytical process. In this research also applies triangulation analytical process of interview results to promote the robust strategy of asset optimisation

3.8.4. Contribution of In-depth Interview in Strategy Development.

The results of the analysis of in-depth interview contributed to the development of the strategy by confirming the results of the survey regarding the priority level of key elements in asset optimisation. The interviews also contributed to the achievement of the second research objective, which is the identification of inherent barriers in developing asset optimisation in Indonesia. Contextually, the in-depth interview provided some recommendations and insights into key elements and the implementation of asset optimisation for land and buildings in Indonesia.

The challenges in the development of optimisation strategy, based on the current implementation of asset optimisation, are discussed for finding better solutions during the interview, and validated in the test case as follows:



3.9. Test Case

This case is an implementation stage of the strategy. The aspects of the test consisted of achievement of KPIs of selected cases. These KPIs were partly to have been measured by the tested buildings and some of them are the simulation of proposed KPIs. In order to proceed into the test case, type of data and other relevant information required were:

1. Data for building
2. Land and other improvements
3. Standards and codes of building and land for governmental office
4. Data of operation, maintenance and refurbishment costs
5. Annual reports of assets

3.9.1. Selection of Test Case

There are two test cases related to land and building of government offices that have been selected to implement the projected strategy . The selection criteria of each test case were based on the location, type of building, characteristic of service provided by the office that resided in the building. These parameters were chosen due to the following reasons:

- Locations, as this research, affirmed environmental issues as one of the key elements in asset optimisation strategy. There were two cities chosen; Jakarta and Semarang. The predominant reasons for selecting these cities were due to environmental aspects. According to (Yusuf & Francisco, 2009), Jakarta has a vulnerability index of 1.00 to climate change. This index is the highest compared to other cities. Focusing on the highest index of climate change such as flooding

as a result of heavy rainfall will then represent other cities who have similarities in terms of climate change impacts. Semarang city has potential tidal inundation that causes interruption of public services (Marfai & King, 2008). The area of the state office building II as the selected building is impacted by inundation that sometimes stops the office operation. Tidal inundation is one of the frequent disasters in Semarang that has impacted as flooding in Jakarta (Rahardjo et al., 2015; Siswanto et al., 2015). The DJKN building as the second selected building is also located in the flooding impacted area in the middle of Jakarta. Having two cities impacted by specific environmental issues implied a more comprehensive study in representing the various natural environments of governmental offices.

- Single and multiple office buildings. DJKN's central office building is a multi-story building occupied by only one organisation that is the DGSAM central office. On the other hand, the state finance building II (Gedung Keuangan Negara –GKN) is a multi-story office building occupied by four governmental organisations. Having various organisations with diverse clients or customers means differing provisions of services. Buildings and facilities have accommodated waiting rooms, corridors, an entrance hall, a parking area and other amenities, which will differ in fulfilling the standard and the performance (Ramos et al., 2015).
- The characteristic of services, whereby DJKN's building in Jakarta provides services to other governmental institutions. Therefore, institutional and coordinative services are provided resulting in more space for meetings, facilities and the interior aspects of the building, characteristics of which are needed. On the other hand, the state finance building II Semarang provides public services directly to the individual users.
- The landscape of the selected test case provides how to optimise the parcel of land and land improvement on it.

The test case selection and the length of the visit are shown in Table 3.4.

Table 3.4 Property Selection for Test Case and Observation Date

No	Building	Level	Date	Length
1.	DJKN Building, Lapangan Banteng Timur St 2-5 Central Jakarta	Central office	6 – 23 July 2017 14 – 17 Aug 2017	3 weeks
2.	State Finance Building (Gedung Keuangan Negara/GKN) II, Jl. Imam Bonjol 1, Semarang	Regional	24 July – 14 Aug 2017	2 weeks

The office building of DJKN is a complex of offices and amenities, such as parking lots, landscaped areas, a canteen, and a tennis court. This building has 12 levels and one basement level, located at Lapangan Banteng Timur Street 2-4, Central Jakarta. It is owned by the central government. The state finance building II Semarang, comprises the offices for the Ministry of Finance occupied by the DGSAM Regional office of Semarang and Daerah Istimewa Yogyakarta (DIY), Kantor Pelayanan Kekayaan Negara dan Lelang (KPKNL) as the operational office of DGSAM for state asset management and auction services in area of Semarang and Yogyakarta as well as the regional tax offices of Semarang.

3.9.2. Test Case Process

There were two main techniques to implement the strategy into the real context. Asset operators in Jakarta and Semarang were recruited via phone call to make an appointment for a face-to-face interview. These asset operators then provided secondary data to support the information on land and building in the test case. The following paragraph describes the secondary data and information regarding the selected test case.

1. Data for building.

Data of building comprises of basic data and information on the physical building. This information is important to understand the records of not only the buildings'

physical aspects but also the past performance of the buildings. The construction year, materials, cost of construction and the natural environment event that affected building construction, will provide essential information for the optimum usage of the building. The challenge in collecting historical data are related to the validity, availability, and accessibility of records of buildings. To address the validity and accessibility, researchers were assisted by a staff of the Secretary-General of the Ministry of finance. The availability of data was solved by searching data records across a longer period to trace data thoroughly.

2. Data for Land and Other Improvements

The generic strategy outlines the land and building as one real estate and unseparated. Information about the improvements such as parking lots, landscape, roads and other facilities also included in the selected test case. The information such as size, type of improvements, size ratios around the selected buildings and also the standards of land improvements based on the current regulations. All of these improvements support the degree of optimisation of one property which is the land and building.

3. Standards and codes of building and land for the governmental office of land and buildings.

Official documents consist of layout, build drawings, maintenance procedures, location, size and local regulation, standards and codes and environmental regulation for construction to raise understanding and awareness, relating to the compliance of building construction to meet the optimum usage. Current regulation for governmental or public offices includes building construction guidance (Public Works). Compliance with this regulation is essential in attempting the optimum building and to fulfil the stakeholder perspective. This includes natural environment aspects, such as positive investment associated with corporate or organisational social responsibility (Miles, 2017).

4. Data of operation, maintenance and refurbishment costs.

Historical financial data, such as expenses or expenditure for the operation of the building, maintenance and refurbishment, provide valuable data for developing better

budget planning. The reliable and accurate budget reflects good governance in delivering value and service to the public (Egbide & Ade' Agbude, 2012). Cost analysis consists of variations between planning and actual expenditure, and cost monitoring in relation to the building performance (Frangopol et al., 2017).

5. Annual report of assets.

An internal report of assets assisted the researcher to understand the performance of the organisation to achieve the goal. The reports consisted of the annual performance of an organisation, human resources development program reports, asset performance utilisation, and asset administration. These reports include recommendations and additional information for a better decision-making process. According to J. Scott (2014), official documents are essential to be used in scientific research, as it can demonstrate the format of patterning and consolidating organisational activities (Prior, 2003).

6. Calculation of the projected KPIs based on the current reports and conditions.

All official documents and organisational historical data are conveyed in the calculation of KPI in DGSAM organisation level. Referring to Chapter two, the KPIs of each key element is as shown in Table 3.5:

3.9.3. Contribution of Test Case in Strategy Development Finalisation.

The literature of this research provided the foundation of strategy, how to develop and position the organisation prior to developing the asset optimisation strategy. The literature also provided a reflective strategy of asset optimisation from various countries at different levels of governmental structure. Therefore, the literature process generated the distillation optimisation strategy as the initial strategy of optimisation (see Figure 3.1). This then turned into the empirical stage - the survey provides important prioritisation of key elements (based on the level of importance-using AHP) of the organisation and how to achieve the main objectives of asset optimisation strategy using performance measurement. This process contributed to developing a generic asset optimisation strategy (GAOS) in BSC.

Table 3.5 Key Performance Indicators (KPIs)

Key Element	Detail of Key Elements	Key Performance Indicator	Formula
SER	Stakeholder requirements	Number of complaints	Based on the number of complaints that have been received.
		Customer satisfaction index	Based on DGSAM's survey
	Natural environment	Compliance indicator	Based on the positive regulations
		Pollution prevention indicator	Based on factual activities in pollution preventing
		Eco-efficiency indicator	Reducing environmental impacts activities
OB	Budgeted fund	Sum of deviation of the planned budget	Comparison between budget planning and actual costs
		Percentage of operation and maintenance cost	(Operation & maintenance costs: total costs) x 100%

Key Element	Detail of Key Elements	Key Performance Indicator	Formula
AAA	Asset Data	The availability of basic data on land and building	
		Percentage of public land and building that have value	
		Legal ownership and boundaries	
	Asset maintenance and monitoring system	Total maintenance expenditure	Total maintenance cost: the size of managed land
		Physical condition index (PCI)	Actual condition – the required physical condition
		Functional performance index (FPI)	
	Asset layout	Building density	A ratio between the total gross floor of buildings and the total size of the site
		Efficient land use mixed	The balanced conditions between the building and other amenities
CHR	Skilled asset manager	Improvement understanding of asset management	Based on current data
		The number of asset manager training or professional certifications	Based on current data
		Employee satisfaction concerning organisations' facilities, hardware, and software.	Based on a survey

Source: Author's Compilation

The test case of this research validated the GAOS through evaluation of KPIs. Therefore, from the trial implementation of GAOS, an applicable and robust asset optimisation strategy (RAOS) can be applied as a generic strategy. The flow of the strategy development as the research process was drawn, is depicted in Figure 3.4.

The outcome of this research was the generic strategy that considers inherent barriers as the challenges of developing asset optimisation in Indonesia. The results of this research will assist public sectors in optimising assets, especially land and buildings. This research will also contribute to developing guidelines for asset optimisation procedures, techniques, and recommendations of strategy.

3.10. Conclusion

This chapter confirmed the research proposition, method, and process of research. The research proposition promised the effectiveness of the designed research process by affirming the achievement of the objectives of this research. After the literature reviews of the existing BSC and finding the gaps then move to the data collection process and technique using the chosen method, The development of the preliminary strategy also helps in providing requirements of the data collection steps. The methods of data collection which are survey, in-depth interview and test case, were equipped with techniques, analysis and strategy's contribution from each selected method. The test case is the major method whereby the strategy is finalised to be more applicable. This chapter also concluded with the argument of expected results that become the foundation for research findings in the following chapters.

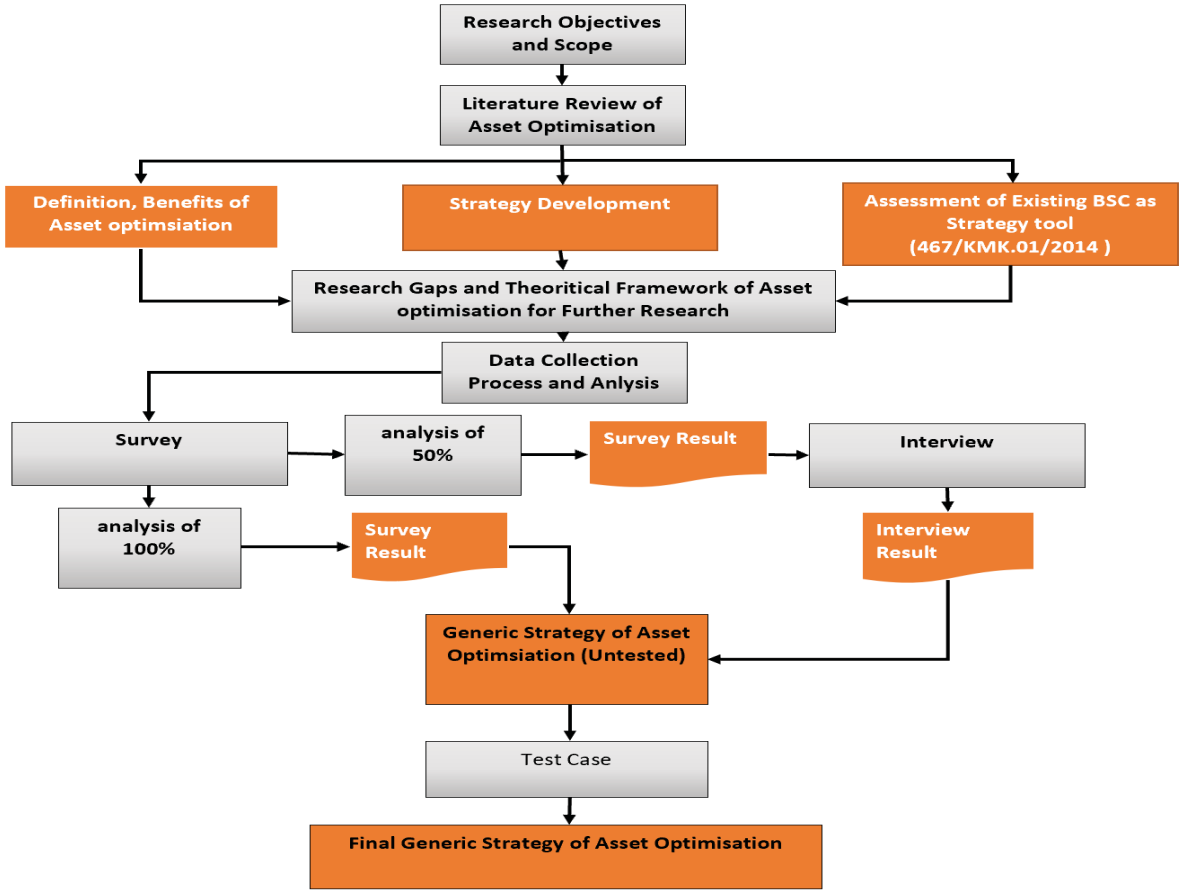


Figure 3.4 Flow of Research

Chapter 4. Survey Analysis and Results

4.1. Introduction

The researcher conducted the survey as the first data collection method to achieve the first objective of this research, being to identify and examine the key elements of asset optimisation. The identification of key elements is essential to develop a generic asset optimisation strategy for public land and buildings in Indonesia. So, the first research question had been addressed. The process of identification required reinforcement of the presence of key elements and examination of the key elements' level of significance in contributing to the organisational goal. In measuring the key elements, their adaptation into the perspectives of BSC was posed as questions to the survey respondent based on the AHP Scale.

This chapter described the analysis of survey data starting from the explanation of the respondents' profiles in section 4.2. The next section explains the analytical process of AHP of survey data in Stage 1 followed by findings from each respondent that corresponded to the survey resulting in generating the final score in section 4.5. Sections 4.6 and 4.7 discuss the implication of the final score into the decision-making process section and key findings of the survey respectively. The process of AHP and how its results contribute to strategy development is described in section 4.8. The last section outlines the key findings of the survey and the development of the strategy in asset optimisation.

4.2. Profile of Organisation of Respondents

There were three main governmental organisations with which the respondents were associated, DGSAM, LMAN, and Municipal Governments. In addition, there is another category of respondents, namely auction participants, which represent buyers in the property market, being non-government sector or external stakeholder. The profiles of each of the three organisations including the profile of participants are described in the following sections as follows.

4.2.1. Directorate General of State Asset and Management (DGSAM)

Respondents from the Directorate General of State Asset Management (DGSAM) were selected from several directorates of central office and divisions from its branch offices, namely the regional and operational offices. DGSAM is acknowledged as the asset manager in the public sector, managing public assets owned by central government across the country. It is responsible to the Minister of Finance of the Republic of Indonesia as stated in the Indonesian law number 27 the year 2014. Law number 27/2014 aims to rule the management of assets of the central and the local government on the basis of functional, legal certainty, transparent, efficient, value assurance, and accountability principles. DGSAM consists of several divisions to perform its functions in state asset management as follows:

a. Directorate of State Assets. It is responsible for drafting the rules and regulations, establishing standards and controlling the compliance of the state asset management process from asset utilisation, maintenance and asset disposal.
b. Directorate of Separated State Assets. It is responsible for drafting the rule, establishing standards and controlling the compliance of the separated stated asset management process. Separated state asset is the government's investment funded by the national budget.
c. Directorate of State Receivable and Other State Assets. It is responsible for drafting the rules, establishing standards and controlling the compliance of the governmental receivables and other state assets.
d. Directorate of State Asset Management and Information System. It is responsible for the authorisation and implementation of state asset management such as asset utilisation, maintenance and disposal. It is also responsible for constructing the asset information system to support asset management decision.
e. Directorate of Valuations. It is responsible to design rules and regulations of asset valuation including its standards and procedures, perform valuation and supervise the government appraisers.
f. Directorate of Auctions. It is responsible for drafting the rules, establishing standards and controlling the compliance of the auction.

g. Directorate of Law and Public Relation. It is responsible for drafting the rules and regulations of the whole function of DGSAM including evaluation of existing policy and regulations to ensure all rules and regulations are harmonised. It is also responsible in the area of public relations, to external stakeholders and the public.
h. Branch offices consist of 17 Regional Offices (echelon 2) and 81 Operational Offices (echelon 3). The Regional Office is responsible for technical and implementation of all functions of DGSAM in its respected regions. It is also responsible in supervising and controlling the operational offices, namely Kantor Pelayanan Kekayaan Negara dan Lelang (KPKNLs), where the KPKNLs provide services of asset management functions to the public and other customers as the end-users.

DGSAM has also three advisors (echelon 2) to the Directorate General as follows:

- Advisor of Policy Harmonisation, with responsibility in harmonising rules and regulations of DGSAM that refer to the existing rule and regulations, to avoid contradiction or overlapping.
- Advisor of State Asset Optimisation, with responsibility in legal and operational aspects of the implementation of the asset optimisation program, by providing recommendations to the decision-makers of DGSAM.
- Advisor of Restructuration of Privatisation and Separated State Asset Effectiveness, with the responsibility to provide a recommendation from legal, techniques and managerial aspects of restructuration and privatisation for the effectiveness of asset management of separated assets.

4.2.2. Lembaga Manajemen Asset Negara (LMAN)

LMAN is one of the arms of DGSAM that has a special duty to implement a public asset optimisation program for public land and buildings (MoF, 2015). As the public service agency (Badan Layanan Umum/BLU), LMAN is an operator of asset utilisation to generate governmental income from renting, build operate transfer or build transfer operate (BOT/ BTO) or other productive activities. LMAN is also the agency to counter or reduce underutilised assets in a more flexible and specific manner

using the entrepreneurship approach. As a brand new organisation, LMAN was supported by an organisation structure that includes directorate of risk management, directorate of land procurement and funding and directorate of development and utilisation. The respondents from LMAN were recruited from across organisation structure and roles. They have a role as a manager and have the various educational background, mainly from doctoral and master degree.

4.2.3. Municipal Government

Municipal governments of Semarang and Surabaya represent the users of public building and asset information systems provided by the governmental asset manager that is DGSAM. Semarang is the capital city of Central Java; Semarang is also the fifth-largest city after Jakarta, Surabaya, Bandung and Medan. The municipal government of Semarang services the public, covering 2 million citizens who are living in the city. The respondents from the municipal government of Semarang are from the low-level management from the Internal Affairs department, division of asset or equipment, and staffs who work with and are responsible for managing assets (Barang Milik Daerah/BMD) in this department. The academic background of respondents from the municipal government of Semarang is undergraduate (above 55%) and master's degree (7%). Recruitment of the respondents from this governmental organisation considered the academic level of respondents to gather qualified opinion and to be representative of professional academia in public policy.

The municipal government of Surabaya also has a similar situation to that of Semarang. The academic background of respondents, from the municipal government of Surabaya, is undergraduate (45%) and master's degree (3%). The majority of respondents were from the internal affairs department, which is responsible for managing local governmental assets. The main function in asset management of the department in municipal government has been closely linked to the main function of the DGSAM regional office. Accordingly, the central and municipal government can be collaborated and synergised their tasks in public asset management.

4.3. Description of Sample Respondents of the Survey

As previously mentioned, there were two types of survey in this research, offline (paper-based survey) and online. The respondents of the online survey in this research are from DGSAM, representing the public asset managers, LMAN as representative of the practitioner of asset optimisation in the public sector for government assets, municipal governments of Semarang and Surabaya representing users of governmental buildings, and real estate agencies represented by auction participants (buyers from previous auctions). The researcher targeted a number of 131 respondents for the survey. However, there were 129 responses fully answered the questions of the survey and were returned to the researcher, consisting of 117 responses from the online survey and 12 responses in paper-based form (offline) as shown in Figure 4.1.

- Offline/online :
  a. Offline: 12 Respondents (9%)
  b. Online: 117 Respondents (91%)

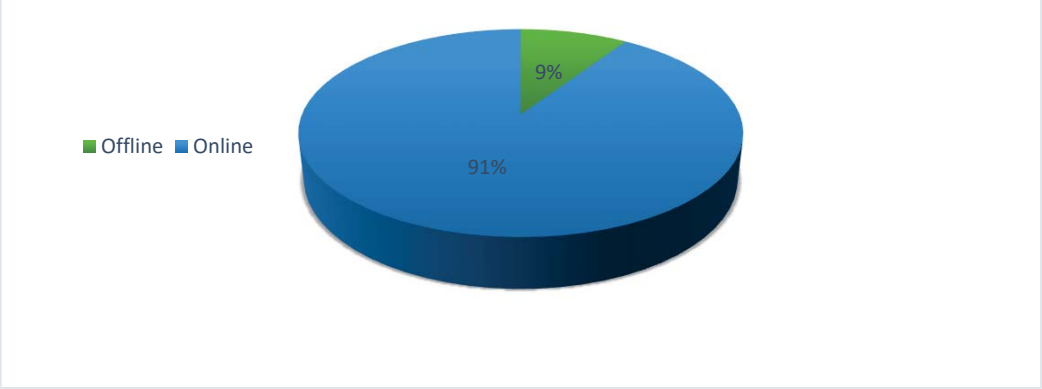


Figure 4.1 offline and online survey

Table 4.1 provides descriptive statistics of the organisation where the respondents were from. There were 96 respondents (74 %) who were from DGSAM, 6 respondents (5%) were from LMAN , 10 respondents (8%) were from municipal governments of Semarang and Surabaya and 17 respondents (13%) were from real estate agencies (auction participant) considered as market players of the real estate.

Table 4.1 Sampling distribution of respondents based on background of the organisation

	Respondents' Organisation Background	Frequency	Percentage
By organisation of respondent	DGSAM	96	74%
	LMAN	6	5%
	Municipal Government	10	8%
	Auction Participant	17	13%

Table 4.2 provides descriptive statistics of role and position of the respondents in their respective organisations, such as one respondent who was in position of echelon II, 8 respondents (6%) were from echelon III, 55 respondents (43%) were from echelon IV and the remaining were at staff level (50%).

Table 4.2 Frequency of Respondents According to Their Role/Position in Organisation

	Respondents' role and position	Frequency	Percentage
By role and position in the organisation	Echelon II (Top Manager)	1	1%
	Echelon III (Middle Manager)	8	6%
	Echelon IV (Lower Manager)	55	43%
	Staff (operator)	65	50%

The respondents of LMAN and municipal governments are from the echelon IV and staff as shown in Figure 4.2 below. The auction participants are respondents that expressed perceptions of users of land and buildings owned by the government and also considered as market players of real estate. Their perspectives were considered as those of external stakeholders that contributed to asset optimisation. Therefore, there were balanced views covering external and internal perspectives that were drawn from the survey about how the government assets give benefit to the community.

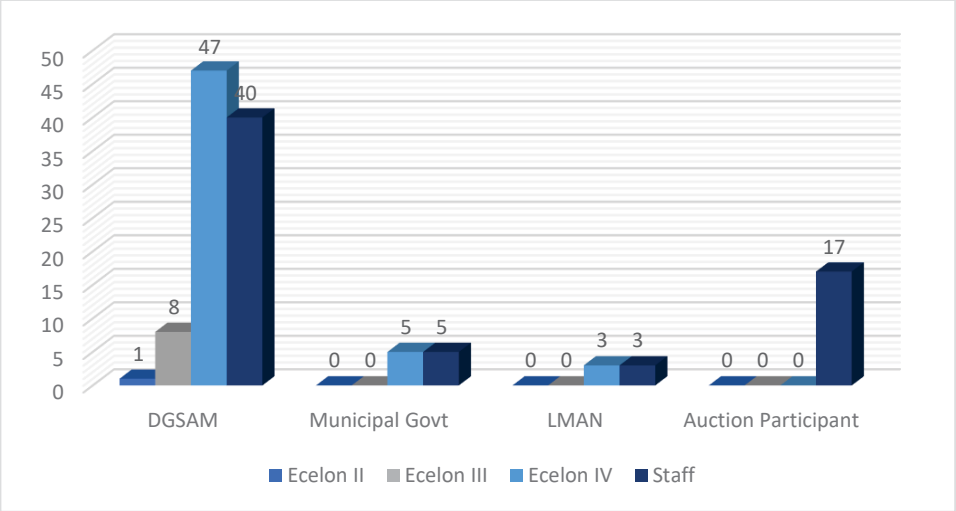


Figure 4.2 Role or Position in Organisation of Respondents

Respondents from Auction Participants.

The auction participants are customers of DGSAM's operational offices (KPKNL). They are real estate agencies and potential and previous buyers of state assets put on auction by KPKNL. They involved in the auction process as bidders, and the researcher has considered their participation as part of the national property market from the auction industry. According to the annual report of DGSAM, the average of the number of auctions conducted per year was 47.042 times. In the last five years (2012-2016), auctions have contributed IDR 1.245 billion or AU$ 125 million to the country's revenue. This contribution is shown in the following figure. The significant contribution of auctions in the country in term of the number of auction undertaken, and the revenue generation. The number of auctions has increased steadily from the year 2012 to 2016, as shown in Figure 4.3. The contribution of auctions in generating government income as another indirect role of the auction participants is shown in Figure 4.4. The number of government revenue reached the highest in 2013 then it declined in 2014. Besides, the increase of the number of auction 2014 to 2016 slightly generated amount of revenue but not as much as in 2012 and in 2013. The auction participant provided an opinion as a property market player and also as an end-user of public land and buildings.

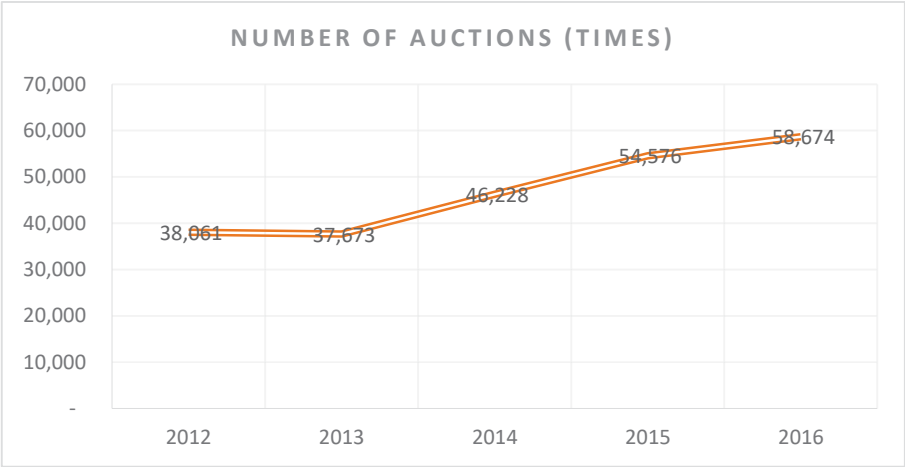


Figure 4.3 Graph of Number of Auctions 2012 to 2016 (source: DGSAM, 2017)

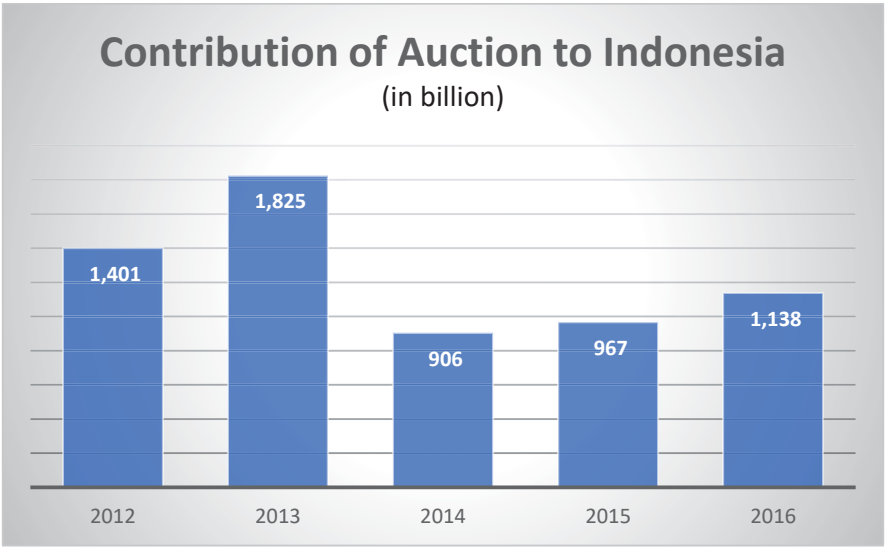


Figure 4.4 Graph of Auction Contribution to the Nation

4.4. AHP of Survey Analysis Stage 1

Analytical Hierarchy Process (AHP) process was implemented to identify the level of significance of each key element. It is one of the multi-criteria decision analyses that quantify relative priorities of a set of alternatives on a ratio from 1 to 9 scale. The motto of AHP is 'divide and conquer' (Ishizaka & Nemery, 2013), meaning that

respondents will be asked to consider one variable and disagree or will not join together with another, in choosing the pairwise provided in a certain level of importance. In the AHP process, this research utilised Microsoft Excel software in accommodating 129 respondent opinions by conveying the flow, as illustrated previously in Chapter 2, Figure 2.4. There are five main steps for each stage of the survey. The benefits of the analysis of differentiation between Stage 1 and Stage 2 are as follows:

- The calculation of weighting criteria, checking consistency and selecting the best alternative of the survey in Stage 1 resulted in the preliminary results to be asked in the in-depth interview.
- The results of the survey in Stage 1 and Stage 2 provide an understanding of the involvement of different numbers of respondents whereby 62 respondents were involved in Stage 1 and 129 respondents were involved in Stage 2. This affected the decision-making process and is also part of the process in triangulation analysis.
- The results of the survey in Stage 1 contributed to the results of the in-depth interview, whereas the survey in Stage 2 contributed to the final findings from the analysis of survey data leading to the development of a strategy .

4.4.1 Structuring the Hierarchy

As a system, the hierarchy of asset optimisation was developed from the subsystem (the key elements of the optimisation program). Figure 4.5 illustrates the structure of AHP, in which the main goal of asset optimisation is optimum asset management (Level 01).

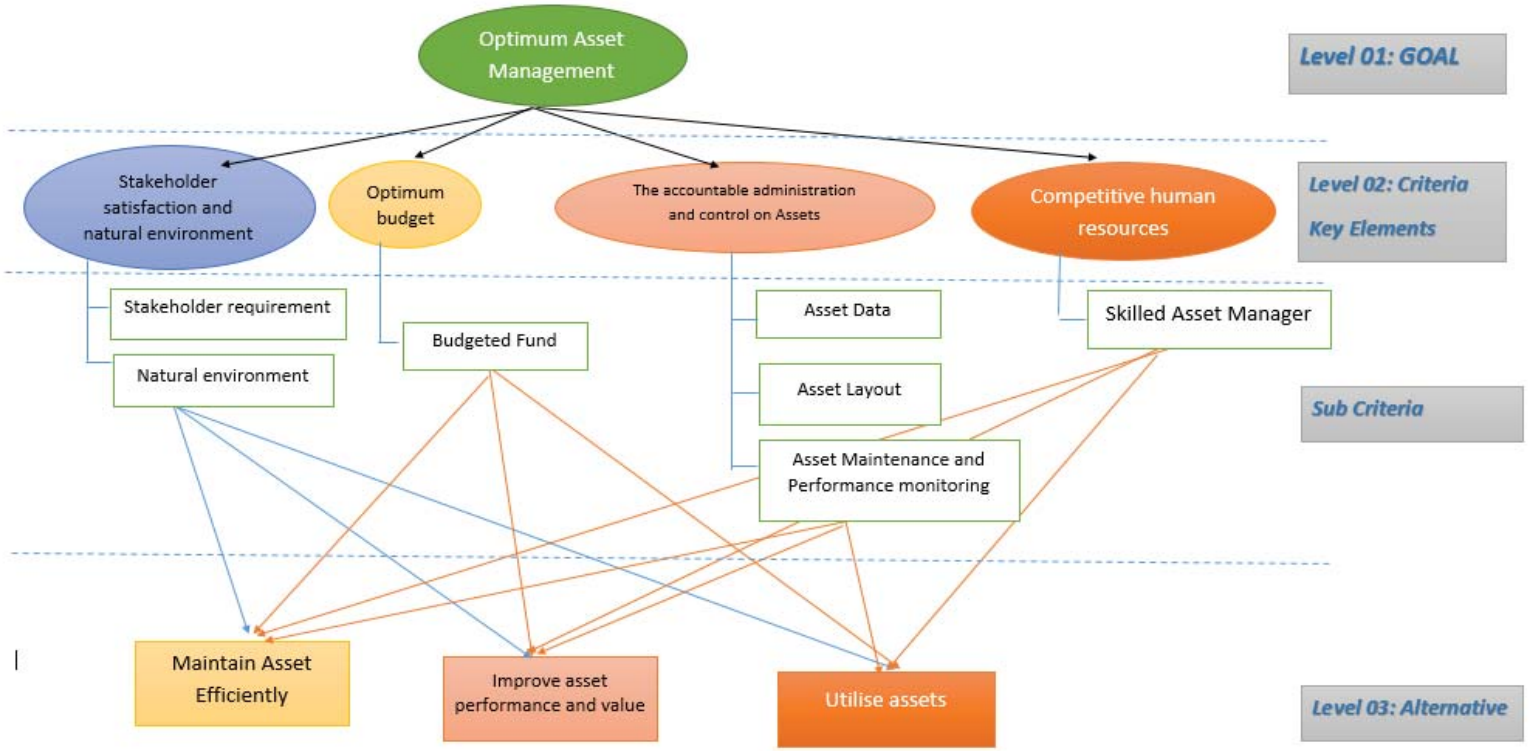


Figure 4.5 Hierarchical Structure of Asset Optimisation Strategy

Each level of optimum asset management depends on the key elements (Level 02) as the criteria of the optimisation program. The adaptation of key elements into the perspectives of BSC was grouped into four criteria, including its corresponding sub-criteria as follows:

- Stakeholder satisfaction and natural environment (SER):
    - Stakeholder satisfaction and
    - The natural and built environment
- Optimum budget (OB) as a representation of the financial aspect of
    - Budget fund
- Accountable administration and control of assets (AAA):
    - Asset Data
    - Asset Layout
    - Asset maintenance and performance monitoring
- Competitive human resources (CHR):
    - Skilled asset manager

These criteria (SER, OB, AAA, and CHR) were asked to the respondents, using the 9 scales of AHP questionnaire (see Appendix 1). Level 03 consists of several alternatives of asset optimisation, namely to maintain assets efficiently, improve asset performance and value, as well as utilise assets.

4.4.2 Assigning the Weight of the Level of Criteria with Scoring for Survey Data in Stage 1

This process is assigning the weight of the level of criteria (Level 02). The valuation of each criterion is based on the pairwise between them. The output of the weighted criteria is in the K matrix below:

$$K = \begin{bmatrix} k\,(AAA, AAA) & k\,(AAA, OB) & k\,(AAA, CHR) & k\,(AAA, SER) \\ k\,(OB, AAA) & k\,(OB, OB) & k\,(OB, CHR) & k\,(OB, SER) \\ k\,(CHR, AAA) & k\,(CHR, OB) & k\,(CHR, CHR) & k\,(CHR, SER) \\ k\,(SER, AAA) & k\,(SER, OB) & k\,(SER, CHR) & k\,(SER, SER) \end{bmatrix}$$

Where, K (AAA,AAA), K (OB, OB)… in yellow colour = score of comparison between criteria AAA with criteria AAA = 1, OB with OB = 1
K (OB, AAA) score of comparison between criteria OB criteria AAA

The result of the survey in Stage 1 is placed into the table (as a comparison in the matrix) as shown in Table 4.3 as follows:

Table 4.3 Matrix of Criteria

Criterion	AAA	OB	CHR	SER
AAA	1.0000	1.9822	0.8520	2.2251
OB	0.5045	1.0000	0.2973	1.0742
CHR	1.3493	3.3635	1.0000	1.3613
SER	1.8823	0.9309	0.7346	1.0000
Total Priority of criteria	4.7361	7.2766	2.8839	5.6607

Note:
AAA : Accountable Asset Administration and Control of Asset
OB : Optimum budget
CHR : Competitive human resources
SER : Stakeholder requirement and natural environment fulfilment

4.4.3 Calculation of the weight of priority

There are three calculations in weighing the priority as shown in Table 4.4 as follows

1. Pairwise comparison in decimals, where there are 4 criteria that means ¼ or 0.25
2. Calculate the EigenValue (EV) by = squaring the matrix of criteria or K^2 as shown in Column 6.
3. Calculate the weighted priority of criteria (EV=total of EV) as shown in Column 7

Table 4.4 Weighted Priority of Criteria

Criteria	AAA	OB	CHR	SER	Eigen Value (EV)	Weighted Priority
1	2	3	4	5	$6 = K^2$	7= EV : Total EV
AAA	1.0000	1.9822	0.8520	2.2251	1.3923	0.2464
OB	0.5045	1.0000	0.2973	1.0742	0.6336	0.1121
CHR	1.3493	3.3635	1.0000	1.3613	1.5766	0.2790
SER	1.8823	0.9309	0.7346	1.0000	2.0478	0.3624
Total	4.7361	7.2766	2.8839	5.6607	5.6502	1.0000

Note: Table 4.4 is continued to Table 4-5 below.

The weighted priority of each criterion (AAA = 0.2464, OB= 0.1121, CHR = 0.2790, SER = 0.3624) shown in Column 7 becomes the weight of alternative of asset optimisation.

4.4.4 Checking for consistency

There are six steps undertaken to check the consistency of pairwise in order to be accepted (Consistency Index (CI) < 10 %) as follows:

1. Calculate the weighted synthesis:

   It is undertaken by dividing the value of each row in Column 2 in Table 4.4 by the total value of all rows in the same column as shown in Column 8 in Table 4.5 as follows:

   AAA = 1.0000: 4.7361 = 0.2111

   OB = 0.5045: 4.7361 = 0.1065

   CHR = 1.3493: 4.7361 = 0.2849

   SER = 1.8823: 4.7361 = 0.3974

   This calculation should also be performed for column 9, 10 and 11 with the same formula. Weighted synthesis in Column 12 is the summation of Column 8, Column 9, Column 10 and Column 11, therefore, for example, the weighted synthesis of row AAA (1.1721) is resulted from summation of all values in each column from the same row (0.2111 + 0.2724 + 0.2954 + 0.3931 = 1.1721). A similar calculation for other rows is also applied.

Upon calculation of weighted synthesis, the calculation of Eigen Maximum (X) is undertaken by dividing each value of weighted synthesis in Column 12 with the corresponding value of weighted priority in Column 7 resulting value of Eigen Maximum (X) placed in Column 13 as shown in Table 4.5.

Table 4.5 Weighted Synthesis and Eigen Maximum (X)

Criteria	AAA	OB	CHR	SER	Weighted Synthesis	Eigen Max (X)
	8= col 2:∑ col 2	9= col 3:∑ col 3	10= col 4:∑ col 4	11= col 5:∑ col 5	12 = (8+9+10+11)	13=12:∑12
AAA	0.2111	0.2724	0.2954	0.3931	1.1721	4.7564
OB	0.1065	0.1374	0.1031	0.1898	0.5368	4.7874
CHR	0.2849	0.4622	0.3468	0.2405	1.3344	4.7822
SER	0.3974	0.1279	0.2547	0.1767	0.9567	2.6399

2. Calculate the Consistency Index (CI) and Consistency Ratio (CR)
3. CI is the result of λ (Lambda) Max deducted by a number of criteria, which is 4 divided by the number of criteria minus 1 (or 4 – 1). While λ Max is a summation of Eigen Max (X) (see Column 13 Table 4.5) divided by the number of criteria. Therefore, λ Max is resulted from : *4.7564 + 4.7874 + 4.7822 + 2.6399) : 4 = 4.2415*
4. Therefore,

   CI = (λ max - 4): 3

   CI = (4.2415 - 4): 3 = 0.0805

5. While CR is the Consistency Index (CI) divided by Random Index (RI) as shown in the following table:

n (criteria)	1	2	3	4
RI	0	0	0.58	0.9

Therefore

CR = 0.0805: 0.9 = 0.0894 or 9% that means accepted

As previously mentioned, the minimum requirement for acceptance if the Consistency Ratio is less than 10% (CR < 10 %). Because CR is less than 0.9 or 10%, accordingly, it is accepted.

In this step the ranking of criteria as indicated in Table 4.4 has shown the highest score of criteria, that is Stakeholder Requirement and Natural Environment fulfilment (SER) with a score of 0.3624. The complete result of the priority and score of survey stage 1 as the following order:

- Ranking 1 SER 0.3624 or 36%
- Ranking 2 CHR 0.2790 or 28%
- Ranking 3 AAA 0.2464 or 26%
- Ranking 4 OB 0.1121 or 11%

This result becomes the first main factor of the validation step in the in-depth interview analysis, as described in Chapter 5.

4.4.5 Selecting the best alternative.

There are three alternatives that were given to respondents:

a. To improve the performance and value of assets
b. To maintain assets efficiently
c. To utilise assets

Based on the structural hierarchy of the asset optimisation strategy as shown in Figure 4.5, an alternative of asset optimisation is placed in level 03. The pairwise among the alternatives were set in accordance with each criterion. Therefore, there are four priority weights of alternatives. In order to do so, data from the survey should be put in the table. The calculation of priority of weight of alternative is as follows:

1. Pairwise comparison in decimal, whereby there are 3 alternatives that mean 1/3 or 0.3333.
2. Calculate the EigenValue (EV). The EV is the square of matrix or K^2. The matrix of alternatives depends on the criteria that the alternative is referring to. The EV

of alternatives corresponds to the criteria as shown in column 5 of Table 4.6, Table 4.7, Table 4.8 and Table 4.9.

3. Calculate the weighted alternative as shown in column 6 of Table 4.6, Table 4.7, Table 4.8 and Table 4.9, whereby the formula of weighted alternative is EV: a total of EV.

Table 4.6 Priority of weight of alternatives corresponding to the AAA

AAA	Improve Performance And Value	Maintain Asset Efficiently	Utilise Asset	Eigen Value	Weighted Alternative
1	2	3	4	5	6
Improve Performance And Value	1.0000	0.8115	1.9129	1.1579	0.3613
Maintain Asset Efficiently	1.2323	1.0000	2.4871	1.4525	0.4532
Utilise Asset	0.5228	0.4021	1.0000	0.5946	0.1855
Total				3.2050	

Table 4.7 Priority of weight of alternatives corresponding to the OB

OB	Improve Performance And Value	Maintain Asset Efficiently	Utilise Asset	Eigen Value	Weighted Alternative
1	2	3	4	5	6
Improve Performance And Value	1.0000	1.0657	0.5817	0.8527	0.2732
Maintain Asset Efficiently	0.9383	1.0000	2.0153	1.2366	0.3962
Utilise Asset	1.7191	0.6393	1.0000	1.0320	0.3306
Total				3.1212	

Table 4.8 Priority of weight of alternatives corresponding to the CHR

CHR	Improve Performance And Value	Maintain Asset Efficiently	Utilise Asset	Eigen Value	Weighted Alternative
1	2	3	4	5	6
Improve Performance And Value	1.0000	0.9828	0.4903	0.7840	0.2576
Maintain Asset Efficiently	1.0175	1.0000	1.5505	1.1641	0.3825
Utilise Asset	2.0395	0.6449	1.0000	1.0957	0.3600
Total				3.0438	

Table 4.9 Priority of weight of alternatives corresponding to the SER

SER	Improve Performance And Value	Maintain Asset Efficiently	Utilise Asset	Eigen Value	Weighted Alternative
1	2	3	4	5	6
Improve Performance And Value	1.0000	0.9821	1.7070	1.1879	0.3859
Maintain Asset Efficiently	1.0182	1.0000	1.5829	1.1725	0.3809
Utilise Asset	0.5858	0.6317	1.0000	0.7180	0.2332
Total				3.0784	

4. The last step in selecting the best alternative is a summation of Weighted Alternative of each criterion as shown in Table 4.10:

Table 4.10 Matrix of Value of Alternatives of Survey Stage 1

ALTERNATIVES	AAA	OB	CHR	SER	Matrix Value	Ranking
Improve Performance And Value	0.3613	0.2732	0.2576	0.3859	0.3314	2
Maintain Asset Efficiently	0.4532	0.3962	0.3825	0.3809	0.4009	1
Utilise Asset	0.1855	0.3306	0.3600	0.2332	0.2678	3

According to the survey in Stage 1, respondents have chosen the Stakeholder Requirements and Environmental Fulfilment (SER) as the highest factor in asset optimisation and the best alternative of asset optimisation is to Maintain Assets Efficiently. This result becomes the second validation in the in-depth interview as described in Chapter 5.

4.5. Survey Analysis Stage 2 (complete)

The process of analysis of survey data in Stage 1 is also applied to that of Stage 2. However, all respondents were included in the calculation of AHP calculation in Stage 2. The calculation of Stage 2 can be seen in Appendix 3. The CI of Survey in Stage 2 is 10%, which means the pairwise is accepted because it was consistent.

According to the survey in Stage 2, respondents have chosen the Stakeholder Requirements and Environmental Fulfilment (SER) as the most important key element

in asset optimisation and the best alternative of asset optimisation is Maintain Assets Efficiently. The comparison of results between survey in Stage 1 and Stage 2 is shown in Table 4.11.

Table 4.11 Comparison of Results of Survey Stage 1 and Stage 2

Description	Stage 1	Stage 2
Percentage of Respondent (total respondent 229)	50%	100%
1. Weighted Priority		
a. Accountable Administration of Asset (AAA)	0.2464	0.1880
b. Optimum Budget (OB)	0.1121	0.1098
c. Competitive Human Resources (CHR)	0.2790	0.3408
d. Stakeholder Requirement and Environmental Fulfilment (SER)	0.3624	0.3614
2. λ max (Lambda max)	4.2415	4.2500
3. CI (Consistency Index)	0.0805	0.0833
4. CR (Consistency Ratio)	9%	10%
5. Alternative		
a. Improve Performance of Asset and Value	0.3314	0.3148
b. Maintain Asset Efficiently	0.4009	0.4045
c. Utilise Assets	0.2678	0.2809

According to Table 4.11, the first weighted priority of the key element remains the same, being Stakeholder Requirement and Environmental Fulfilment (SER). It is followed by Competitive Human Resources (CHR), Accountable Administration of Asset (AAA) and Optimum Budget (OB). Most participants agree that external factors, such as Regulations, Natural Environment, and Stakeholder Requirement are the most important elements in selecting alternatives of asset optimisation scoring 0.3624 (36%) and 0.3614 (36%) in Stage 1 and Stage 2 respectively. The best alternative for both stages in asset optimisation is to Maintain Asset Efficiently, scoring 0.4009 (40%) and 0.4045 (40.45%) in Stage 1 and Stage 2 respectively. The other options are Improve Performance of Asset and Value and Utilise Assets. The Consistency Ratio is below 10% as the limit for acceptance CR.

Stage 1 and Stage 2 of the surveys showed similarities of the most important key element and alternatives, regardless of the organisation and the role of participant. As a result, the AHP of both stages is very general. The general view of criteria and alternative of asset optimisation could potentially create a bias if this result turns into the decision making the process. Thus, this research requires an investigation of the type of organisation and role of respondent in order to demonstrate a thorough view of how the organisation and position influence the key element and alternative of asset optimisation.

4.5.1 Organisation View-based and Role View-based and implications on AHP Result

There are five main groups of organisation of respondent and five roles or positions of the respondent in their organisations. These organisations and roles of respondent impact on their perspective in determining the most significant criteria and the best alternative of asset optimisation. For that reason, the organisation where the respondent works and the role of the respondent, are responsible for having to be investigated further for developing more integrative and broad views in optimisation strategy.

The organisation provides the experience of working and social interaction among employees. Moreover, the organisation has a positive relationship with perceptions of employees that influence the learning competence (Neiva et al., 2015). The learning process is part of the experience, and that experience builds perceptions of respondents. The preference of respondents in providing their opinions might differ because of their organisational backgrounds or roles. The organisation-based investigation of surveys is important because each organisation has a special mission and duties that can interfere with the opinions of respondents in perceiving the questions of the survey. Also as an environment, the organisation is a specific physical, technological, cultural and social environment where people are required to adapt, in order to exist (W. R. Scott & Davis, 2015). This circumstance leads respondents from different organisations to have dissimilar perceptions. Therefore, organisations such as

DGSAM, LMAN, municipal governments and a group of auction participants, have different missions and duties as well. The calculation and results of AHP of each organisation of respondents are shown in Table 4.12 and explained in detail in Appendix 3.

Table 4.12 Result of AHP based on the Organisation or Group of Respondent

Description	Organisation/Group			
	DGSAM	LMAN	Municipal Government	Auction Perticipant
Percentage of Respondent (total respondent 229)	74%	5%	8%	13%
1. Weighted Priority of Criteria				
a. Accountable Administration of Asset (AAA)	0.1915	0.2542	0.1902	0.1472
b. Optimum Budget (OB)	0.1119	0.0804	0.1763	0.0715
c. Competititve Human Resources (CHR)	0.3415	0.2583	0.2557	0.4320
d. Stakeholder Requirement and Environtmental Fulfilment (SER)	0.3550	0.4071	0.3779	0.3492
2. λ max (lamda max)	4.2816	4.3770	4.4364	4.2617
3. CI (Consistency Index)	0.0939	0.1257	0.1455	0.0872
4. CR (Consistency Ratio)	10%	14%	16%	10%
5. ALTERNATIVE				
a. Improve Performance of Asset and Value	0.3148	0.3126	0.3150	0.3152
b. Maintain Asset Efficiently	0.4100	0.3878	0.3950	0.3832
c. Utilise Assets	0.2752	0.2996	0.2900	0.3016

Table 4.12 demonstrated the Stakeholder Requirement and Environmental Fulfilment (SER) is the most important key element in asset optimisation. The group of auction participants expressed their opinions that Competitive Human Resources (CHR) is the first priority in asset optimisation.

Nevertheless, the Consistency Ratios are not all accepted, meaning CR is more than 10% except that of DGSAM and auction participants. This also means that the respondents of DGSAM and the auction participants are consistent. Consistency is the intensity among ideas or objects under specific criteria and justifying between them in a logical way (Saaty, 2002). In order to improve on the inconsistency, there are several pieces of advice from the previous literature, such as employing an algorithm to modify inconsistency (Girsang et al., 2015), applying non-linear programming (Pereira & Costa, 2015), and using integrated linear programming and the Eigen Vector method (H. Zhang et al., 2014). These methods have been mathematically

proofed but are complicated, and some of the approaches are difficult to replace in the original comparison matrix (Ergu et al., 2011). In fact, in this research, the accepted CR was represented by 87% of the total respondents. The remainder of 13% of total respondents is inconsistent with CR, which needs to be improved to provide the preference measurement. This improvement process only has a limited number of integer values to create a fully consistent matrix (Kou et al., 2014).

One of the methods was used to identify inconsistent elements in the matrix based on the pairwise comparison matrix is by developing a Hadamard product (Kou et al., 2014). In this method, the process of identification requires two steps by constructing the Hadamard product induced bias matrix (HPIBM) and identifying the largest value as an indication of inconsistent elements. The next step is to construct the estimated value to replace the inconsistent element and its reciprocal. This step requires further consistency testing of the revised matrix. If the test fails, then the element of the second largest value is selected. This method is called the Hadamard product induced bias matrix.

To address the inconsistent element, it has to be beneficial also to provide an easy tool especially for decision-makers (Moshkovich & Mechitov, 2017). Therefore, a tool that is more effortless and allows users from various backgrounds are recommended. The most important consideration in this research is that the process of prioritisation of elements and AHP analysis corresponds to how to build a strategy of optimisation for decision-makers ranging from various backgrounds and expertise. Moshkovich and Mechitov (2017), have developed a Microsoft Excel-based tool to improve ordinal consistency through three-way cycles in the matrix of paired comparison, obtained possible changes in pairs in the modified matrix, and allow the effective steps of changes to create an ordinal matrix.

The process of improvement for the inconsistency of CR of LMAN and Municipal Government respondents is explained in the following steps:

1. Encode the initial matrix of paired comparison into a specially coded matrix as follows:

Initial matrix of the respondent from LMAN:

$$\begin{bmatrix} 1.0000 & 87.5595 & 2.3691 & 0.1492 \\ 0.1323 & 1.0000 & 0.1775 & 1.1404 \\ 0.4221 & 5.6346 & 1.0000 & 1.1976 \\ 6.7007 & 0.8769 & 0.8530 & 1.0000 \end{bmatrix}$$

Encoded matrix of the respondent from LMAN:

$$\begin{bmatrix} 0 & 8 & 2 & 0 \\ 0 & 0 & 0 & 2 \\ 0 & 6 & 0 & 2 \\ 7 & 2 & 2 & 0 \end{bmatrix}$$

Table 4.13 Unique Pairs of LMAN

Unique pairs		
	I	*J*
1	1	2
2	4	1
3	2	4
4	1	3
5	3	4
6	3	2
7	4	3

2. Analysis of the consistency of matrix in three-ways cycle analysis is shown in Table 4.14.

Table 4.14 Three ways Cycle Analysis of LMAN

Possible pairs			Previous relationship	New relationship	Number of cycles after the change
	i	*j*			
1	4	1	SER = AAA	SER < AAA	**1**
2	2	4	OB = SER	OB < SER	**1**
3	1	3	AAA = CHR	AAA < CHR	**2**
4	3	4	CHR = SER	CHR < SER	**2**
5	3	4	CHR = SER	CHR > SER	**2**
6	4	3	SER = CHR	SER < CHR	**2**
7	4	3	SER = CHR	SER > CHR	**2**
8	1	2	AAA = OB	AAA < OB	**3**
9	1	2	AAA = OB	AAA > OB	**3**
10	4	1	SER = AAA	SER > AAA	**3**
11	2	4	OB = SER	OB > SER	**3**
12	1	3	AAA = CHR	AAA > CHR	**3**
13	3	2	CHR = OB	CHR < OB	**3**
14	3	2	CHR = OB	CHR > OB	**3**

There were 14 possible changes, however, only two can lead the consistent matrix by following two steps:

Step1	SER = AAA	SER < AAA
Step2	OB = SER	OB < SER

Finally, the consistent matrix is:

$$\begin{bmatrix} 1 & 8 & 1 & 1 \\ 0 & 1 & 0 & 0 \\ 1 & 6 & 1 & 1 \\ 0 & 1 & 1 & 1 \end{bmatrix}$$

According to this matrix, the improved CR of respondents from LMAN is 0.0894 or 8.9%, which means accepted.

The similar process was undertaken in improving the inconsistency of CR of respondents from Municipal Governments

1. The original matrix of respondents from the Municipal Government is:

$$\begin{bmatrix} 1 & 1.69 & 0.52 & 1.29 \\ 0.59 & 1 & 0.99 & 1.43 \\ 1.94 & 1.01 & 1 & 1.87 \\ 0.93 & 0.7 & 0.53 & 1 \end{bmatrix}$$

2. The encoded matrix is:

$$\begin{bmatrix} 0 & 2 & 1 & 2 \\ 1 & 0 & 2 & 2 \\ 2 & 2 & 0 & 2 \\ 2 & 2 & 1 & 0 \end{bmatrix}$$

3. Three-ways cycle of analysis is:

Table 4.15 Unique Pairs of Municipal Government

Unique pairs		
	I	***J***
1	1	3
2	1	2
3	3	2
4	1	4
5	4	2
6	4	3
7	3	4
8	2	4
9	2	3

Table 4.16 Three-ways cycle analysis of Municipal Government

Possible pairs			Previous relationship	New relationship	Number of cycles after the change
	i	***J***			
1	4	3	SER > CHR	SER = CHR	**3**
2	1	3	AAA > CHR	AAA < CHR	**4**
3	1	3	AAA > CHR	AAA = CHR	**4**
4	1	4	AAA = SER	AAA < SER	**4**
5	1	4	AAA = SER	AAA > SER	**4**
6	4	3	SER > CHR	SER < CHR	**4**
7	3	4	CHR = SER	CHR < SER	**4**
8	3	4	CHR = SER	CHR > SER	**4**
9	1	2	AAA = OB	AAA < OB	**5**
10	1	2	AAA = OB	AAA > OB	**5**
11	3	2	CHR = OB	CHR < OB	**5**
12	3	2	CHR = OB	CHR > OB	**5**
13	4	2	SER = OB	SER < OB	**5**
14	4	2	SER = OB	SER > OB	**5**
15	2	4	OB = SER	OB < SER	**5**
16	2	4	OB = SER	OB > SER	**5**
17	2	3	OB = CHR	OB < CHR	**5**
18	2	3	OB = CHR	OB > CHR	**5**

The steps in creating a consistent matrix as follows:

Step1	SER > CHR	SER = CHR
Step2	AAA > CHR	AAA = CHR
Step3	AAA = OB	AAA < OB
Step4	OB > AAA	OB = AAA

Therefore, after the improving steps, the consistent matrix becomes:

$$\begin{bmatrix} 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 \end{bmatrix}$$

The improved CR of respondents from the municipal government is 0.1010 or 10% that means accepted.

The compilation of implementation of Orcon on the AHP result is shown in Table 4.17.

Table 4.17 Compilation of AHP Results based on Organisation/Group after Orcon

Description	Organisation/Group			
	DGSAM	LMAN	Municipal Government	Auction Perticipant
Percentage of Respondent (total respondent 229)	74%	5%	8%	13%
1. Comparison in Decimal	0.25	0.25	0.25	0.25
2. Weighted Priority				
a. Accountable Administration of Asset (AAA)	0.1915	0.2651	0.2119	0.1472
b. Optimum Budget (OB)	0.1119	0.0736	0.1898	0.0715
c. Competititve Human Resources (CHR)	0.3415	0.2366	0.2414	0.4320
d. Stakeholder Requirement and Environmental Fulfilment (SER)	0.3550	0.4246	0.3568	0.3492
3. λ max (lamda max)	4.2816	4.2414	4.2728	4.2617
4. CI (Consistency Index)	0.0939	0.0805	0.0909	0.0872
5. CR (Consistency Ratio)	10%	9%	10%	10%
6. ALTERNATIVE				
a. Improve Performance of Asset and Value	0.3148	0.3186	0.3189	0.3152
b. Maintain Asset Efficiently	0.4100	0.3867	0.3931	0.3832
c. Utilise Assets	0.2752	0.2947	0.2879	0.3016

Table 4.17 demonstrated the Stakeholder Requirement and Environmental Fulfilment (SER) as the most important key element in asset optimisation. The second important element was Competitive Human Resources (CHR) followed by the Accountable

Administration of Asset (AAA) and finally the Optimum Budget (OB). This priority order was different for the 13% of respondents from auction participants, whereby the CHR is the most important element followed by SER.

4.5.2 Contribution of the Organisation or Group in Developing Strategy

The perceptions of each organisation or group of respondents provided the priority level of alternatives based on the key elements as the criteria. The correlation between key elements could provide logical reasons for the final multi-objective decision before it comes to the final decision. This degree of importance of key elements in selecting alternatives can also derive recommendations to decision-makers. Table 4.18 illustrates the distribution of priority of weight of key elements among the respondents with regards to their respected organisations.

1. Accountable Administration of Asset (AAA)

The AAA comprises of Asset Data, Asset Layout as well as Asset Monitoring and Maintenance System. It has been nominated as the third-most important element by 95% of respondents from DGSAM, Municipal Governments, and auction participants. Respondents from LMAN (5%) have considered AAA as the second important element in asset optimisation. However, in term of the weighted priority LMAN has the highest score of AAA compared to that of the remainder organisations or group (0.2651 or 0.0612 higher than the average score of other organisations or group). Interestingly, the score of LMAN has also shown a higher standard deviation of 0.0123, as the standard deviation of this element was 0.0489. The respondents from DGSAM contributed more than half of the total percentage (74%) in choosing the AAA as the third-most important level of element. Likewise, municipal governments (8%) and auction participants (13%) have considered the AAA as the third-most important level of element. None of the respondents has selected the AAA as the most or fourth-most important key elements in the development of asset optimisation strategy.

Table 4.18 The Rank of Key Elements according to The Respondents' Roles/Positions in their Respected Organisations

		Ranking			
a. Accountable Administration of Asset (AAA)	Weighted Priority	1	2	3	4
DGSAM	0.1915			74%	
LMAN	0.2651		5%		
Municipal Government	0.2119			8%	
Auction Participant	0.1472			13%	
Total	0.8158	0%	5%	95%	0%
Average	0.2039				
Median	0.2017				
Standard Deviation	0.0489				
		Ranking			
b. Optimum Budget (OB)	Weighted Priority	1	2	3	4
DGSAM	0.1119				74%
LMAN	0.0736				5%
Municipal Government	0.2119				8%
Auction Participant	0.0715				13%
Total	0.4690	0%	0%	0%	100%
Average	0.1117				
Standard Deviation	0.0658				
		Ranking			
c. Competititve Human Resources (CHR)	Weighted Priority	1	2	3	4
DGSAM	0.3415		74%		
LMAN	0.2366			5%	
Municipal Government	0.2414		8%		
Auction Participant	0.4320	13%			
Total	1.2516	13%	82%	5%	0%
Average	0.3129				
Standard Deviation	0.0930				
		Ranking			
d. Stakeholder Requirement and Environtmental Fulfilment (SER)	Weighted Priority	1	2	3	4
DGSAM	0.3550	74%			
LMAN	0.4246	5%			
Municipal Government	0.3568	8%			
Auction Participant	0.3492		13%		
Total	1.4857	87%	13%	0%	0%
Average	0.3714				
Standard Deviation	0.0358				

2. Optimum budget (OB)

The OB as the key element embraces the planned actual budget of asset maintenance and operation, capitalised expenditures and other operational costs. The viewpoint of

respondents based on their respective organisations considered OB as the fourth-most significant element in asset optimisation strategy. The average score from all organisations or groups was 0.1117. The highest score of weighted priority was contributed by municipal government (0.2119) followed by DGSAM (0.1119), LMAN (0.0736) and auction participant (0.0715). The municipal governments and DGSAM's scores are above the average being 0.1002 and 0.002 respectively. The standard deviation was 0.0553 which is not significant as shown in Figure 4.6

3. Competitive Human Resources (CHR)

The CHR means the quality of human resources is based on competency, skill, and expertise to achieve organisational goals. According to the survey, this element has been selected by 13% of respondents from auction participants as the most important element in developing an asset optimisation strategy. The respondents from DGSAM (74%) and municipal government (8%) have perceived CHR as the second significant element in asset optimisation strategy. However, 5% of respondents from LMAN selected the CHR as the third rank of the key element. Nonetheless, the score of weighted priority is the lowest (0.2366), which is below the average score of 0.3219. The standard deviation of the CHR is 0.320, which is the highest standard deviation among the key elements. The scores, average and standard deviation of CHR are shown in Figure 4.6.

4. Stakeholder Requirement and Environmental Fulfilment (SER)

The SER represents the view, problems or needs from users, customers, community and other parties related to the organisation's role and function, directly or indirectly. These requirements include the standard of quality of the product or services, rule and regulation obedience and also environmental fulfilment. The survey that exhibited the majority of respondents (87%) selected this key element as the most significant factor in an asset optimisation strategy development. The organisations that selected SER were DGSAM (74%), LMAN (5%) and municipal government (8%). Moreover, as the most important factor, SER has been the second-highest score of 0.4246 or 0.0074

lower than CHR. The average score of SER was 0.3714, with the lowest standard deviation of 0.0358.

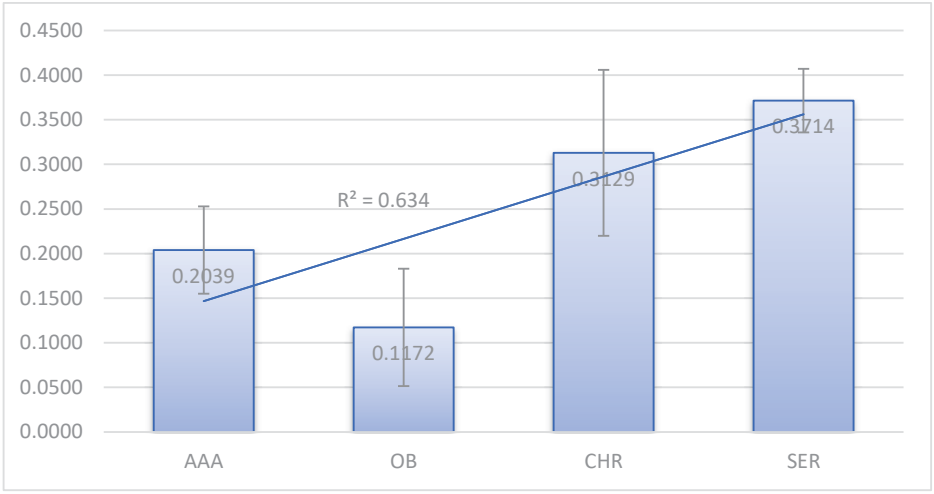


Figure 4.6 Mean of Weighted Priority of Key Elements

Figure 4.6 exhibited the mean of weighted priority of key elements and the level of the standard deviation of each element within the organisation or group of respondents. The trend line has a functional formula (R^2=0.634) indicating the regression line to show the variability of weighted priority data around its mean. The highest standard deviation occurred in the CHR, meaning the variability of weighted priority among the organisations or group was relatively high. The opposite condition occurred in the standard deviation of SER.

4.5.3 The Best Alternative Based on Organisation / Group of Respondent.

The respondents from all organisations or groups considered Maintain Asset Efficiently as the best alternative of an asset optimisation program. It has an average score of 0.3933, whereby the highest score was dominated by that of DGSAM (0.4100), followed by the municipal government (0.3931). The standard deviation of all scores was normal at 0.0119, as presented in Table 4.19.

Table 4.19 Distribution of Ranking of Alternative among Organisation/Group of Respondent

		Ranking		
a. Improve Performance of Asset and Value	Weighted Priority	1	2	3
DGSAM	0.3148		74%	
LMAN	0.3186		5%	
Municipal Government	0.3189		8%	
Auction Participant	0.3152		13%	
Total	1.2675	0%	100%	0%
Average	0.3169			
Standard Deviation	0.0022			
		Ranking		
b. Maintain Asset Eficiently	Weighted Priority	1	2	3
DGSAM	0.4100	74%		
LMAN	0.3867	5%		
Municipal Government	0.3931	8%		
Auction Participant	0.3832	13%		
Total	1.5731	100%	0%	0%
Average	0.3933			
Standard Deviation	0.0119			
		Ranking		
c. Utilise Assets	Weighted Priority	1	2	3
DGSAM	0.2752			74%
LMAN	0.2947			5%
Municipal Government	0.2879			8%
Auction Participant	0.3016			13%
Total	1.1594	0%	0%	100%
Average	0.2898			
Standard Deviation	0.0113			

The second-best alternative was Improve the Performance and Value of Assets that offer strategies on how to increase the performance of assets in providing services or in maximising functions. Improving the value of assets means strategies to increase the value in terms of market value and intrinsic value accordingly; if land or buildings are being transferred to another party, the value of the transfer will be higher than the book value. Interestingly, the score of the weighted priority from each organisation is on average indicated by the standard deviation of only 0.0022, whilst the average of scores was 0.3169. The highest score was slightly higher in municipal government (0.3189) and LMAN (0.3186) was not considered significant.

The third-ranking of alternatives was Utilise Assets, which means strategically assets can be rented, build operate transferred (BOT) or build transfer operated (BOT), transferred to local government and disposed of. The 13% of respondents of auction participants have a slightly significant expectation in this option by providing score 0.3016. On average, all respondents have a score of 0.2898 and standard deviation of 0.0113.

These three options and its distributions are shown in Figure 4.7

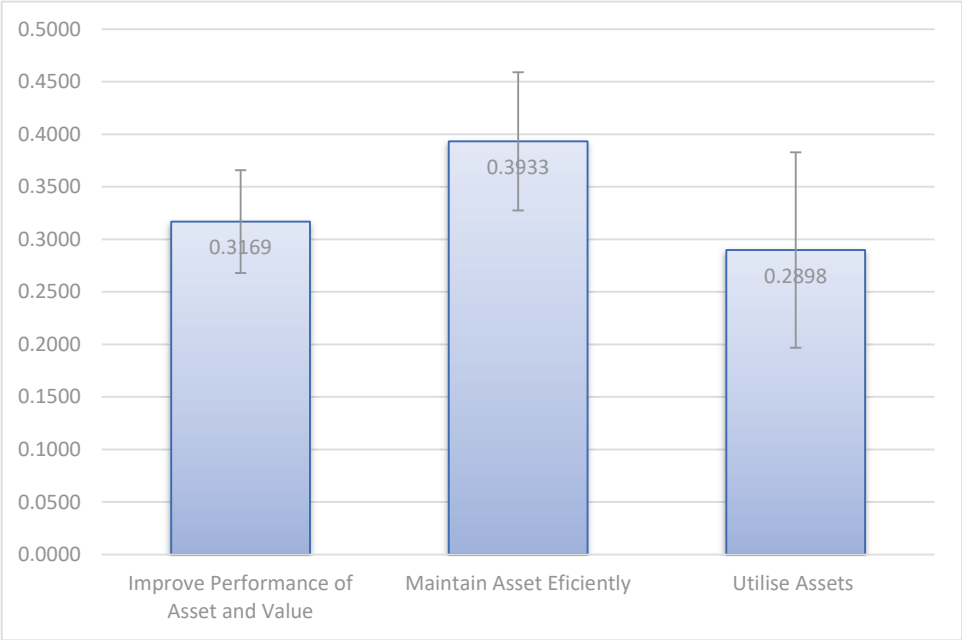


Figure 4.7 Mean of Priority of Weight of Alternatives

4.5.4 Role of Respondents and Its Implication on AHP Results

According to data collected from the survey, respondents of this research have influential roles in their organisation with various positions and responsibilities attached to their positions. The role means accountability or responsibility, because every role requires capacity, knowledge, work skill or experience, to be able to fulfil the job description and be successful. This research concerns the roles of respondents in their organisations contributing, in perceiving questions of the survey. Therefore, the AHP process has addressed the roles as one of the viewpoints to interpret the

respondents' perceptions. This roles also means the position of respondents at the managerial level. The distinction between top or middle manager and the lower level or operator can influence in choosing the answer of the survey. It might respond to the level of responsibility or the range of power attached to the perception of respondents. Upon calculation of the AHP process (see appendix 4), the category of respondents with the role of echelon 2 has resulted in CR of 18%, meaning unacceptable. Consequently, this category of respondents requires the Orcon tool to improve the inconsistency. The steps of applying the Orcon tool is by converting the matrices into coded (encoded matrix) followed by undertaking three-ways cycle analysis and then creating the consistent matrix. To achieve the consistent matrix, the improvements have been made following the recommendation from the Orcon tool being OB < CHR and AAA< CHR, whereby previously these pairwise were equally important. The new CR of echelon 2, as a result of the improvement, was 0.0886 or 8.9 % concluded as acceptable.

The changes to show the rank of key elements, based on the roles or positions of respondents in their organisations, are shown in Table 4.20. The correlations between the respondents' roles in their organisations and their perceptions of key elements are shown in Table 4.20 and explained in the following paragraphs.

The element of AAA has been the second important key element perceived by 7% of respondents of echelon 2 and echelon 3, however, it is perceived as the third level of importance by 93% of respondents of echelon 4 and staff/other. The average of weighted priority score is 0.2388 with the standard deviation fairly low at 0.0716, indicating that the dispersion of scores of each role of respondents from the mean was relatively low.

Table 4.20 The Rank of Key Elements according to The Respondents' Roles/Positions in their Respective Organisations

		Ranking			
a. Accountable Administration of Asset (AAA)	Weighted Priority	1	2	3	4
Echelon 2	0.3121		1%		
Echelon 3	0.2746		6%		
Echelon 4	0.1804			43%	
Staff/other	0.1880			50%	
Total	0.9551	0%	7%	93%	0%
Average	0.2388				
Standard Deviation	0.0649				
		Ranking			
b. Optimum Budget (OB)	Weighted Priority	1	2	3	4
Echelon 2	0.0660				1%
Echelon 3	0.2293			6%	
Echelon 4	0.0966				43%
Staff/other	0.1098				50%
Total	0.5017	0%	0%	6%	94%
Average	0.1117				
Standard Deviation	0.0716				
		Ranking			
c. Competititve Human Resources (CHR)	Weighted Priority	1	2	3	4
Echelon 2	0.2625			1%	
Echelon 3	0.1615				6%
Echelon 4	0.3609		43%		
Staff/other	0.3408		50%		
Total	1.1257	0%	93%	1%	6%
Average	0.2814				
Standard Deviation	0.0905				
		Ranking			
d. Stakeholder Requirement and Environtmental Fulfilment (SER	Weighted Priority	1	2	3	4
Echelon 2	0.3594	1%			
Echelon 3	0.3346	6%			
Echelon 4	0.3621	43%			
Staff/other	0.3614	50%			
Total	1.4175	100%	0%	0%	0%
Average	0.3544				
Standard Deviation	0.0132				

The element of OB has been the third-most important key element perceived by 6% of echelon 3 and the last element to be considered by 94% of respondents, consisting of echelon 2, 4 and staff in order to develop an asset optimisation strategy. The dispersion of scores in this key element was more spread out compared to that of other key elements as indicated by the average score of 0.1117 with a standard deviation of 0.0716.

The CHR has been the second-most important key element perceived by 94% of respondents of echelon 4 and staff. However, the respondents of echelon 2 and echelon 3 perceived this element as the third and last important element respectively. The

respondents' perceptions towards CHR have been the highest dispersion of scores whereby the standard deviation of 0.0905 is the highest compared to that of other key elements.

In this category, all respondents selected the SER as the most significant key element in developing an asset optimisation strategy. Surprisingly, the score of the weighted priority weight was evenly on average with the standard deviation of 0.0132. The highest score was demonstrated by respondents of echelon 4 and staff/operator. The main role of echelon 4 in the organisational structure is supervising staff and one level higher than staff in the organisational structure.

The overall roles of respondents contributed to the score of the weighted priority with various differences with the mean of each key elements. The coefficient of $R^2 = 46$ % as the trend line (Figure 4.8) exhibited the variation of the score and its mean. This coefficient showed the relative distance between all data of scores whereby the mean below the 50% indicates the variation of scores was relatively high.

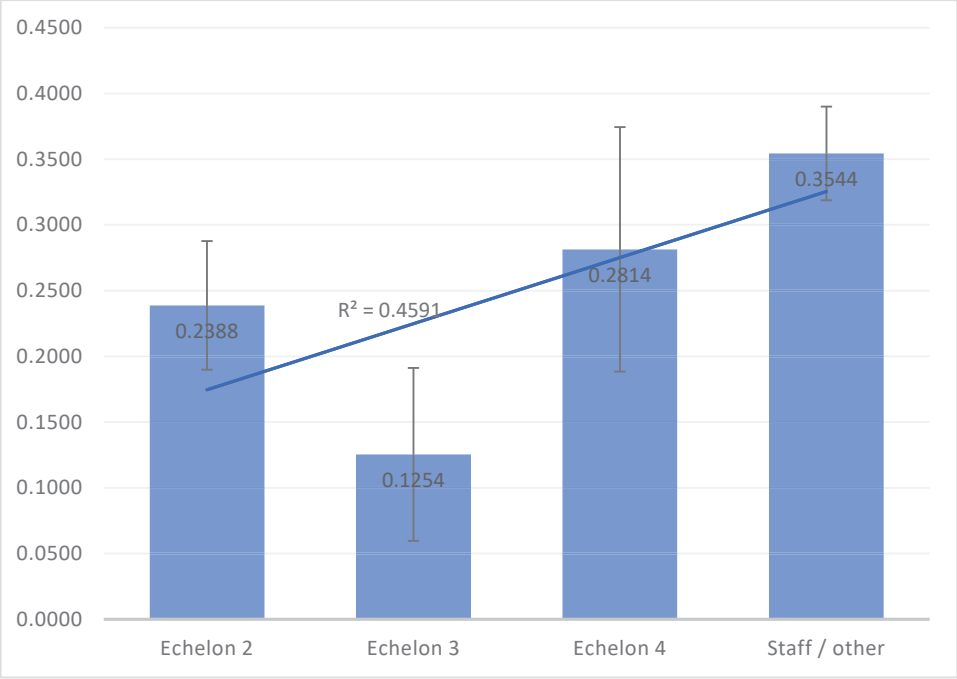


Figure 4.8 Mean of Weighted Priority of Key Elements Based on the Role/Position in Organisation

4.5.5 The Best Alternative Based on the Role of Respondent.

Based on the role of respondents, the best alternative is to Maintain Asset Efficiently chosen by 94% of respondents from various roles except echelon 3 (6%). Maintain Asset Efficiently is a strategy to hold and maximise the function of assets within the range of affordable planned budget that requires a control system to evaluate the variation of real cost and budgeted cost.

The second level of the best alternative that obtained the majority selection by respondents from echelon 4 and staff (93%), was Improve Performance of Asset and Value. Several programs designed to improve the asset performance and value of land and building simultaneously are refurbishments and landscaping or layout improvement of the building. The respondents of echelon 3 and echelon 2 considered this alternative as the best and third alternative respectively.

The third alternative utilises assets selected by 99% of respondents with background of echelon 3 (6%), echelon 4 (43%) and staff (50%). Utilise Assets comprises strategy to promote the economic value of assets including BTO, BOT and renting.

There were no convergence perceptions from the alternatives as is tabulated in Table 4.21.

Table 4.21 Distribution of Ranking of Alternative based on the Role/Position in Organisation

		Ranking		
a. Improve Performance of Asset and Value	Weighted Priority	1	2	3
Echelon 2	0.2515			1%
Echelon 3	0.4551	6%		
Echelon 4	0.3150		43%	
Staff/other	0.2985		50%	
Total	1.3200	6%	93%	1%
Average	0.3300			
Standard Deviation	0.0876			
		Ranking		
b. Maintain Asset Efficiently	Weighted Priority	1	2	3
Echelon 2	0.4201	1%		
Echelon 3	0.3348		6%	
Echelon 4	0.3950	43%		
Staff/other	0.4392	50%		
Total	1.5891	94%	6%	0%
Average	0.3973			
Standard Deviation	0.0454			
		Ranking		
c. Utilise Assets	Weighted Priority	1	2	3
Echelon 2	0.3284		1%	
Echelon 3	0.2101			6%
Echelon 4	0.2900			43%
Staff/other	0.2624			50%
Total	1.0909	0%	1%	99%
Average	0.2727			
Standard Deviation	0.0498			

The roles of respondents contributed to the weighted priority of alternatives. The majority of respondents from echelon 4 (43%) and staff (50%) have dominated the alternatives. Interestingly, these two roles are convergent in the selection of alternatives, consequently, their preferences became the majority's votes. Figure 4.9 illustrated the pattern of selection of alternatives and standard deviation from the mean of each alternative. The lowest standard deviation occurred in the first alternative, being Improve Performance of Asset and Value.

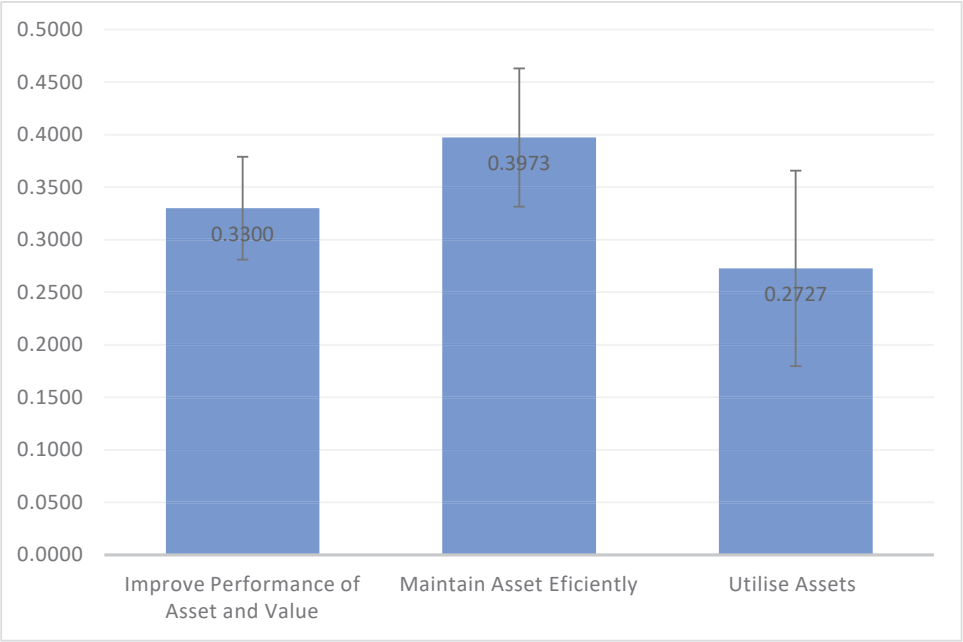


Figure 4.9 Mean of Priority of Weight of Alternatives based on the Role/Position in Organisation

4.5.6 The Implications of Key Elements in the Decision-making Process.

1. The implication in weighting key elements

The consistency matrix reflects the transitivity of preference in the pairwise comparison when the equality is true for each *i*, *j*, and *k*: where *aikakj* = *aij*. This basic requirement is necessary as the precise measurement for the decision-making process when the CR ≤ 10% (Cabala, 2010; Thomas L Saaty, 2002). Implementation of AHP in this research concluded the CR≤ 10%, resulting in the preference of the key element based on all respondents in the following order.

Ranking	Key element	Weighted priority
1	SER	0.3624
2	CHR	0.2790
3	AAA	0.2464
4	OB	0.1121

2. The implication of respondent perception

However, when the respondents were classified into the organisation or group and the role, these preferences of key element altered in order and scattered among the group and role (see Table 4.18 and 4.20). In the global alternative level, the ranking of alternatives was different only when the respondents were grouped based on the role. The first ranking alternative was scattered whereby 94% of respondents selected the option of Maintain Asset Efficiently, while 6% of respondents selected this option as the second-ranking. It also occurred in the second-ranking when 93% of respondents chose the option of Improve the Performance of Asset and Value, while 6% of respondents chose this option as the first and the remainder of 1% considered it as the third-ranking. The third-ranking has slightly been divergent whereby 99% of respondents decided on the option of Utilise Asset but 1 % of them favoured it as the second-best alternative.

According to the circumstances, the decision making of an asset optimisation strategy should consider the following aspects:

a. Other institution or organisation that may directly or indirectly become one of the stakeholders, users, customers or neighbours of asset or property as the target of strategy development. This is important to provide better preference and enrich the different standpoints. Therefore the more integrative decisions and policies can be made and are able to accommodate the public interest, as the composition of stakeholders also sets the state, business and associational sectors (Lovan et al., 2016).
b. Participations or contributions from other ranges of roles in the organisation are also important, to obtain participatory decision or policy to achieve the competitive advantage of an organisation. The participation forms can be for providing suggestions, critiques, and feedback of the provided services. Devoting opinion by online or survey participation is also one of the effective methods to collect public interest regarding the strategy of optimisation of assets. The role and organisational synergy combined with the stakeholder realm are the key values creation to create competitive advantages (Tantalo & Priem, 2016).

c. The availability of clear and easy mechanisms to participate in the decision-making process is also another important aspect to provide the ease of access to improve asset optimisation strategy development. Some of the alternatives can be relationships between citizens and professionals to create reciprocal benefit, public participatory budgeting, participatory policy, participatory asset design and assessment policy (Bovaird et al., 2015).
d. Building positive relationships and cooperation with professionals and community, such as auction participation, can create better chances to increase the government income and to meet their interest. As it is suggested by Winch (2014), in order to meet community interest, an approach to capture and accommodate participation is essential to assure that most of the public interests are considered properly in the asset optimisation strategy. It is impossible to accommodate 100% of communities and stakeholder requirements in the single asset optimisation policy, however, the equity of strategy objectives among the public can be one of the best alternatives in meeting their interests (Winch, 2014).

4.6. Key Findings of Survey Analysis

The AHP process that applied the survey data conveyed the research findings as further resources of asset optimisation strategy development. The consistency matrix has been resolved through Orcon tool calculation. There are three analyses of survey data from different deliberations of purposive respondents, such as analysis of survey stage 1 and stage 2, organisations of respondents and roles or positions of respondents. These three analyses suggested the key findings of the survey as follows:

- Concerning the number of respondents, there is no significant disparity pertaining to the level of significance of key elements as criteria in developing an asset optimisation strategy. This also occurs when weighing the alternative of asset optimisation. A number of respondents who are involved in the survey do not contribute substantially to the final selection of alternatives.
- The respondents' roles or positions and organisations' perspectives contributed **insignificantly** in defining the level of significance of key elements in

contributing to the development of asset optimisation strategy as well as in selecting the alternative of asset optimisation.

- Each of the key elements has a level of importance in contributing the strategy development as it is proposed by respondents. Nonetheless, the disparities of ranking among the categorical respondents explicitly appeared, and the majority of respondents agreed the significant level of key elements and alternatives of asset optimisation was in the following order:
    - Ranking 1 (36%) : Stakeholder Requirements and Natural Environment Fulfilment (SER)
    - Ranking 2 (34%) : Competitive Human Resources (CHR)
    - Ranking 3 (19%) : Accountable Asset Administration (AAA)
    - Ranking 4 (11%) : Optimum Budget (OB)

The percentage of weighted priority indicates the contribution of key elements to achieve the strategic goal when it turns into the implementation of BSC. None of the respondents has selected the AAA as the first or fourth important key element in the development of an asset optimisation strategy. This emphasises the importance of AAA compared to OB.

- The priority level has been generated across respondents, with a small dispersion and the proposed best alternative in the following order
    - Ranking 1 (40%) : Maintain asset efficiently
    - Ranking 2 (32%) : Improve asset performance and value
    - Ranking 3 (28%) : utilise asset

4.7. Contribution of Survey in Strategy Development

The contribution of the survey result to the strategy development is in determining the level of significance of each key element as the criteria of strategy and priority of alternative strategy. However, the level of significance of key elements and the alternatives of asset optimisation based on this survey have not been validated; unless the survey result has a similar priority to the in-depth interview, the result of this

survey is valid. Assuming the survey result is valid, the contribution to the strategy development is in prioritising the key elements and alternatives. When the survey result is put into the BSC as a strategic tool, the key elements are then transformed into the perspective of BSC:

- Stakeholder perspective or customer perspective element was represented by stakeholder requirement and Natural environment fulfilment element (SER).
- Learning and growth were indicated by competitive human resources elements (CHR).
- Internal perspective was described by Accountable Asset Administration (AAA).
- Financial perspective was featured in the optimum budget.

These key elements in their levels of priority become the weight of BSC perspectives. The perspectives were driven by calculating key performance indicators (KPIs). The alternatives of asset optimisation when transformed into BSC become the strategic initiative. Strategic initiatives are the action of the projects to help achieve the goal of the strategy, so the strategy becomes actionable.

4.8.Conclusion and Discussion

The analyses of the survey concluded the interpretation of significant levels of key elements and alternatives of asset optimisation to develop the strategy. This priority was generated from the pairwise amongst the key elements through the implementation of AHP. The analysis of respondents' perspectives in respect to the number of respondents, organisations and roles or positions of respondents have been employed during this process. The results showed the **convergence of respondents' perspectives** either in organisations or roles of respondents' angles. This means that the position of the respondent has no significant contribution to perceiving the importance of key elements and alternatives. It confirmed that more than 90 % of them agreed, therefore the conclusion of the survey can be drawn. The most important key element of asset optimisation was a stakeholder requirement and natural environment fulfilment (SER). Additionally, the best alternative to the strategy of optimisation was to Maintain Asset Efficiently.

SER was composed of the quality and standard of service, rule and regulation compliance, the public or community interest fulfilment and also natural environment obedience. This means in optimising public land and buildings, the awareness of stakeholder interests in most circumstances is important. Stakeholders of organisation can be the supplier, governments and agencies, and union employees from which the organisations can draw resources. This also means planning, procurement, improvement and operation of public land and buildings have to be able to fulfil their needs precisely. In order to do so, the strategy required analysis of stakeholders to manage and identify opportunities to mobilise their support for the achievement of strategic goals (Bryson et al., 2011; Shirey, 2012). It also includes how the organisation complies with the current rule and regulation, and environmental factors, as some stakeholders create regulations and rules or regulators (Kaufman & Englander, 2011). Nonetheless, some of the regulations might have a certain impact on the assets. For example, prioritising the SER in strategy in land and buildings organisation may take the alternative strategy to improve the land or buildings in terms of performance and value. Choosing this option tends to raise costs such as cost to obtain permission or codes by using certain materials or building facilities as requested by law (Bocarejo et al., 2013; Kok et al., 2014; Monkkonen & Ronconi, 2013).

In light of this, the improvement of asset performance as part of the improvement in public service is one of the second-highest alternatives of strategy to optimise asset. This linkage contributes to the strategy more effective, due to the strong and direct connection between key elements of strategy and the alternatives.

Maintaining assets of land and buildings efficiently as the highest score of alternative strategy corresponds to the operational and maintenance cost of land and buildings. This strategy connects to financial elements, one of the last priority based on the AHP process and also complying with the stakeholder's obligations as the first priority of the key element.

Concerning the reliability of survey's result and part of the triangulation process, this result of analysis requires a confirmation process through in-depth interview and validation in the test case. Additionally, an in-depth interview is also important to investigate the barrier and better recommendation of the strategy development process. Whereas, test cases ratify the strategy to be more applicable.

Chapter 5. Analysis of In-depth Interview

5.1. Introduction

The level of importance of key elements based on the balanced scorecard (BSC) perspectives has been identified as the results of the survey. The survey distilled the perspective of asset operator, academies, range of stakeholders and governmental strategy's policymakers, middle and lower managers. In the in-depth interview, the researcher attempted to capture the opinion of top managers from DGSAM and LMAN. The aim of the in-depth interview is to validate the results of Stage 1 of the survey. This validation is important to discuss the link between survey and interview participants. It is also required particularly to validate the key elements, barriers, and recommendation before it turned into the strategy.

In-depth interview was also designed to answer the research question on the barriers and recommendations. In doing so, the analysis of in-depth interview also includes the supportive definition and benefits of implementation of asset optimisation. These additional subjects, in some aspects strongly correlate to the expression of interviewees' opinion as background to their understanding.

This chapter is divided into five sections. The profile of respondents is explained in Section 5.2. It is then followed by facets of the strategic role to describe the role of interviewees in strategy development in section 5.3. The process of analysis of data is demonstrated in Section 5.4. Analysis of key elements and alternatives are in Section 5.5. The content analysis of barriers and recommendations of asset optimisation are in Section 5.6. Section 5.7 demonstrated the strategy finalisation. Finally, Section 5.8 is conclusion and discussion.

5.2. Profile of Interviewees

Respondents of the in-depth interview are decision-makers in asset management from the government sector, from different levels of management and roles. The respondents are active government employees and when interviews were held they were also working at DGSAM or LMAN. The interviewees were selected by

consideration of their roles in organisations. One out of six candidates of respondents was replaced by one of the top managers, who is also a key person with a background in asset information systems. The face-to-face interviews were conducted at the agreed time and place, upon agreement with respondents. The summary of the profile of interviewees is described in Table 5.1.

Table 5.1 Summary of Interviewee Profile

Respondent	Organisation and characteristic	Managerial Level	Role	Experience (year)	Educational Background
R1	DGSAM, government (public asset manager)	Top Manager	Human Resources, budget and asset authority.	20	Master Degree
R2	LMAN, Semi government (public asset manager and business enterprise)	Top Manager	budget and optimisation project management	5-10	PhD
R3	DGSAM, government (public asset manager)	Top - middle Manager	Asset utilisation and state asset executive.	10-15	Master Degree
R4	DGSAM, government (public asset manager)	Top – middle Manager	State Asset optimisation and asset management	10-15	Master Degree
R5	DGSAM, government (public asset manager)	Top-middle Manager	Asset Information system	10-15	Master Degree
R6	Regional Manager	Top Manager	Asset and office manager	15-20	Master Degree

R1 is a key person responsible for the management of human resources, budget planning, and the asset management process. Therefore, R1 contributes and facilitates the development of asset management strategy as well as operational, financial and human resources plans. The role of R1 has reflected how all key elements in asset optimisation can be convergent to achieve an organisation's goals. R1 also provides directions and clarity to the organisation's strategy and policy development, including ensuring a smooth transition and synchronisation of any changes in policy and

budgetary management. The roles, views, and opinion of R1 in this research are particularly significant.

R2 is tasked with a substantial position in the strategic development of asset optimisation. There are at least three roles of R2 in accordance with the asset optimisation strategy. First is the achievement of set goals of governmental investment especially in infrastructure and land. This role associated with the land management and improvement of the land value. Second, R2 is also responsible for conducting governmental funding in land procurement and other vital infrastructures including highways, bridges, and dams. Lastly, R2 manages the optimisation of public land and buildings in term of strategy and implementation to provide land and building to be used by governmental institutions.

R3 is one of the top governmental asset managers, having a duty in designing, implementing and evaluating asset management rules and regulations. In this sense, asset optimisation is one of the main responsibilities to create optimum performance and value. Recruiting R3 as one of the interviewees is important to gather opinion and views on how asset optimisation can be measured from the draft of rules (legal drafting) to the implementation stage.

R4 is tasked with supervision of the implementation of existing asset management regulation. The task includes proposing amendments to existing regulation and evaluation of the application of asset optimisation as well as analysis, evaluation, and recommendation in asset optimisation policy and regulation.

R5 has an important role in developing asset management and information systems. This role has a strong connection with the administration, database, data management and reporting of state assets. The recruitment of R5 as one of the interviewees is important, in order to obtain views of asset optimisation from the perspectives of asset data and information systems, because one of the key elements is asset maintenance and monitoring systems. Another important duty of R5 as asset manager of state assets is providing authorisation of asset utilisation for various schemes such as rent, build

operate transfer (BOT) or build transfer operate (BOT), transfer of an asset to local government and asset disposal. One of the essential considerations in providing the approval of available schemes is how to select the best option.

R6 is a regional manager, who represents a branch office implementing policy at the regional and operational level. The view of a regional manager is critical in providing governmental services to users directly. As the top manager at a regional level, the regional manager has a role as the decision-maker of asset planning, procurement, operation or utilisation in all asset management schemes, asset transfer and asset disposal. Currently, the regional asset manager is authorised to conduct functions and duties on behalf of the Minister of Finance for public assets with a value ranging up to IDR 5 billion or AU 500,000. The role of establishing the strategy in the regional level is also the other main duty of the regional asset manager, whereby the strategy of regional offices should be part of the national grand strategy of public asset management.

According to the characteristic of roles and main duties of the interviewees and as the unit analysis of interview, there are three facets of strategy based on the current role and responsibility:

Table 5.2 Facets of Strategy Role based on the interviewee's Role and Responsibility

Asset Optimisation Strategy Role	Interviewee	Facets of Strategy Roles
Top Manager	R1 and R2	Portfolio optimiser
		Trend Forecaster
		Innovator
Regional Manager	R6	Portfolio optimiser
		Trend Forecaster
		Innovator
Asset Manager	R3 & R5	Portfolio optimiser
		Competitive advantage officer
		Resource allocator
		Strategist Capability builder
		Decision-maker facilitator
Law and Regulation Advisor	R4	Government/Regulatory Strategist
		Decision-maker facilitator
		Performance challenger

Legend: : Generating insight : Enacting strategic decision Strategy formulator

*Author Compilation and adaptation from Birshan et al. (2014)

5.3. Facets of Strategy Role

1. Top and Regional Manager in Asset Management

Top asset managers (R1, R2, and R6) play predominant roles in developing strategies in their organisations, either related to the current responsibility or in terms of a strategy facets role. In this particular aspect, top managers set prioritisation, control, and selection of the organisation's programs in accordance with the strategic objectives or organisation's goal. Therefore, in the development of asset optimisation strategy, top asset managers take significant parts in selecting, controlling and also prioritising alternatives and resources in line with the main goal. In generating this insight with the portfolio optimiser, firstly, the top managers need to consider the

programs to achieve strategic objectives subject to the risks, resources, barriers, and affordability of the programs. Secondly, the top managers are obligated to control and ensure the programs are effective and efficient in delivering the programs. Finally, top managers also ascertain the achievement of potential benefits of the chosen programs.

In enacting strategic decisions, top managers are also a trend forecaster for their organisations. Their abilities in shaping the asset management industry for the future is importantly required. This role can be undertaken by identifying and exploring the long trend relevant to the organisation and then assessing the impacts on the organisation or society. Abundant data and information are needed to obtain the accuracy and precision of a decision before it is made. In analysing the asset optimisation trend, several types of information are needed, such as the series of stakeholder's needs and changes in natural environment, regulations and also shifting of asset focus from compliance to performance (Doran, 2015). Doran (2015) suggested that the recommended approach to cope with the asset management trend is by aligning the goals of organisation and asset management at an operational level in optimising the contribution of asset management to the organisation. Therefore, asset management governance and direction, strategic intent and operational implementation and appropriate environment skills can be aligned to achieve the organisation goal.

Innovation in asset management is set to closely meet the needs of stakeholders. This means that long term success of asset management depends on the ability to embrace the changing landscape. New technologies emerge in the asset management industry that leads the asset manager to deploy them in creative ways, in accordance with the availability of resources. The top asset managers should become more innovative and help the organisation to drive the organisation infrastructures to be more efficient and effective. Creating an innovative culture might start from the top level of organisation to empower the lower-level manager or employees to drive the transformation to the entire organisation. In developing strategy well, being knowledgeable about the trend can set the proper innovations.

A regional manager has roles as portfolio optimisers, forecasting the trend and being an innovator at the regional level.

2. Asset Manager (R3 and R5)

Asset Manager is the authorised person to manage an organisation's business and affairs by implementing strategies, monitoring the asset acquisition or disposition including identifying trends and evaluating alternatives of strategies (L. A. Jackson, 2013; Read et al., 2016; Singh et al., 2012). These duties have placed the asset manager as the portfolio optimiser in developing asset optimisation strategy, meaning that the asset manager as the executor of strategy is responsible for the affordability of strategy program, should consider risks, barriers, and benefits as well as select the best options of optimisation alternative programs.

Having a fact-based analysis of the organisation generates an understanding of an organisation's strengths and weakness to create competitive advantages. Therefore, it can develop a clearer and differentiated strategy. Internal comprehensive understanding helps the asset manager to identify the needs and allocate organisational resources such as funding, human resources and facilities properly. It also promotes the capacity and capability of employees to be a strategist. Additionally, as a provider of information related to resources, competitive advantage and strategy, the asset manager also supports recommendations for decision-making purposes.

3. Law and Regulation Advisor (R4)

Law and regulation advisors maintain the organisational performance, always keeping it running on the track and compliant with the current regulations. In doing this role, a law advisor possesses deep knowledge of regulations, governmental policies and stakeholder's interests. In developing a sound strategy, this role is important because of requirements in understanding the current legal environment to shape the opportunity and risks that arise from the stakeholders and to reflect the responsibility of external relations. A portrait of the legal, formal policy from a law advisor provides valuable recommendations for the decision-making process.

5.4. Process of Analysis Data

There are five major steps in analysing the interview data before drawing the conclusion. The first step was preparing data; after the interview process was undertaken and recorded in a voice recorder file, the interview was transcribed accordingly. There are six files of transcripts of interviews in the format of Microsoft Word having been written over 25 pages. These files then were imported into the QSR NVivo11 program.

The second step was to develop the themes of content analysis. These themes paved the analysis process where each theme was analysed from the perspective of respondents. Each respondent represents the perspectives of a respected role and responsibility. Therefore, the analytical content of interviews was based on the interviewee's facets of strategy role.

The third step was to develop a coding scheme whereby the code was determined based on the theme of the interview question. There were six nodes that represented the theme of questions important to describe the phenomenon and associated to the research questions. The summary of the codes is presented in Table 5.3. The category of code was assigned based on the four main strategy roles: top manager, regional manager, asset manager, and law and regulation advisor. The content analysis was undertaken accordingly to highlight the findings.

Table 5.3 NVivo Summary of Codes

No.	Code Nodes	Number of References
1.	Key elements of asset optimisation	31
2.	The most important key element	15
3.	The best alternative of strategy	8
4.	Barriers of asset optimisation	14
5.	Recommendation of optimisation strategy	12
6.	Implementation of optimisation strategy in BSC	21

The fourth step was content analysis, based on the node representing the theme. In this step, pinpointing and examining the patterns of data set to describe phenomenon were emphasised. It is then followed by referring the phenomenon to the strategy roles across the interview data.

The fifth step was drawing the findings as the triangulated data of cross-reference with the survey result and as the element of the strategy. These findings were distilled to be drawn as the final wisdom or outcome.

5.5. Content Analysis of In-depth Interview

Content analysis is the fourth step of interview analysis after the thematic code has been drawn. The aims of this analysis are to verify the result of the Survey in Stage 1 and also analyse the inherent barriers and recommendations from the top and middle managers. According to the summary code, there are six themes to be scrutinised. The following paragraphs describe all of the themes, starting with the key element and alternatives first, then the barriers and recommendation and finally, the implementation of optimisation strategy in BSC as a strategy tool.

5.6.1 Analysis of In-depth Interview of Key Elements of Asset Optimisation

The opinion of key elements of asset optimisation varied amongst respondents having roles as top leaders. All of them confirmed that there are more than four key elements of asset optimisation. There were also various terms for key elements introduced by interviewees to define one key element. Accordingly, clarifications are needed to assure these terms have been covered by the standardised key element nominated in the survey. In order to verify closely the following paragraphs described each key element based on the survey and how this element was perceived by interviewees using their subjective terms.

1. Stakeholder requirement and natural environment fulfilment element (SER).

This key element has been perceived as the regulation and other environmental aspects that need to be complied with. Respondents agreed on this key element by using the

term highest and best use (HBU). According to R2 (top manager), assets in the condition of highest and best use capture stakeholder demand, reveal zoning and comply with environmental regulation. From the organisational side (internal), the analysis of HBU is also affordable because of its ability to generate income or to save the maintenance and operating costs of an asset. The second element of optimisation is aspects of natural environment meaning how an optimisation program adheres to the environmental regulations. R6 (regional asset manager) added that an asset database is one of the important key elements before elements of qualified human recourses and natural environment. HBU is a product of a reliable database of the asset. This database provides information including the functionality of assets, whether the asset is in use or idle, as was stated in the following comment:

'The most important element is an asset database, as it informs (whether) the asset is utilised or idle. So, there is always a better recommendation to achieve HBU of asset. The next important elements are qualified human resources and natural environment-friendly. The legal aspect is another important factor to assure the compliance to the governmental regulation such as governmental spatial plan and zoning regulation'.

The concept of HBU concluded some elements of the asset as in the best and highest use, permissible in legal aspects, possible in physical aspects, feasible in financial aspects and maximum productivity. This concept is applicable in mixed-use developments that require sets of more flexible strategy to support the decision-making process (Yuo, 2014). These four aspects are part of the key elements based on the literature review of this research:

- The physical aspect of assets includes the physical condition, layout, shape and physical appearance of asset. This aspect has been defined in the accountable administration of asset (AAA). The AAA in this research is more than the physical aspect of an asset as it described administration, database, value, and ownership of the asset. The aspects of AAA are relevant for decision making if the information about relevant aspects is updated continuously.

- The legal aspect of assets is an important aspect of AAA (ownership) whereby it links to the regulation and its compliance. This aspect is also included in the key element of SER. The SER has encompassed various stakeholders' requirements, such as government, community, and employee as well as stakeholders' concerns, needs and obligations. It also maintains the adequate compliance system and is generally to be implemented in accordance with safety and standard of services (Barr et al., 2016).
- The financial aspect is part of the optimum budget (OB). This aspect contains not only the budget of cost and expenses but also revenue. HBU is concerned about feasibility both in revenue and costs, whereas in the OB, this aspect covers the feasibility and the optimum financial resources. It means that OB defines portfolio aspects when an organisation attempts to allocate resources optimally to achieve an organisation's goal simultaneously.
- Maximum productivity is represented by the optimum usage of assets in terms of space functions and the life span of assets. This aspect combines the physical, economic and financial aspects. In other words, maximum productivity has been covered in the key element AAA or if the measurement of the productivity is financial aspects, it has been covered by key element OB.

The term of HBU that had been proposed by interviewees indicated the agreement of respondents regarding the three elements of SER, AAA, and OB.

2. Competitive human resources element (CHR).

Human resources are the most agreed key element according to the interviewees. This element has a vital role to support the asset optimisation in achieving the goal of the organisation. One of the respondents (R1) acknowledged that one of the key elements of asset optimisation that needs more focus is human resources, consisting of soft and hard skills. The successful asset management or other strategic programs start from how high the quality of human resources is in an organisation. According to R1, human resources mean compatibility between workload and personal capacity. This element is highly important and the respondents focused their support of this by

defining the qualifications of human resources. Qualified human resources can be described as professional, competent or expert human resources.

The statement from R3 regarding this key element is more focused on the characteristic of human resources which is a **strong commitment**. R4 stated the human resources as part of their ability to do the job in a **professional and fully competent** manner. Also important is the **mindset** of an asset manager that fully understands property, is able to analyse the property market, and is self-motivated to improve their knowledge. The comment of R3 regarding this key element was:

'*…First of all, is organisation vision and mission, then the* ***strong commitment*** *to achieving these visions and mission and the third is an online and real-time database….'*

R3 and R4 are the executive levels of manager, therefore their views of human resources emphasised the performance or impacts of human roles rather than the concept of human resources. R5 as the law and regulation advisers defined the CHR as a key element by emphasising the role of the asset manager, as stated in the following comments:

'*…The factor that we need to pay attention to is that the organizational selfish cannot dominate the optimisation. Therefore, not only reliable asset administration is urgently required but also* ***the strength of a managerial role*** *is also important….'*

The strength of a managerial role is the performance of human resources in managing the asset. It is depicted as the performance level of conducting the specific role and it can only be done by humans based on their responsibility. This analysis confirmed that CHR as the key element has been agreed by interview respondents.

3. Accountable Asset Administration (AAA).

This key element covered the internal process perspective to support the goal of asset optimisation. All interviewees acknowledged AAA that plays a significant role in the decision-making process. R1 as one of the top managers asserted AAA is the essential element using the infrastructure term. R1 defined the infrastructure consisting of not

only the physical aspect but also the process. It means the internal business process or governance of asset optimisation itself. The outcome of infrastructure is a database of assets. R3 also highlighted AAA as an updated database, and this was agreed by R4 as well. The following comments were stated by R3:

'First of all, is organisation vision and mission, then the strong commitment to achieving these visions and mission and the third is an ***online and real-time database****. This database should be* ***integrative and comprehensive*** *reflecting asset life cycle. Accordingly, optimisation can be done based on the* ***updated database****.'*

The presence of AAA as an important element has been emphasised in the online and real-time database, which is integrative and comprehensive. R3 has a role as a regional asset manager and highly demands a reliable database of assets. As a policymaker, R3 stressed the importance of an integrative and comprehensive database. This data character potentially enables the decision-maker to control the governance of an organisation, such as to mitigate the risk, generate benefits or control the expenditure (Fisher, 2009). The reliability of the database becomes an organisational need because one of the primary performance measurements focuses on how to manage the asset, how to utilise it and how it contributes to achieving the organisation's missions.

Asset administration is another term of a database of assets where the current condition of assets is always up to date. The only proper mechanism of control can be generated from the good governance of asset management. R5 viewed the AAA more as the administrative process of an asset to provide the necessary information required by a policymaker. The statement of R5 regarding this key element is as follows:

'*….Therefore, not only reliable asset administration is urgently required but also….'*

Reliable asset administration has been acknowledged as one of the key elements in asset optimisation. Asset administration contains not only records, history of an asset, but also how the asset changes over time within the economic life of assets. In the view of AAA from the administrative aspect, it reflects that AAA is a process of

recording, updating and retrieving data of an asset. Therefore, the placement of AAA as part of the internal process is on the right track.

4. Optimum budget (OB)

The key element of the optimum budget explicitly was agreed by interviewees in defining the HBU, whereby one aspect of HBU is financially feasible. Feasibility of financial aspects arises from revenue or income and costs or expenses. R1 asserted that genuinely the government sector focusses on how to reduce costs and maximise services. As one of the elements of asset optimisation, R1 admitted the OB is an important element in the organisation, as he stated in the following comments:

'…optimisation needs a budget, human resources, and infrastructure…'

Budget in this context refers to the potential expenditure that has to be planned in a certain portion of the budget. This opinion was also confirmed by R6, where optimisation is required to achieve cost-saving condition, as stated in the following comment:

'….The next factor of optimisation is green building so that it can be environmentally friendly and can save on the operational and maintenance costs…'

As a top manager, R2 also stated the similar condition of the asset optimisation element in regards to the optimum budget. R2 commented:

'.....in my view optimisation can also create economic benefits, meaning what the nation has got from the optimisation, and from non-economy aspects how much we save from the process…?'

'…capital expenditure in asset optimisation is an expenditure in the beginning, but it will reduce the maintenance cost in the future….'

Optimum budget is mostly recognised by respondent views as cost-saving or cost reductions in operational and maintenance cost. Regarding the revenue or income, R3 and R5 measured the optimum budget focusing on how to generate income. The role of budgeting is to achieve cost-saving and effectiveness of spending of an

organisation's resources (Bolojan, 2011). Optimum budgeting is the balancing between costs reduction and risk mitigation in developing budget planning (Sato & Hirao, 2013) or the fulfilling of the modern budgeting system by adopting budgeting principles such as accuracy, clarity, publicity, allocation of expenses, authorisation and comprehensiveness (Avci, 2015). These two concepts of optimum budgeting are applicable in this research to define the necessity of asset optimisation strategy, which needs risk awareness in the beginning and also constitutional budgeting to proof the regulatory compliance of the budgeting process.

The flow of analysis of key elements and validation of an in-depth interview is described in the following figure:

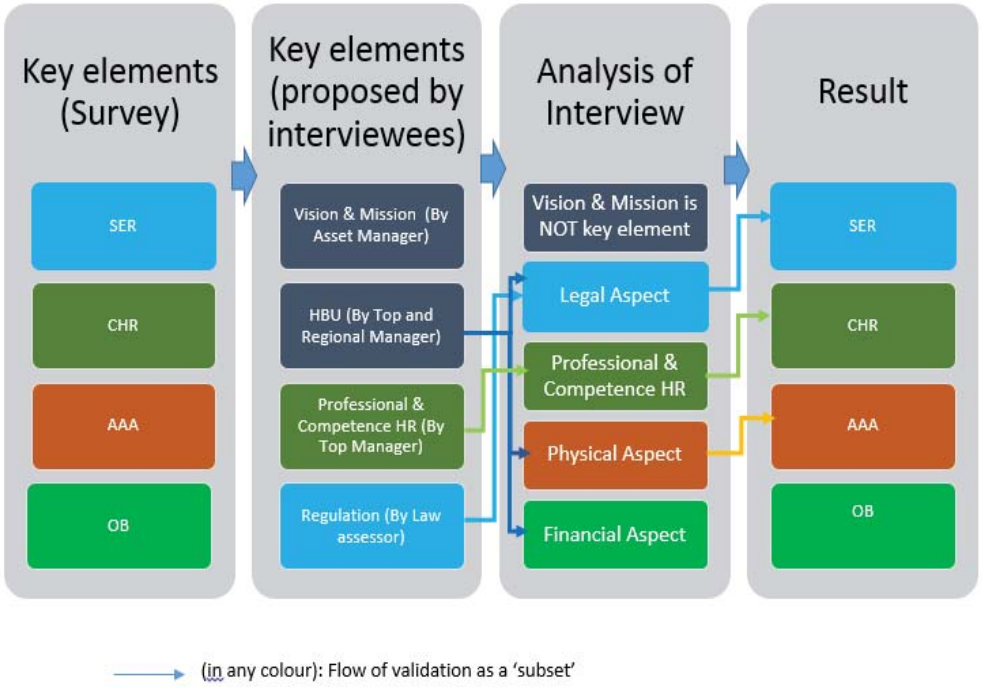


Figure 5.1 Validation of Survey Result of Key Elements

In addition to key elements, interviewees proposed an additional important element that should be one of the key elements. This idea was raised by executive-level or asset manager (R3) who argued that a key element of asset optimisation should include the

vision and mission of the organisation. The statement from R3 regarding the elements is the following quote:

*'First of all, is organisation **vision and mission**, then the strong commitment to achieving the vision and mission and the third is online and real-time database….'*

R3 argued that vision and mission of an organisation guide all components of the organisation to achieve the goal by accomplishing every mission and the ability to apply HBU is obtained from an understanding of asset life cycle concerning to the organisation vision and mission. Vision and mission, therefore, provide main guidance to optimise the asset where all programs refer to it.

However, in this research, organisation vision and mission have different and separated positions in the organisation and cannot be classified as a key element. Vision is a statement to articulate the ideal description of an organisation where the organisation would like to be in the years to come (Michael et al., 2016). The vision is very general and abstract therefore it is difficult to measure, but it should be achieved as part of the whole achievement of an organisation. Vision becomes the foundation of mission, and mission specifies the organisation's steps to compete or to serve the customers. Thus, as a direction, vision and mission are critical aspects of analysis based on engaging strategic action to achieve organisational goals. As a direction, an organisation must accept the vision and mission before the strategy has been developed. So, the vision and mission are not a key element; instead, they are foundation elements of the organisation. For this reason, vision and mission do not comprise a key element in asset optimisation.

After considering the analysis of key elements, proposed by the top and regional manager, asset manager and law advisor, this research confirms that the key elements of asset optimisation are (see Figure 5.1):

1. Stakeholder requirement and natural environment fulfilment element (SER).
2. Competitive Human Resources element (CHR).
3. Accountable Asset Administration element (AAA).

4. Optimum Budget Element (OB)

5.6.2 Analysis of In-depth Interview of the Most Important Key Element

The results of the survey in Stage 1 regarding the most important elements have been found in the weighted priority. The weighted priority of key elements shows the contribution of each element in achieving optimum asset management. The objective of the in-depth interview is to validate the preliminary findings of the Survey in Stage 1. The results of the in-depth interview were then triangulated with the results of Survey in Stage 2 (complete) as the final research finding of the important key element. In achieving this objective, the views of facets of strategic roles in asset management were defined including the reasons for selecting key elements they consider the most important element. Their views were then explored more deeply to correspond with the general perspectives of respondents.

The most important key element that resulted from the survey in Stage 1 based on the AHP was SER (36%), followed by CHR (28%), AAA (26%) and OB (11%). The results of the AHP process was validated in the in-depth interview by questioning the reason for selecting one element considered more important than other elements. All interviewees agreed on CHR as the most important key element. CHR is a key element, on which other elements depend (R1). As a consequence, competent and professional human resources become the most important element that plays a significant role and acts as a source of commitment where spirit and professional behaviour come from (R2). Human resources lead other elements, for example, continuously updated the database and regulative compliance is preserved (R1 and R3). Therefore, creating the proper asset optimisation strategy will rely on the quality of human resources (R5).

Human resource is one of the important resources in an organisation that contributes directly to the achievement of an organisation's goal from the ability, knowledge, and skill of its human resources. Only can professional and competent persons put their commitment into their work and create a better strategy (R6). Other elements, such as regulation and asset database cannot guarantee asset optimisation without the strong

commitment of people in their respected organisation. The following statement is the comment in respect to this matter:

'I totally agree that human resources are one of the important elements to develop an asset optimisation strategy. (Asset) Optimisation requires an entrepreneurial person and asset specialist. Having an entrepreneur leads the profitability of asset and an asset specialist is important to manage it. However, between entrepreneur and asset specialist should be in balance, so that we can reduce the number of idle assets and at the same time grab the opportunity (in terms of) revenue from assets. Nonetheless, the governmental human resources should think of the public services first. What we need to do regarding this, is about changing the mindset (R2).'

In this sense, human resources need to have entrepreneurial skills and asset specialist mindset that can be effective in optimising assets in terms of reducing underutilised assets and saving costs of maintenance and generating income. The mindset of entrepreneurship is part of the soft skills of a public asset manager including knowledge, skill, expertise, talent, and leadership (Tsolmon, 2015; Turner, 2014).

Human resource is a key of asset optimisation responsible to design, monitor and operate a strategy of asset management. The importance of human resources in asset optimisation is due to the reliability of professional persons with strong commitments having orientation on providing excellent public services and ability to improve themselves, as well as being able to change the mindset from asset administrator to asset manager (R3).

Human resources play an important role to establish the reliable administration of assets by an updated database. Therefore the quality and quantity of human resources need to be monitored and evaluated properly to create the required skills and improve competency. The reason of the importance of human resources in asset optimisation strategy is because the human resources can support the strategy of the organisation as long as they are highly professional and committed to the achievement of the goal of organisations (R3, R4). The summary of reasoning from interviewees regarding the

fundamental reasons for selecting CHR as the most important element is shown in the following table.

Table 5.4 The Reasons for Selecting CHR as the Most Important Element

The strategist facets (Respondent)	Reasons for Selecting CHR
Top and Regional Manager R1, R2	Only a professional and competent person can put the commitment into their work. Regulation and asset administration cannot guarantee the optimisation without a strong commitment
Asset Manager (R3, R4)	They are responsible for operating the asset management system. This professional and committed persons operate the system with a fully responsible manner.
Law and Regulation Advisor (R5)	Professional human resources are keys of other elements, because of their ability to develop and operate good systems and update the database accurately.

According to Table 5.4, the top manager considered that the importance of human resources is due to the characteristics of professionalism and competence. This characteristic is instrumental for the success of other factors. Professionalism creates responsibility and reflects the public accountability standard of quality of services (Gazley, 2014) and becomes the key to good governance. In addition, a reflection of professionalism is a strong commitment. Furthermore, professional people tend to be more responsible because of establishing and internalisation of good behaviour and discipline (Fenwick & Wrbka, 2016). The middle level of asset managers selected competitive human resources as a significant element due to their characters and commitment to do the jobs in a fully responsible manner (R3, R4, R5).

The comparison between the results of the survey and in-depth interview are shown in the following table:

Table 5.5 Comparison of Priority of Key Element of Survey Result and In-depth Interview

Survey Stage 1 Result	Survey Stage 2 (complete)	In-Depth Interview
#1. SER (36%)	#1. SER (36%)	#1. CHR
#2. CHR (28%)	#2. CHR (34%)	#2. SER
#3. AAA (25%)	#3. AAA (19%)	#3. AAA
#4.OB (11%)	#4.OB (11%)	#4. OB

Table 5.5 shows the comparisons of priority of each key element between the results of the Survey in Stage 1 and the in-depth interview. The comparison between Stage 1 and Stage 2 shows similarity in terms of ranking with weighted priority slightly changed. However, the results of the in-depth interview have shown CHR as the first priority compared to SER. Accordingly, there is a gap between results from the survey, in-depth interview and the test case. This condition has most likely been influenced by the background of respondents. Respondents in the survey were predominated by staff and lower-level managers that focus on their daily scope of jobs. The profile of respondents in the survey varied in terms of their backgrounds and job descriptions, which may interfere with their opinion in selecting the most important elements. In contrast, respondents in the in-depth interview were from top and middle managers that have holistic insight and wider thought across all departments or units with various duties and targets. This insight has been reflected in their role as top leaders that tend to consider all relevant aspects of their organisations. In addition, their focus of thinking is not only wider but also visionary, covering a long-term perspective. These circumstances lead them to select CHR as the most important element. The quality of CHR is central for other elements whereby other elements can rely on it. Thus the finding of the most important key element adopts the global and wider insight, which is CHR.

5.6.3 Analysis of The In-Depth interview of The Best Alternative Strategy

An alternative of asset optimisation promises to benefit and opportunity in achieving strategic goals. According to the results from the in-depth interview, the best alternative that currently provides advantages can be seen in the following table.

Table 5.6 the Best Alternative of Optimisation Strategy

The strategist facets	The best alternative	Advantages
Top and Regional Manager	Asset utilisation in the rental scheme (R1)	Simple, beneficial in term of time frame, short and medium-term and controllable.
	Improve asset performance (refurbishment)	This is an effective method to attract investors and the market to become involved
	Asset utilisation in partnership scheme (R6)	Wide impact to activate private or local sectors who are expert in the industry. It is also able to enable economic activities in the surrounding area.
Asset Manager	Asset utilisation in rental scheme (R3 & R4)	Simple in the procedure, low risk and without auction or open bidding.
Law and Regulation Advisor	Asset utilisation in partnership scheme (R5)	The impact is real and beneficial to generate income regularly compare the rental scheme

Table 5.6 shows utilisation is the most affordable option. There are two possible schemes, firstly, rent the asset proposed by the top manager and asset manager, secondly, partnership of asset utilisation mentioned by the top manager and law and regulation advisor. The reasons for selecting the rental scheme were underpinned on the simplicity of implementation either in procedure or time frame. It also has minimum risk and provides benefit. The utilisation of assets in the rental scheme is the best alternative because it is simple with low risk (R1). This scheme provides beneficial options to asset managers in the decision-making process, which is to generate income and decrease the number of idle assets, in some cases renting assets can also reduce the costs of operation and maintenance of assets depending on the agreement.

This statement is also agreed with by other interviewees (R3, R4, R5). There are some sensible reasons for selecting an asset optimisation program through utilisation in the form of rental schemes, such as maintaining the value of asset and reducing risk. This was commented on by R3 as follows:

'Without optimisation, assets face risks such as legal risk; some public assets have not been registered and certified properly, potentially giving rise to disputes on ownership. Another risk, such as financial risk, includes lack of capturing the opportunity of income, and opportunity loss due to the inability to save on the maintenance costs. So that optimisation is an approach to reduce such risks (R3)*.'*

R4 also added that benefits of asset optimisation definitely increase the value and reduce the occupational risks (like an impact of idle assets, some cases were occupied illegally); f,or example, buildings that have been vacant for such a long time need extra expenditure for evacuation expense, and this can be avoided by optimisation.

According to the top manager, the advantage of the implementation of asset optimisation can beneficially increase the capital gain on assets that arise from the increase of the value of assets. This benefit is gained in a very short time instead of in the range of time after the optimisation action was taken. Optimisation also potentially improves the quality of public service as the refurbishment on a building can improve building performance.

Regarding risk, respondents have different opinions. R1 & R2 believed that asset optimisation potentially reduced the risk of an asset, such as the risk of impairment and legal. It is because the asset needs to be scrutinised prior to the optimisation program. On the other hand, the regional manager argued that optimisation is part of risk itself. Taking on an optimisation program means also taking risks; it might be a legal or financial risk, as is mentioned by R6.

The main point of the optimisation is the potential rise of benefits such as increasing the value of assets, improving the performance of assets and also reducing opportunity costs of assets. However, the benefits might carry some risks due to mismanagement,

environment degradation and economic situation (Buhr, 2017). The preventive action to obtain the benefits and mitigate the risks is required in selecting the best alternatives or the selected alternative might also include this prevention in one action.

The comparison of results from the survey, in-depth interview and test case for the best alternative of asset optimisation is shown in the Table 5.7.

Table 5.7 Comparison of Result of Survey and In-depth Interview for the Best Alternative of Optimisation Strategy

Survey Stage 1 Result	Survey Stage 2 (complete) result	In-Depth Interview Result
#1. Maintain asset efficiently (40%)	#1. Maintain asset efficiently (40%)	#1. Utilise Asset (in various schemes)
#2. Improve Performance of Asset and Value (33%)	#2. Improve Performance of Asset and Value (32%)	#2. Improve Performance of Asset and Value
#3. Utilise Asset (27%)	#3. Utilise Asset (28%)	#3. Maintain asset efficiently

Table 5.7 shows the different priorities of an alternative strategy for asset optimisation from the results of the survey and in-depth interview. The results from the survey show opposite conditions whereby maintaining asset efficiently was chosen as the best alternative, which is a less considered alternative based on the interview and test case. It is most likely due to maintaining assets efficiently being the main job of the respondents of the survey, who put more emphasis on this alternative as less risky, which dominated their perceptions. In other words, the majority of respondents had risk avoidance as their predominant motive. Among the three alternatives, maintaining asset efficiently is the lowest risk option in asset optimisation compared to the utilisation or improvement of asset performance. The results of the interview suggested that asset utilisation is the best option considering its low risks and simple procedure. Improving asset performance and value is also considered as low risk but less affordable due to financial constraints. Risk avoidance can potentially influence the results of the survey. The implication of this gap in the development of the strategy

is affected by the respondents' background, which is important to be revealed to ensure precise and accurate results are far from the biased analysis. Thus, if it turns in the decision-making process, it will induce an effective and optimum decision. Therefore, the confirmed best alternative of asset optimisation is the utilisation of assets, followed by improvement of performance and value of assets as well as maintaining assets efficiently.

5.6.4 Barriers of Asset Optimisation and Recommendation of Asset Optimisation

The researcher has gathered information from an in-depth interview about the barriers in the implementation of asset optimisation, particularly in how to overcome the barriers as proposed by interviewees. Barriers in asset optimisation are mostly due to the weaknesses of key elements of asset optimisation. It might be caused by lack of evaluation, meaning the KPIs have not been assigned to monitor the key elements, environmental aspect or unsupportive regulation. Some proposed solutions were suggested by interviewees based on their experiences and assumptions. Recommendations are also part of the better idea of asset optimisation for the future and become a preventive solution for any asset optimisation's issues that may occur. The following passages described the analysis of barriers and recommendation of asset optimisation and also the existing implementation of asset optimisation based on the test case.

5.6.4.1 The barrier of asset optimisation

Barriers have previously been mentioned in the test case analysis due to the weaknesses of key elements. It was indicated by less acceptance in measuring elements of CHR and AAA in the evaluation of strategy as described in the annual performance report of 2017. Up to this stage, there were two main barriers to human resources and asset data factors. The barriers that have been experienced by interviewees were revealed from the in-depth interview. These barriers might occur in the development and implementation stage of strategy. Table 5.8 describes barriers and the initiative of the solutions proposed by interviewees:

Table 5.8 Barriers and Proposed Solutions of Asset Optimisation

The facet of Strategist	Barriers	Proposal for Solution
Top and Regional Manager	Legal Risk	Thoughtful analysis and prudent procedure of the process.
	Lack of competency	Training or workshop to improve competency in asset management
	Inadequate regulations	Rule and regulation assessment
	Lack of Database of Asset	Asset identification and valuation program
Asset Manager	Lack of Competency	Training of asset management program, Discussion forum
	Inadequate regulation	Regulation assessments and evaluation of compliance.
	Lack of Database of Asset	Asset identification and legal authentication program (certification)
Law and Regulation Advisor	Lack of Competency	Training competency of asset manager.
	Inadequate regulations	Assessment of regulations

Table 5.8 confirmed the preliminary indication as described in the key element investigation in the test case and also the endorsement of interviewees' perspectives. There are three barriers that have been found including the proposed solutions:

1. Inadequate regulation means that current regulation or rule has not been enough in supporting the practical aspects of asset management strategy so that the accountability of the chosen strategy is in questioning because there is no sufficient legal umbrella. This barrier was stated by R5, who has considered current regulations are sometimes too general and potentially prone to multi-interpretation. As a consequence, the policymaker has no sufficient legal basis for their decisions. In other words, the practical aspect of asset management does not have sufficient support from existing rules or acts. It tends to be questioned in the audit of compliance and also induces less accountability due to inadequate proper legal rules (R5).

The proposal of solution for this barrier is by conducting an assessment of current regulation followed by revision, amendment or establishing new regulation. R5 proposed a suggestion in their comment:

'I think we need to be efficient in drafting rule or regulation, as it needs devoted resources and is time-consuming to amend current regulation. However, assessment and evaluation is the most possible choice to deal with this condition.'

2. Lack of competence of human resources in initiating, leading, and operating management of an asset. Competence means to have a necessary capability, skill, and knowledge to do something successfully. Incompetence tends to be less professional development (Chlivickas, 2014). This barrier was introduced by interviewees where the incompetency is the real problem and it produces other problems in the organisation. The problems caused by incompetence of HR can be in the form of low productivity, unsafe environment as well as increased expenses due to human error or loss of the customer. Considering these impacts the root cause of incompetence needs to be addressed promptly.

   The incompetent human resources are most likely due to low motivation to improve skill and knowledge. It is also because of lack of experience, so there is no preference to deal with it. Therefore, the organisation needs to develop the skill of its HR effectively (R2). R2 proposed the solution of the provision of a relevant training program to HR in order to improve asset management knowledge and skill. Some solutions proposed are by having a consultation with relevant private sectors or special treatment through 'learning by doing' to handle the job (Chang, 2010).
3. Legal risk is one of the barriers that has been raised by R1 and R6 from the top and regional manager. This risk potentially arises from the legal ownership of assets and also from policy due to one or more practices that have not been legally ruled. It can be because the case is too complex or rarely occurs, so is not accommodated by existing law. The documentary review in the test case revealed that legal ownership is not an issue on the observed buildings. However, the annual performance report in 2017 has shown the amount of asset that has been assigned

its legal status is the most frequent program. The report also deemed that status designation can mitigate the legal risk of ownership.

Legitimate ownership is a basic requirement before an optimisation program is taken. The Minister of Finance regulation number 87/PMK.06/2016 stated that state or public asset should be statutory clearance for security and safety purposed asset management, included the legal risk mitigation. Another important aspect in order to minimise this barrier is also a prudent and thoughtful process of utilisation. This respect has been criticised by R6 in the comment:

'Asset utilisation is part of the risk if the position of the asset is not clear legally. Therefore, before the utilisation program is taken, legal ownership of asset should be satisfied. Following this, the process of utilisation has to be thoughtful and prudent, complying with the regulations. Otherwise, it will raise new problems instead.'

4. A non-updated database of an asset can impact on the accuracy of the decision. The database of assets also needs to be comprehensive and completed, so it can provide good quality information to be used in decision making. An identification and valuation program of assets is one approach to resolve this issue. Asset identification addresses the size, quantity and quality of assets as well as other relevant information of assets. Moreover, the asset valuation program can address the issue of the value and potential use of assets, for example by undertaking the highest and best use analysis (Finance, 2017).

5.6.4.2 Recommendation of Optimisation Strategy

Asset optimisation strategy at the level of implementation is equipped with alternatives, such as maintaining asset efficiently, improving the performance and value of an asset or utilising the assets. In selecting these alternatives, key elements should be considered as the key factor in the achievement of the goals of asset optimisation. In addition, the exploration of ideas can be from the key persons who have experiences and wisdom. Accordingly, better ideas and options might come from them, similar to the objectives of an in-depth interview with the executive and top managers at various levels. As a portfolio optimiser and trend forecaster, the top level

of asset manager's view was that the implementation of asset optimisation will be advanced, considering the following concerns:

1. Comply with the regulations. The regulation is a legal umbrella for ensuring the compliance of implementation of asset optimisation and accountability to the public. Regulations and rules should accommodate and address the changing trend of the property market and be liable to the market situation. R2 commented on the regulation as follows:

   'I am sure that the asset optimisation program is on track, but there is always room for improvements, such as flexible regulations as an umbrella of implementation of optimisation. Because the property market emerges more rapidly than the acceleration of property regulation as a foundation of implementation in various conditions. …we have to consider the property trend, price and demand as property tend to be vulnerable to the market situation.'

2. Continuous improvement can open the opportunities to select the best option and to achieve goals promptly. The target of enhancement or improvement is mostly on the criteria of optimisation, which are key elements. It has been suggested by R1 in the comment below:

   'The first that we could improve is human resources that have to be open for development and upgrading. This can create the correct view of assets. When we are going to utilise land and building (we) should recognise the environment, regulation, funding availability and opportunity costs and affordability aspects of assets. One asset may be fit for rental, but another asset may be suited for a partnership scheme; it depends on many factors. As asset managers, we urgently need to assess the options that correspond to the factors of an asset, human resources, funding and regulation before we decide on one option.'

3. Building information modelling of asset supplies the way how the buildings or infrastructures are designed, conceived and managed. This model also provides an accurate and reliable database of assets and other information of assets as one of

the keys of efficiency and efficacy in the management of land and building, so that the policy taken will be effective. The development of database and continuous improvement can also create opportunity for value appreciation of assets or avoiding the opportunity lost. This important recommendation from top management level is to start from improving the database of assets. One of the comments of R2 is as follows:

'Prior to the optimisation of assets we need to build the profile of assets into the business case to portray the legal issues, how to maintain, and current condition. At the same time, we set the concept of asset development based on the market trend and organisation's needs to assure that our developed or refurbished asset will be absorbed by market.'(R2)

The asset optimisation program can only be conducted if the database of assets is reliable and updated. The aspects of asset administration comprise size, number, location, condition, and organisational function or in other words, no idle asset because the asset optimisation means assets are fully utilised or zero idle.

4. Building synergy between the asset manager and asset operator as well as other parties who are potentially involved in the asset management and play the role consistently. The asset operator is committed to the operational level to follow the plan designed by the asset manager. Asset manager plays a role in planning, organising and controlling the asset optimisation program. As an executive level in the organisation, the comment of the asset manager was affirmed by R3:

   'We comply with the asset optimisation plan and it is necessary to build a good synergy between the asset manager and asset operator or users. For example, in reducing the number of idle assets, we as an asset manager and asset operator agreed to select asset utilisation in the partnership scheme. This scheme has to be clearly ruled by law and regulation that we need to comply with. At the same time, the approved amount of contribution, who will evaluate it and how the mechanism works, what are the sanctions and so forth".

5. Sustaining in the innovation of asset optimisation to overcome the barriers and to earn the potential gain by adopting energy efficiency program i.e. saving energy initiatives. Innovation is not only the enhancement of optimisation but also innovation to proposing better regulation to protect the asset optimisation to be accountable, profitable and improve the quality of services. This recommendation is suggested by R4. In this sense, regulation advisor (R5) also commented:

   'I recommend to have regulation enforcement and focus on the current organisation mission. Too flexible sometimes just blurs the main mission. In accordance with the regulation we should also consider not being too detailed; that can be very hard in implementation. Therefore, it should be simple."

The highlights of the recommendation from the facet of the strategist role regarding the implementation of asset optimisation are as follows:

1. Improvement inconsistent manner should be made on the factors or elements of asset optimisation before it turns into the final decision of optimisation.
2. Perceiving assets objectively considering surrounding factors and environment, including regulations that are important in selecting the best option.
3. Development of an updated database is a must before the optimisation is resumed.
4. Implementation of asset optimisation requires a commitment to building synergy from involved organisations/units, managers and operator of assets
5. Innovative, flexible, simple and comprehensive regulation is important in maintaining the asset optimisation to be on track to achieve the goal.

5.6.5 Implementation of Asset Optimisation Strategy in the BSC

Current asset optimisation strategy in the organisation where the interviewees are working can capture the practical aspects of asset optimisation. It was examined through in-depth interviews with respondents, observation of two selected buildings as well as a review of the relevant documents, such as annual performance report and budget planning and realisation report. This investigation aims to explore the necessity of adaptations and flexibility of strategy resulting in a robust and applicable strategy.

Furthermore, BSC as a strategy tool could be described in great detail to find room for improvement. The interviews performed were adhered to as the components of BSC. The following paragraph begins with the perspective of BSC in the respondents' standpoints and it confirms the practical evidence in the observed building specifically and related to current asset management process in general.

- The perspective of BSC and asset optimisation

There are four perspectives of the BSC in which the strategy and its performance are measured. The understanding of respondents regarding the perspectives of BSC diverged into two outlooks: adaptation of the perspective of BSC and prioritisation of the perspectives. The adaptation of the perspective of BSC was based on the view of DGSAM as governmental asset manager that should provide public services. Therefore, four perspectives of BSC should be reformulated to fit in the governmental organisation. This opinion concerned specifically the financial perspective because a governmental organisation should emphasise public services. Consequently, according to this assumption, the financial perspective reflecting the measurement of the profit is substituted with a customer's perspective. R1 suggested to include the financial perspective as part of the learning and growth perspective and replace it with the customer's perspective. Accordingly, the financial measurement aspect is directed to focus on the budget performance as it enables alignment of internal resources, not only human resources but also financial resources. Therefore, financial measurement is included in the learning and growth perspective. The comment of R1 was as follows:

'In the implementation of asset optimisation using BSC as a strategy tool we replaced the financial perspective with the customer. In private organisations, financial means profit measurement. Learning and growth are composed of budget or funding, organisation structure, information and technology, and human resources. Why? Because the public sector goal is for excellent services. Therefore, optimisation of asset means also good quality services.'

In respect to this suggestion, the modification of BSC is possible because the implementation of BSC is about measuring the strategy to create the focus of the entire

organisation. However, the matters of how an organisation is able to serve the customers, modify their business process, reskill the human resources and deploy the technology to achieve the goal of strategy have to be consistently functioning (R.S. Kaplan & Norton, 1992). As a result, the modification of BSC for a governmental organisation might consider three high-level perspectives, such as (1) the cost incurred or efficiency; (2) value created, which means how to provide excellent service to the public; and (3) how to legitimise the support to the taxpayers or citizens (Kaplan. & Norton., 2001).

Regarding the prioritisation of perspectives, the implementation of BSC in the public sector in an asset optimisation strategy should place stakeholder perspective as the first priority before other elements due to being public service-oriented (R2). R2 assumed that the four perspectives in the BSC model were also concerned about the priority of this perspective. As a consequence, the arrangement of the perspectives corresponds to the core business of the organisation. This argument is mentioned by R2 as follows:

'I think as a governmental organisation we should put the stakeholder perspective firstly, then we can put other perspectives afterwards. As a public service provider, the government is not a profit-oriented organisation.'

Instead of modifying the perspective for the governmental organisation, this argument concerns the priority of the perspectives, whereby the stakeholder perspective is the highest level of priority. In this facet, the prioritisation of perspective is positioned SER at the highest priority and it is measured in the results of the survey. This statement has also emphasised the results of the first validation of the key elements. In addition, this opinion also admitted the concept of alignment of BSC into governmental organisations by placing the focus of the organisation (Curtis, 2013; Robert S. Kaplan & Norton., 2014). Among the perspectives of BSC in the profit-oriented organisation, especially for financial perspectives, they can potentially be aligned in the public service-oriented organisation or government. It is due to the financial perspective concerns on how to look after the stakeholders if the organisation

is successful in achieving its goal. Furthermore, the BSC also allows the organisation to use the same measures including financial measures to evaluate the organisation performance in creating the value (L. A. Jackson, 2013; Robert S. Kaplan & Norton., 2014). The comments from R6 adhered to this concept as in the following statement:

'Perspective of BSC potentially changes when the Minister of Finance of Republic Indonesia demands that DGSAM as the public asset manager becomes one of the revenue centres. This important mission can only be achieved if we have a reliable database of assets, competitive human resources, and synergy with stakeholders. Financial perspective also connects to the budget. In my opinion, the first perspectives of BSC that we put into place first are stakeholder perspectives.'

Revenue centre in this context means generating income for the government, which also means the ability to serve the government as stakeholders. Additionally, financial perspectives can also be derived from the aspects of budgeting or fund meaning how to allocate the fund efficiently, compliant with the stakeholder's interest.

In the view of asset managers, implementation of BSC in the public sector organisation that focuses on developing asset optimisation has set the stakeholder perspective as the first priority. It is because the mission of government is to deliver services to the public. However, it does not mean that generating income is not allowed, rather it might be done after the stakeholder's interest has been fulfilled. The goal of asset optimisation refers to the stakeholders' needs. This opinion was stated by R4:

'In my view, asset management provides service to the stakeholder, so that means the priority has to be on them, whereas the focus of asset optimisation is to provide excellent service. Meeting the stakeholder interest is very important. It includes how to manage idle assets in order to be more beneficial to stakeholder. Next, we can step on to the revenue and the organisation's need.'

In the view of asset manager on asset optimisation as represented by R3, the implementation of BSC in asset optimisation has to consider the stakeholder perspective as the first priority, which means the measurement, evaluation, and

proportion of resources to fulfil the stakeholders' needs has to be based on stakeholder perspectives.

Implementation of asset optimisation using BSC according to R5's view is also focussing on the stakeholder. Therefore, the flexibility in existing regulations is necessary. In order to provide the stakeholder's interest, the capacity and capability of employees need to be improved continuously. System and procedure in an organisation should be able to control the process systematically and automatically regardless of the leader.

According to this, the views of law and regulation advisor (R5) can be drawn as follows:

1. Implementation of BSC as a strategy tool of optimisation places stakeholders as the first priority. In this perspective, allocation of human, financial and capital resources to meet stakeholder perspective is essential and one of the evaluation aspects is creating the value for stakeholders.
2. Flexibility in regulation is part of the learning and growth perspective in the optimisation strategy process.
3. Alignment of BSC in the corporate entity into the governmental organisation can be done by substituting the financial perspectives to stakeholder perspective in order to achieve the goal of asset optimisation successfully.

5.6. Key Findings of In-depth Interview

Based on the thematic analysis of the respondent perspective, key findings can be drawn as the skeleton of the optimisation strategy, particularly the key elements and its prioritisation, and alternatives or program of optimisation. The current barrier of implementation of asset optimisation is the contextual situation that becomes challenges of implementation of asset optimisation. Recommendations of strategy emerged from the understanding of current situations that may not meet the ideal situation, therefore need to be improved. The key findings of the in-depth interview are summarised as follows:

1. Key elements of asset optimisation. In-depth interview process and analysis found the stakeholder requirement and natural environment fulfilment element (SER) has been perceived as the compliance of the regulations (legal) surrounding the assets including environmental awareness. The policy, procedure, maintenance and operational stages of asset, land, and building should adhere to the positive regulation and the stakeholder interest. Competitive human resources (CHR) are the reflection of the professional and competent employee and become the main ingredient of the quality of asset strategy and its achievement. Accountable asset administration (AAA) is acknowledged as an important element to support managers in developing a strategy and is the reflection of good records, updated asset data and reliable administration of assets. Optimised budget (OB) is acknowledged as the financial aspect in the strategy to optimise assets. This aspect is also agreed to be one of the important elements for the successfulness of strategy.
2. The priority of key elements has the following order:
    - #1 Competitive Human Resources element (CHR).
    - #2 Stakeholder requirement and natural environment fulfilment element (SER).
    - #3 Accountable Asset Administration element (AAA).
    - #4 Optimum Budget element (OB)
3. The prioritisation of alternatives or programs for asset optimisation is different from the resulting survey. The order of alternatives for asset optimisation is:
    - #1 Utilise asset
    - #2 Improve performance of asset and value
    - #3 Maintain asset efficiently
4. Barriers of implementation of asset optimisation mostly derive from the weaken key elements of asset optimisation that are CHR, such as lack of competency of asset manager or asset operator, AAA as the lack of database of asset, SER as an inadequate regulations to support the operation or utilise asset prudently, accountably and transparently as a reflection of the accountability to the public as part of being a stakeholder.

5. Recommendations of asset optimisation strategy consist of the improvement of key elements such as:
    - Improve the regulations and awareness of environmental aspect and its rule (SER)
    - Improve asset administration and database (AAA)
    - Build the synergy from involved organisation/units, managers and operators of assets.
6. Implementation of BSC as a strategy tool places the stakeholder as the first priority, which means that the prioritisation of key elements should consider SER as the highest priority to be considered. This also means that allocation of human resources, financial and capital resources should be taken after SER, in other words, these other key elements (out of SER) can be evaluated based on the value-creating to the stakeholder. Alignment of BSC into the governmental organisation (or public sector) is important before the adoption of BSC.

5.7. Conclusion of Survey and Interview Results.

The survey stage 1 perceived the viewpoint of respondents from various role and position and also organisations, LMAN, DGSAM, auction participant and municipal government. The position of the respondent is mainly from the middle to lower manager and operator or staff. The stage 1 result confirms that the most important key element is SER (36%), then is followed by CHR (28%), AAA (26%) and OB (11%). This stage also confirms the best alternative is to maintain asset efficiently (40%), to improve asset performance and value (34%) and to utilise (26%).

This result of survey stage 1 then was validated in the in-depth interview of the top-level manager as the respondent. According to the interview result as per Figure 5.7, the most important key element is CHR then is followed by SER, AAA, and OB. This result was slightly different from the survey stage 1, where the first two key elements are in the opposite position. However, the other two key elements mutually supported each other. This means the position of top to lower manager influenced the perception of the service for stakeholders, compliance of rule and regulations and natural and

built environment tasks and the position of competitive human resources. The in-depth interview as a validation of survey stage 1 did not support the result of stage 1 of the survey, and only closed the key elements of AAA and OB .

The stage 2 of the survey confirmed stage 1 survey that is key element has the same order, the differences are in the percentage level, as per Figure 4.6 shows SER (37%), CHR (31%), AAA (20%) and OB (12%). In addition, the alternative of optimisation has been also in the same order. The option to maintain asset efficiently has the highest score as 40%, then it is followed by an option to improve asset performance and value as 33% and to utilise asset as 27%.

Comparison of the in-depth interview (as validation of survey stage1) and the survey stage 2 concluded that both methods have been partly supportive in prioritising the key element as well as in selecting alternatives of optimisation. SER is the highest priority of key element in asset optimisation based on the survey, where the respondents are the middle-lower managers. However, this key element is the second-highest element after CHR based on the top manager's opinion. Therefore, this needs further analysis before the final conclusion can be drawn. Other key elements such as AAA and OB are in the same priority based on both methods.

The analysis to confirm the importance level between CHR and SER has been done when the interview was questioning the recommendation from interviewees. All of the interviewees agreed that the lack of competency of the human resources or CHR was the most problem of asset optimisation. The top dan regional manager selected SER which is a legal risk as to the first recommendation to build asset optimisation while asset managers and law and regulation advisor placed the CHR as the first element on their recommendation. Besides top, regional and asset manager are proposed the SER as the second important element. This also was supported by the law and regulation advisor. However, in this context SER means regulation only. The definition of SER has also to be related to the stakeholder and built and natural environment as well. These two aspects have not been emphasised by the interviewees when they were proposing the recommendations.

The proposal of the solution has also been endorsed to address CHR (see Table 5.8.). The fact that CHR is the key to the robust asset optimisation strategy is not in debate. The successful asset optimisation requires the competent CHR is proofed. This confirms that CHR is the key to asset optimisation rather than SER.

In additions, the best alternative is the maintenance of asset efficiently based on the survey is then followed by improving asset performance and value and utilising asset. Contrastly based on the interview, utilising asset is the best alternative and the third alternative is maintenance asset efficiently. Refers to this condition, in order to draw the conclusion the test case is applicable to answer.

5.8. Discussion

The analysis of in-depth interview investigated key elements and alternatives that previously have been proposed by the results of the Survey in Stage 1. It also investigated barriers and proposed solutions, recommendations, as well as the implementation of BSC in asset optimisation to promote the framework in order to be robust and applicable. The result of investigation through in-depth interview confirmed the important elements is CHR. The best alternative of optimisation still required a further test case to define it. These two final findings altered from the results of Survey in Stage 1 and Stage 2 (complete). The gap might be due to the different level of managerial and work experiences of respondents. The interviewees' perspectives were a reflection of top-level managers who are key policymakers and have more comprehensive and global views in perceiving optimisation of assets and the related issues. This also corresponds to the facet strategy role of interviewees (see Table 5.2). The facet strategy role of top and middle asset managers characterised their roles as generators of insight of portfolio optimiser and competitive advantage officer, enabler of trend forecaster, resource allocator as well as strategy capability builders. In addition, top and middle managers also have roles as innovators in formulating strategy (Birshan et al., 2014).

However, the top level of the element of asset optimisation and alternative alone is not enough in strategy development. It should also take into account some barriers and

consider recommendations from the top and middle managers as well. The barriers are mostly due to less focus on compelling the key elements including AAA and CHR. Recommendations of asset optimisation strategy and implementation have been proposed as an anticipatory action to achieve the effectiveness of asset optimisation.

The further task that needs to be solved will be the percentage of the weighted priority of each element and alternative. The level of priority based on the survey was no longer valid while the results of the interview are taken. This is important to provide detailed percentage when the perspective of key elements will be implemented using the BSC. Each perspective has a level of contribution as a reflection of its level of importance in the goal's achievement. In this research, the results of the interview have answered the research questions. Finally, the generic strategy of optimisation requires to be tested in the real context, to find the best alternative and other challenges before it turns into the final strategy.

Chapter 6 Strategy Development of Asset Optimisation

6.1. Introduction

The generic asset optimisation strategy has been developed mainly from the result of the survey and interview analysis. The asset optimisation strategy describes the prerequisite condition to apply strategy alignment, criteria and alternatives examination, strategy awareness and also strategy awareness and recommendation. This strategy also requires a real implementation to discover problems or difficulties that may occur. The test case approach aims to obtain real case problems from the implementation level to answer the best alternative of asset optimisation. It also verifies the cultural practices that may interfere with the generic strategy developed.

The following paragraphs aim to demonstrate the strategy development process by implementing the test case. The test case process includes the analytical aspects of each parameter of asset optimisation strategy, which are key elements and prioritisation, alternatives of optimisation and its prioritisation through KPI's calculation as the performance measurement. In order to achieve the aims, this chapter is organised into seven sections. Section 6.2 highlights the linkage between this chapter and two previous chapters to describe the role of the test case in finalising the strategy. It is then followed by Section 6.3 to describe the results of the literature review, survey and in-depth interview as the main ingredients of draft strategy before test case. Section 6.4 shows the test case profile and Section 6.5 illustrates the implementation of BSC to picture the local wisdom that influences the optimisation strategy. Section 6.6 and 6.7 describes the analysis of each key element the best alternatives. Finally, Section 6.8 is the key findings of the test case in the final strategy after the test case.

6.2. Linkage of the Literature review, Results of Survey and In-depth Interview and Test case.

Literature review distilled the key elements, alternatives and performance indicators of asset optimisation in certain countries at the federal and local level. The important level of each key element and alternative then was prioritised in the survey. The in-

depth interview validates the results of the survey in Stage 1 in the view of policymakers and key persons in asset optimisation. As the open-ended model, the in-depth interview also investigated the barriers and recommendations of asset optimisation. **The interview question contains the validation of survey results.** All key findings of in-depth interview and survey Stage 2 resolved the most important element in contributing to the asset optimisation strategy and proposed the best alternative, as well as barriers and recommendations of asset optimisation to become the finalised generic strategy before test case. The test case in this research testified the strategy in the minilab implementation and what alternative is the best in optimisation. This final step verifies whether or not the strategy is applicable and discovers how the local policy may interfere with the framework before it turns into the implementation level.

6.3. Draft of Generic strategy before Test Case

The preliminary strategy that has been proposed in Figure 3.1 and Section 4.6 are combined with the key findings of the in-depth interview (Section 5.6) that have led to the significant changes to develop the final strategy. The generic strategy consists of prerequisite elements, alternatives and strategy awareness. The support tool of strategy to calculate the KPI is as shown in the previous chapter (see Table 3.5). The draft of the generic strategy of asset optimisation before commencing the test case as shown in the following table:

Table 6.1 Draft of Generic strategy of Asset Optimisation before Test Case

Generic Asset Optimisation Strategy	Description of Research Recommendation
Elements of Strategy	There are key success factors of strategy that have to be prepared and maintained to generate a robust asset optimisation strategy.
• Key elements of optimisation as criteria of goal achievements: - Competitive Human Resources (CHR) - Stakeholder requirement and environmental fulfilment (SER) - Accountable Asset Administration (AAA) - Optimum budget (OB)	CHR comprises of human resources and other supporting aspects to improve skill and expertise of asset manager to achieve the main goal of asset optimisation. It includes quality and character of competitiveness such as professionalism, expertise, competency, and commitment. SER comprises external and internal stakeholders and their important requirements such as compliance of law and regulations, the standard of service, transparency and required physical performance. SER also include natural environment and built environment awareness in anticipating environmental factors such as disastrous / climatic events and at the same time implementing initiatives towards environmentally friendly policies on assets. AAA comprises of basic characteristic that can enhance the value and performance of asset; this includes layout, amenities, and physical and legal condition. This also includes how to manage or administrate these aspects and how to maintain this. OB consists of budgeted costs of maintenance, capitalised expenditure or renovations, and how assets can be maintained and operated or refurbished using the most affordable budget.

Generic Asset Optimisation Strategy	Description of Research Recommendation
• Prioritising of Key Element	The arrangement of key elements is to allocate resources of the organisation based on the level of importance of key element corresponding to the goal of optimisation. The priority order of key elements is CHR, SER, AAA, and OB.
• Alternatives to strategy options	Some options of alternative strategy implementation are available, which are and are not limited to maintaining assets efficiently, utilisation or improvement of performance and value.
• Prioritising of alternatives	Among those alternatives considering the advantages of each alternative and its impact on the organisation and economy situation, it is necessary to prioritise alternatives. The best alternatives proposed by this researched and still need to be tested are: 1. Utilisation 2. Improve asset performance and value 3. Maintain asset efficiently
• Strategy Awareness	Key elements, alternatives and prioritising them in strategy development are still not enough to build the robust asset optimisation. It needs to understand the barriers and implementation aspects of strategy. Some recommendations and preventive solutions also are beneficial to build the applicative strategy

Generic Asset Optimisation Strategy	Description of Research Recommendation
• Inherent Barriers	There are some barriers to implementation of optimisation strategy: lack of an updated database of the asset, lack of human resources competency and unsupportive regulations.
• Practical Recommendation	There are some recommendations to assure the optimisation such as: - Compliance of regulations or rule - Continuous improvement on the key elements - The innovation of optimisation enhancement (alternatives) and proposing flexible regulation. - Synergy among optimisation parties
• Preventive Solution	Some suggested solutions need to be considered as inspiring ideas such as: 1. Updating database 2. Training and educating program to improve CHR 3. Asset Valuation program 4. Building the thoughtful and prudent procedure in an optimisation program

6.4. Implementation of Proposed Strategy in Central and Local Government

The asset of optimisation strategy is expected to be applicable in central and local government in managing their assets. The key to implementation is that the strategy tool and the key elements. Strategy tool such as BSC is one of the tested tools in this research, as well as the key elements of strategy, have been considered are applicable in the various level of government. The test case is selected from the office in central and the regional offices in reflecting from both levels. The challenge of the optimisation strategy may have similarities with the implementation of public assets management strategy, such as unavailability data of asset management and lack of human resources, legal framework to support the public asset management (Hasbi Hanis et al., 2011). These challenges are the key elements of the asset optimisation strategy.

The similarity concept in developing a strategy in asset management between local and central government can be traced from the reform of the New Public Management (NPM) (Wills, 2009) the key initiatives at the central government level in managing asset include cost reduction and increase the cost-effectiveness (O. Kaganova, 2006). Regardless of the level of governments, these initiatives had a direct implication to the asset when it has been managed. Therefore, the strategy of asset optimisation is applicable for the local and central asset government.

The test case in this research commences with the observation process to the selected object for testing. This process is important to understand the ongoing situation of the asset optimisation process and to align between strategy parameters and the practical aspects. As this strategy is eligible for public land and building the selected test case is governmental offices. An observation process is undertaken to gather relevant information based on the strategy parameter, such as how buildings and facilities are conducive as a proper place of providing services, venue of the meeting, and working area of employees and also how the operation and maintenance of buildings have been conducted. It also includes the compliance of current building with the building codes and existing laws and regulations, or the possibility of implementation of asset optimisation.

6.5.Test case Profile

The test case selected the DGSAM building in Jakarta and State Finance Building II in Semarang. These two buildings have implemented the BSC as a strategy tool using the current perspectives. The cost profile of the property of these two buildings in the years 2015 and 2016 as shown in Table 6.2.

Table 6.2 Cost Profile of observed buildings

Description	DGSAM Building Jakarta		State Finance Building II	
	2015	2016	2015	2016
Building Maintenance Expenses (IDR)	3,018,984,659	2,110,656,400	1,191,088,133.00	1,223,952,503.00
Building Maintenance Expenses (AUD)	301,898.47	211,065.64	119,108.81	122,395.25
Operational Building Expenses (IDR)	5,897,426,428	5,119,902,598	1,928,698,264.00	2,063,067,778.00
Operational Building Expenses (IDR)	589,742.64	511,990.26	192,869.83	206,306.78
other costs	-	-	688,693,500.00	855,178,700.00
Total Cost of Building (IDR)	8,916,411,087	7,230,558,998	3,808,479,897	4,142,198,981
Total Cost of Building (AUD)	891,641.11	723,055.90	380,847.99	414,219.90
Size of Land (M2)	87,500.00		4,345.00	
Size of Building (M2)	101,485.24		7,350.00	
Size of amenities (M2)	38,700.00		3,200.00	
Coordinate	6°10'8"S 106°50'15"E		6°58'9"S 110°25'21"E	
Gross Floor Area (M2)	48,800.00		1,145.00	
Building Density	56%		26%	
Efficient land mix used (amenity)	44%		74%	

The function of the DGSAM building is a central office where the coordination and control of central government asset management take place. Selection of this office complex as a representative of the central government. State Finance Building II in Semarang is one of DGSAM's regional offices where the function of control of several operational offices in the Central Java and Jogjakarta take place. This building represents the local government in managing the state asset. The observation activity was conducted on 24 July 2017; the researcher has considered both properties are currently used as the complex of offices of government agencies under the Ministry of Finance including the central office of DGSAM. The size of the building of DGSAM is 101,485,24m^2 consisting of 12 levels occupied by more than 500 employees. The DGSAM building is not only occupied by DGSAM central office because other levels are occupied by the office of central data and information technology (PUSINTEK). The State Finance Building II in Semarang is occupied by at least 130 employees residing in 7 stories. The Central Java Regional Tax Office uses the 1st, 5th, and 6th level of the building whereas the 2nd and 3rd level are occupied by DGSAM Regional Office of Central Java and Jogjakarta. On the 4th level, it is used by an operational office of DGSAM Semarang (KPKNL Semarang). Having the space size of 4,345m^2 this building has amenities such as landscape, parking area and access

road of 3,200m^2 or 74% of site area. The DGSAM building has 44% amenities of land size. The satellite view of the DGSAM building is shown in Figure 6.1. The DGSAM Building is located in the middle of an office complex. The office complex is bordered by Budi Utomo Street on the north side, Lapangan Banteng Timur Street on the west side, Dr. Wahidin 2 Street on the east side and Dr. Wahidin Street on the south side. This complex has a green landscape along its west side and amenities, such as parking areas, prayer facilities, local access roads, and tennis court. According to the urban land use planning of the City of Jakarta, as stated in the Regional Government Regulation Number 1/2012, this area is classified as the office park and commercial zone.

Figure 6.1 Satellite View of DGSAM Building (inset) in Area of Office Complex

State Finance Building II is the office complex in a very high-density area in Semarang. According to urban land use planning year 2030, this site is classified as an office and commercial area as stated in the Regional Government Regulation Number 14/2011.

State Finance Building II is bordered by Imam Bonjol street on the south side, and it is next to local governmental offices, which are Local Revenue Office and Regional Disaster Management Board on the west and east sides. The north side of the office is vacant land owned privately. A satellite view of the building is shown in Figure 6.2.

Figure 6.2 Satellite view of State Finance Building II Semarang

6.6. Analysis of Implementation of Strategy Tool in the Test Case and the Influence of the Local Policy.

The investigation of the current asset optimisation in Indonesia found that policy in Indonesia influenced the BSC as a strategy tool. The influence of this aspect occurs in perceiving the perspective of BSC. Therefore, the prioritisation may slightly be altered due to strategy map modification. The policy and planning as written in the annual performance report, annual survey report and budget planning document also reflects the influences of local wisdom in asset optimisation. Implementation of BSC in DGSAM in particular and the Ministry of Finance of the Republic of Indonesia should refer to the Guide Book of Management of Performance-Based Balanced Scorecard 2010 (MPBBSC). This book provides a step-by-step implementation of BSC in

organisations under the Ministry of Finance. According to this book, DGSAM has its own strategy map and applies the four perspectives of BSC, which are stakeholder, customer, internal business process as well as learning and growth perspective. The strategy map of DGSAM in relation to the asset optimisation is shown in Figure 6.3.

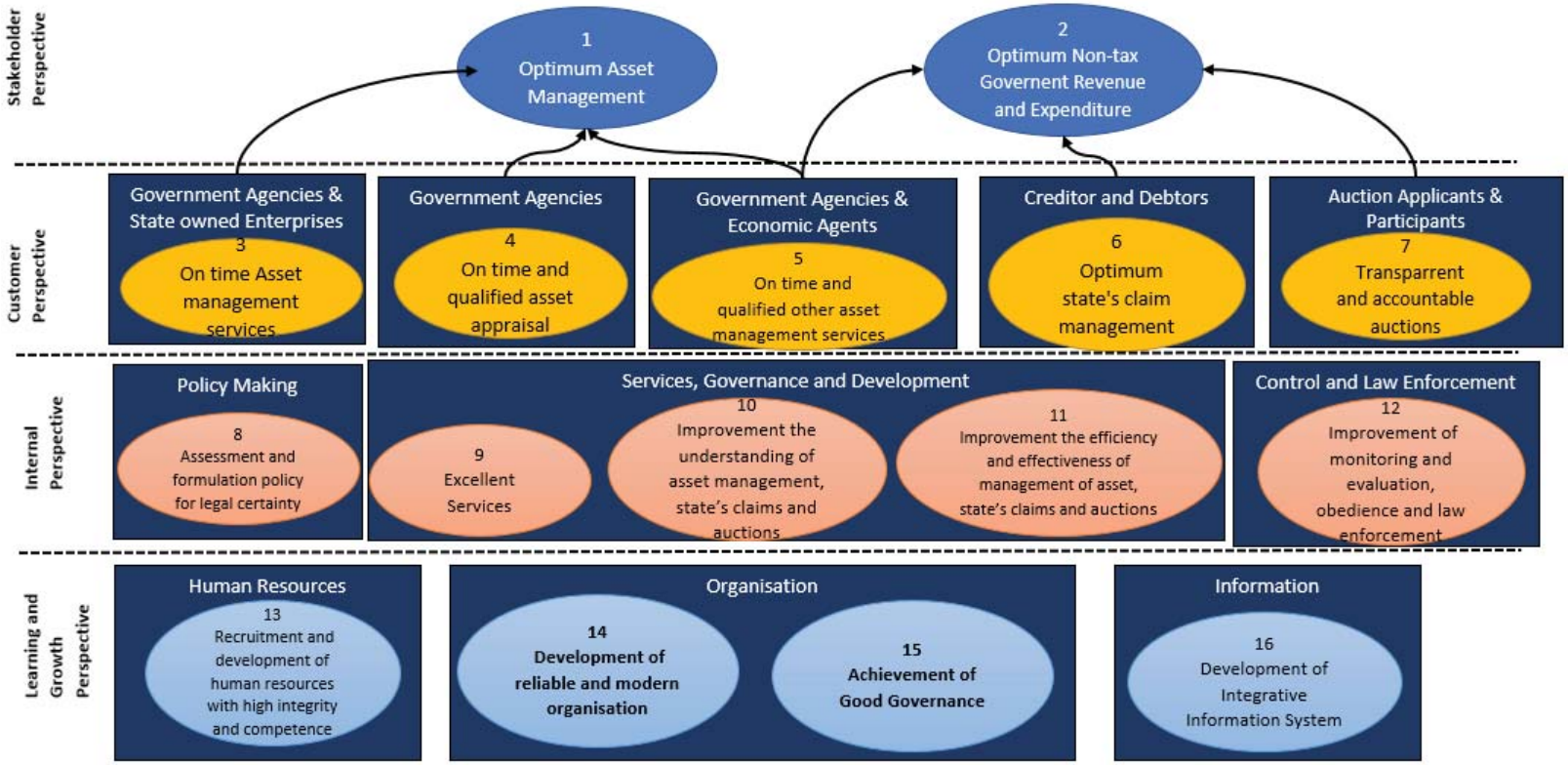


Figure 6.3 Existing Strategy Map of DGSAM for whole organisation BSC

(Source: Guide Book of Management Performance-Based Balanced Scorecard in the Ministry of Finance Republic of Indonesia 2010)

Figure 6.3 shows the current strategy map of the whole organisation of DGSAM as it reflects not only asset management but also other organisational duties such as asset valuation, auction, and management of state's receivable. There are two main organisation's clients, in which DGSAM delivers their services as shown in the customer and stakeholder perspective. The details of the strategic objectives (SOs) are as follows:

- Stakeholder perspective has two SOs:
  1. Optimum asset management
  2. Optimum governmental non-tax revenues
- Customer perspective has five SOs:
  3. On-time Asset management services
  4. On-time and qualified asset appraisal
  5. On-time and qualified other asset management services.
  6. Optimum state's claim management
  7. Transparent and accountable auctions
- The internal business process has five SOs:
  8. Assessment and formulation policy for legal certainty
  9. Excellent services
  10. Improvement of the understanding of the society and economy corresponds to the asset management, state's claims and auctions
  11. Improvement the efficiency and effectiveness of management of asset, state's receivable and auction
  12. Improvement of monitoring and evaluation, obedience and law enforcement.
- Learning and Growth perspective has four SOs:
  13. Recruitment and development of human resources with high integrity and competence.
  14. Development of reliable and modern organisation
  15. Achievement of good governance
  16. Development of Integrative Information system

There are stakeholders and customers as users of DGSAM services where the optimum asset management has been potentially delivered to them. According to the guide book, MPBBSC, the stakeholders receive the service indirectly rather than customers that received the services directly. In addition, stakeholder's interest is different from the customer's, therefore the value creation provided should be mutually beneficial. Whereas, the customer's interest is the value creation based on the excellent service (Frow & Payne, 2011). This distinction has an advantage in how to treat stakeholders and customers differently. However, According to (Fassin, 2010), and based on Freeman's model of dynamic stakeholder theory, the classification of the customer is part of the value responsibility chain of a stakeholder, as shown in Figure 6.4:

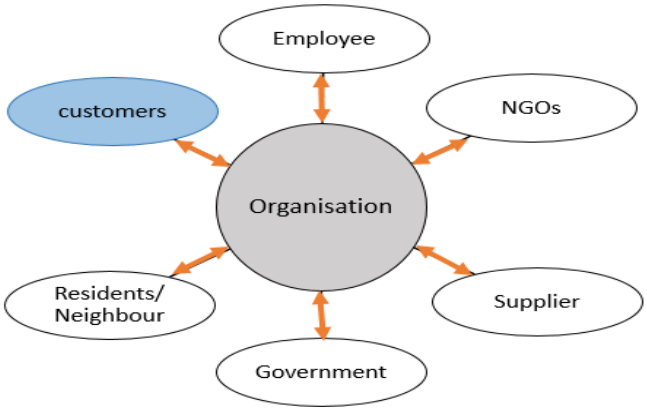


Figure 6.4 Stakeholders map
(adopted from Fassin (2010)

Figure 6.4 shows the dynamics of stakeholders, whereby the number of stakeholders, correlates to the core business and how to provide a value responsibility chain to them. According to this theory it describes stakeholder parties consisting of government, residents/neighbours of organisation or buildings where they are located, customers of the buildings, employees who are working in the buildings, non-governmental organisations (NGOs) as civil societies organisation for social, environment or political purposes rather than commercial, such as environmental organisation (non-government) and unions as well as suppliers as organisations or companies that supply the organisation's needs. Figure 6.4 indicates that the customer is part of the

stakeholders. Therefore, this research applies customers as part of the stakeholder perspective. It is because the focus of stakeholder and customers are similar in term of how the organisation fulfils its interests properly. Additionally, the guide book of MPBBSC also states that the perspective of BSC is flexible to be modified if necessary. Therefore, this research prefers to modify the customer and stakeholder perspective into the stakeholder perspective.

The financial perspective is another important perspective, in which one of three high-level perspectives for governmental organisations is measured. That is a cost incurred or efficiency that can measure the needs to be explicitly stated. However, as shown in Figure 6.5, the financial perspective was not considered as one of four perspectives in the current implementation of BSC. It was not included as a strategic objective (SO) in the learning and growth perspective. Consequently, if the financial perspective does not exist, the financial indicators as success factors, performance measurements as well as the level of achievement or target and initiative or action to achieve the target definitely will not be found to support organisational goals (Viljoen, 2003). In a governmental organisation, in which the financial aspect is more relevant for efficiency in providing public services or making the best use of resources including asset and human resources, the unavailability of financial perspective tends to raise difficulties in the achievement of value creation to the internal and external stakeholders (Sharma & Gadenne, 2011). Moreover, the balance between financial and non-financial aspects enables viewing of the performance of the organisation simultaneously (Kaplan. & Norton., 2001). However, this research focuses only on the optimisation of assets, which is one of the duties of Echelon 2 level of DGSAM. Consequently, the modification of the strategy map is proposed not in the whole organisation of DGSAM, but only at the Echelon 2 level (see Figure 2.5). With respect to the financial aspect, the Optimum Budget (OB) is not considered as the fourth key element. In the Indonesian context, OB is part of the SER based on the strategic objectives. Therefore, the key elements and prioritisation are slightly different, as proposed in the strategy.

Regarding the prioritisation from a BSC perspective, the document observation of the test case shows the priority of stakeholders as displayed in the strategy map. It is followed by the placement of Strategy Objective 1 in the stakeholder perspective. In addition, the guide book MPBBSC has also mentioned the priority of stakeholder perspective as the highest percentage of weighted priority. Stakeholder and learning and growth perspectives have 30% and 30% respectively while the customer and learning and growth perspectives have 25% and 15% respectively. The reason is that the best quantitative outcome is expected from these perspectives and also these perspectives reflect the long-term organisational performance determinants. With regard to the key elements, this aspect influences the prioritisation where the SER and CHR have the same level of significance.

Another implementation of BSC is the KPI measurement in the annual performance report of 2016. This report explains that the achievement of asset optimisation has been reported in the annual performance report of 2016. It also captures the optimisation of whole assets that have been managed by DGSAM in the three years starting from 2014 in the form of a program of utilisation. According to this report, asset utilisation covered all schemes of asset optimisation programs (i.e. asset renting, utilisation partnership, BTO/BOT). The ratio between target and the realisation has been recorded at 63% of asset optimisation of total asset from the target of 45%. Table 6.4 shows the stable increasing value of asset optimisation in 2014, 2015 and 2016 at AU$16.32 billion, AU$ 714.98 billion, and AU$1,158.71 billion respectively. The percentage of optimised assets in 2016 is shown in Figure 6.6. There is a suggestion provided in the annual performance report of 2016, which is to strengthen the asset management strategy to improve the implementation of asset optimisation. One of the recommendations is to undertake revaluation of fixed assets including land, building, and infrastructures. These assets can potentially improve the leverage of government, identify public assets to minimise idle or underutilised assets as well as definitely update the database of assets.

According to the record of assets in the asset valuation form, DGSAM Building and State Finance Building II have been surveyed and valued in 2007. The revaluation program has been started when the observation of this research was conducted. According to DGSAM's planning, the asset revaluation will be completed by the end of 2018. In the last ten years ranging from 2007 to 2017, there are no updating activities of assets to verify the condition or value of assets. Unless running a revaluation program, some issues might arise, including how to estimate values of assets for annual governmental reporting purposes, the current value for collateral purposes, sinking value for asset retirement as well as market rent for internal transfer pricing. Therefore in some cases, asset valuation is necessary (Lu, 2011) because the basic data is not sufficient for more strategic decision making in asset optimisation.

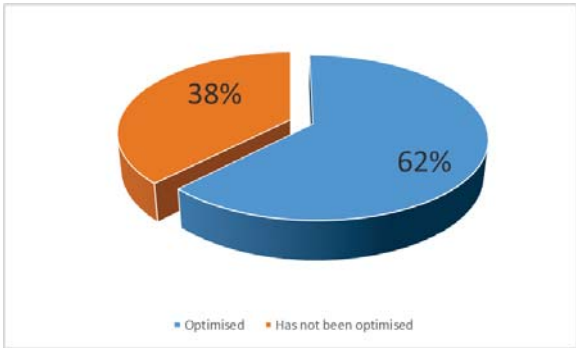


Figure 6.5 Percentage of Optimised assets to Total Asset

The process of asset optimisation in the wider scope of the building currently complies with the Government Regulation Number 27, the year 2014, whereby the implementation of asset optimisation such as asset transfer, rental, BOT or BTO and partnership of utilisation are regulated. Nonetheless, this regulation has not sufficiently covered all features and details of optimisation to be the main umbrella of regulation.

6.7. Analysis of Key elements on the Test Case

It is important to test the strategy using the proposed KPI, to analyse the performance achievement of the buildings. This performance guides how the strategy can be effective to conceive the contribution of each element in strategic objectives and the

goal of optimisation strategy. The role of key elements also reflects how the strategy helps decision-makers to be more focused on the goal by aligning all relevant and important aspects of the organisation. The calculation of KPI in the tested buildings using the formulas in Table 3.5, is shown as follows:

Table 6.3 The Test of Calculation of KPI of Observed Buildings

Key Element	Indicator	KPIs	DGSAM Building Jakarta	State Finance Building II Semarang
CHR	Skilled asset manager	Improvement understanding of asset management	1 training	Centralised*
		The number of asset manager training or professional certification	33 types professional training in 2017	Centralised*
		The employee satisfaction concerning organisations facilities, hardware, and software.	84 out of 100	Centralised*
SER	Stakeholder requirements	Number of complaints	0	0
		Customer satisfaction index	Average: 85 out of 90	Average: 87 out of 90
	Internal Built Environment	Compliance indicator	100 %	75% (no Building Permit)
		Pollution prevention indicator	Waste processing unit is available	Waste processing unit is available
		Eco-efficiency indicator	Non-CFC Air condition Mass transport encouragement	Non-CFC Air condition, Plantation plan
AAA	Asset Data	The availability of basic data of land and building	Available	Available,
		Percentage of public land and building that have value	100%	100%
		Legal ownership and boundaries	100% certified	100% certified
	Asset maintenance and monitoring system	Total maintenance expenditure	29,312/m2	277,910.31/ m2
		Physical condition index (PCI)	N/A	N/A
		Functional performance index (FPI)	N/A	N/A
	Asset layout	Building density	56%	26%
		Efficient land use mixed	44% is for amenities	74% is for amenities
OB	Budgeted fund	Sum of deviation of planned budget	Average 90.5 %	Average 99.65%
		Percentage of operation and maintenance cost	100%	81%

Centralised*: data is available only at central office

Source: Annual Performance Report of the Ministry of Finance of Republic of Indonesia 2017, Annual report of Customer Satisfaction Survey 2017, and Documentary review 2017

The DGSAM Building and State Finance Building II have been tested using the four key elements of optimisation: CHR, SER, AAA, and OB. Table 6.2 shows the calculation of KPI based on the proposed strategy of KPI formula. After calculation of KPIs, the analytical process of observed buildings then embarks on the comparison of the calculation result and the standard of the ideal target. The gap between the actual and ideal standard or expected target was known as the performance gap. This gap provides essential information for decision-makers to improve current indicated key elements or to make a priority in the resource allocation.

6.7.1. Analysis Test Case on the CHR

The most important key element as indicated in the strategy is CHR. The KPI of CHR consists of the improvement of understanding of asset management resulted from the asset manager, number of certified professional training and employee satisfaction level pertaining to the organisational facilities, hardware, and software. The availability of data of these three indicators has been centralised, which means the data is available only at the central office. This condition can affect the reliability of KPIs to address the optimisation in each building. Consequently, in this case, the analysis of the CHR only reflects very specifically to the case, instead of the DGSAM or governmental building in general.

The improvement of understanding of asset management is based on the human resources department that currently has only one training. This training is highly important to increase the skill, awareness, and understanding of how to manage assets and to foster a competent asset manager. The ideal number of this training is sufficient and proportional to the number of asset managers. Having only one training in one year for 88 operational offices (KPKNL) means this training is far below the standard. According to Dahling et al. (2016), the frequency of training related to the management has a positive relationship with the goal attainments, it also implies managerial skill improvement. Adequate training can also promote accurate forethought and planning (Jacobs, 2003).

Other performance indicators of a skilled asset manager in the CHR are the number of professional asset management training and employee's satisfaction in relation to the facilities, hardware, and software. The investigation of professional training has found 33 types of professional and technical asset management to develop capability and capacity in operational and technical asset management. These score of training with the participants, at around 30 persons/training can produce at least 990 professionals yearly. In this case, the identification of skilled people that the organisation already has and how many departments with existing predetermined skills should be balanced (Kochanowski, 2011). Therefore, the ideal number of skilled or professional employees should be proportionally met by the organisation. This circumstance helps decision-makers to identify the type of training, frequency, and the number of employees for supporting the goal of asset management.

In addition, the employee satisfaction level with regards to the facilities, software, and hardware has indicated the contribution of their productivity to the goal attainment. According to (Malchow, 2010; Abhay Shah, 2014; Topolosky, 2013), there is a positive correlation between the level of employee satisfaction and organisational productivity. In this case index of satisfaction is 84 out of 100. That means that the coefficient of employee satisfaction still needs to be improved 26 % of the current achievement in order to fully support in achieving the asset optimisation goal. This incremental coefficient guides the decision on how much the resources should be allocated to improving employee satisfaction.

6.7.2. GNAnalysis of Test Case of the SER

There are two indicators of key element SER, stakeholder requirements and natural environment fulfilment. The stakeholder requirement consists of the number of complaints and customer satisfaction index. There is no complaint about either building meaning that the stakeholders do not have any concerns in relation to the building service and facilities, whilst the customer satisfaction index shows 84 out of 90 or 93 % for DGSAM building and 87 out of 90 or 96 % for State Finance building II Semarang. The achievement of this index can maintain the loyalty of existing

customers, attract new customers, and move towards being more cost-effective and at the same time as a valuable asset for competitive advantages (Micu, 2012).

Natural environment fulfilment indicators comprise compliance indicators, pollution prevention indicators, and eco-friendly indicators. The carbon emission assessment programs include green buildings index (GBI) is one of the contributors to increasing the value of buildings (Roh et al., 2018; Roh et al., 2016). This index has positive contributions to fulfil the environmental regulations and stakeholder requirements. Green building index covers three dimensions of building such as social, environmental and economic sustainability (Chong et al., 2017), this means that as a compliance indicator this index represents permissible factors including environmental friendly. Moreover, GBI is an emerging international rating tool applicable to countries with various climate with some adaptations refers to the local sustainable issues and environmental conditions (Kien Hwa, 2012). This local term also indicates the consent to current and surrounding rules or regulations. In the test case context rule and regulation refers to the local city planning as stated in the Municipal Government regulation of the Special Capital Region of Jakarta Number 01/2012 and also Municipal Government of Semarang City Number 14/2011, the two buildings are located in the office zone and commercial and services zone, which means compliant with the regulation on local urban land use planning. This compliance is not only part of the contribution in proper uses of land, in mitigating the environmental issues but also to elevate the market value of the property and to be more efficient in the cost permit system (Baffour Awuah & Hammond, 2014). This is also stated in the valuation report of DGSAM buildings in 2007, in that the building is physically at optimum to be functioning as governmental offices that provide public services. Other aspects such as pollutant prevention indicators and eco-friendly indicators can provide the awareness level regarding the natural environment effects. In this case, the availability of waste management, no Chlorofluorocarbon (CFC) air conditioning, and plantation program contributed to the positive value of the buildings. In addition, the buildings are owned and certified by the land agency as government property, so that is legally accepted. Moreover, economically the locations of the two

buildings can deliver public services and create economic value to the public to support local economic activities. Thus, the concept of HBU undertaken by the observed buildings has proven the implementation of a key element of stakeholder and natural environment fulfillment (SER).

6.7.3. Analysis of Test Case of the OB

The key element of optimum budget (OB) of the observed buildings is reflected in the KPI of deviation of planned budget, whereby the realisation of budget spending for maintenance and operation of DGSAM Building and State Finance Building II has been 90.5% and 99.65% of planned budget respectively. The deviation of the realised budget to planned budget is minimum as an indication of promoting the cost-saving. In the view of the budget planning strategy, the DGSAM building is slightly more over budget than is State Finance Building II. The deviation of the budget may indicate the quality of scheduled maintenance and accuracy in predicting the cost cycle of operational buildings. The cost budgeting is important to accommodate the trend, is easy to monitor and proves the fiscal accountability (McMillan, 2010). As the function of budgeting element is obviously vital, the precision of the budget and realisation is also essential. The most ideal condition has been achieved in the State Finance Building II where the deviation is almost 100% of the budget.

Other aspects of the optimum budget are the percentage of the operation and maintenance. This parameter reflects the proportion of operation and maintenance of the total costs. The case shows the percentage as 100% for the DGSAM building and 81% for the State Financial Building II Semarang. This percentage can guide the decision-maker with regards to the capital and revenue expenditure decisions, occupancy level of the buildings (Rodrigues & Freire, 2017) or economic performance measurement analysis (Oduyemi et al., 2017).

6.7.4. Analysis of Test Case of AAA

The key element of Accountable Administration of Asset (AAA) is illustrated, firstly, in the KPI of the availability of asset data, the value of the asset and legal ownership of boundaries. The results from observations have shown that all data are available

and the two buildings have their value and document of ownership (certified) issued by the land agency. However, this data has not been updated, resulting in a recommendation from the Board of Finance Audit (BPK) to the annual performance report in 2016 that the value of assets needs to be updated. The updated value is fundamental for a strategy of asset utilisation. It highlights the weakness of the implementation of asset optimisation. Secondly, an indicator of KPI related data was depicted by the system of monitoring and maintenance of assets. This KPI is represented by the total maintenance cost, physical condition index (PCI) and the functional performance index (FPI). The formula of total maintenance cost is derived from the total amount of maintenance cost divided by the size of land that absorbs the cost. In the test case of the buildings, the researcher found difficulties in separating maintenance cost out of total cost and identifying the costs of every single building. It is due to the costs of buildings being available as a bulk amount, not in great detail. PCI cannot be calculated either because the current condition of the buildings has not been officially inspected. This is also the case for FPI whereby no building inspection is undertaken to verify the performance. Inability to define KPIs of monitoring and maintenance system of asset indicates the barrier regarding the asset database.

The incompleteness of KPI calculation in the test case potentially emphasised the weakness of asset optimisation that corresponds to the key elements of observed buildings. This incomplete calculation was caused by unavailable data and this indicated this KPI has not been properly considered as an important element. Therefore, it can affect the optimisation goal achievement. According to Table 6.3, incomplete KPI occurred in the key element CHR and AAA. In the CHR, it showed a lack of relevant training or education in asset management as a requirement for the asset manager. It potentially caused the asset manager to be equipped with inadequate skills resulting in incompetent asset management. The CHR cannot be fully measured to provide the employee satisfaction index as an indicator of the productivity of the employee. These two conditions can potentially create an issue in evaluating the competency level of the asset manager.

Moreover, the incompleteness of KPI in AAA is associated with the updated database and condition of assets including the updated value of an asset. As the key important factor in the decision-making process, the failure of asset data can potentially affect the decision-making process.

The key elements from each data collection methodology have been employed. Key elements of SER, CHR, AAA, and OB have been found in the literature review and then followed by a survey. Upon completion of the survey, the validation of key elements was undertaken through in-depth interview resulting in confirmation of the number of key elements in an in-depth interview, similar to the results of the survey. Nevertheless, in the test case conducted for the two buildings (DGSAM Building and State Finance Building II), some key elements of optimisation have not been found. The existence of key elements has been observed based on the current KPIs of buildings, which has confirmed that only the measurement of SER and OB are matched. The KPIs of CHR and AAA were not all found, as shown in Table 5.6. The missing KPIs of CHR and AAA indicate these two key elements were absent in evaluation and control, which might become barriers in developing the robust strategy of asset optimisation.

6.8. Analysis of The Best Alternative Based on The Test case

The case study that supports the validation of alternatives for asset optimisation strategy was undertaken by a documentary review of the annual performance report 2017. The annual performance report is a yearly achievement of goal reflected in the achievement of the target measured in key performance indicator (KPI). The best alternative in this test case was indicated by the most popular policy of asset optimisation in the DGSAM. The popularity of the option can be found by the materiality or recorded amount of the selected policy. Based on the annual report the asset optimisation of whole assets that have been managed by DGSAM within the last three years that started in 2014, is in the form of an asset optimisation program. According to this report, asset optimisation covers:

1. Utilisation such as rental, partnership/cooperation of utilisation ('KSP), BTO or BOT, lease and cooperation in providing infrastructure.
2. Determination of Asset Use meaning the governmental official decision of asset to be utilised by government institutions or agencies.
3. Grant means an asset is dedicated to the specific use for community or religion, humanity or for local government.
4. Asset exchange means a transfer of assets between the government and the private sector's assets.

The ratio between target and the real optimisation has been achieved at 70% whereas it was targeted for 44%. The following table concluded the optimisation progress within the last three years (2014-2016) as follows:

Table 6.4 Implementation of Asset Optimisation 2014, 2015 and 2016

No.	Description	2014	2015	2016
1	Asset utilisation (IDR)	163.2 T	177.62 T	443.74 T
2	AUD	16.32 B	17.76 B	44.37 B
3	% of Asset utilisation to total asset	31.48	42.26	62.4
4	Accumulation of asset utilisation (IDR)	163.20 T	714.98 T	1.158.71 T
5	Accumulation of asset utilisation (AUD)	16.32 B	71.5 B	115.87 B
6	Total Asset (IDR)	1,706.93 T	1,691.69 T	1,857.03 T
7	Total Asset (AUD)	170.7 B	169.17 B	185.7 B

Source: Annual Performance Report 2016, Ministry of Finance of Republic of Indonesia

Table 6.4 shows the stable increasing value of asset optimisation in 2014, 2015 and 2016 at AU$16.32 billion, AU$714.98 billion, and AU$1,158.71 billion respectively. There is a suggestion provided in the annual performance report of 2016 to strengthen asset management strategy to improve the implementation of asset optimisation. In 2017, total assets that have been optimised is 81.63% of the total asset (IDR 1.568,68 trillion or AUD157 billion). This percentage is increased by 19.63% from 2016 (62%).

The annual report as one of the documents reviewed in the test case showed the concern of the Indonesian Government towards optimisation of public assets by

monitoring the progress of the asset optimisation level, something that is increasing every year. The growth of the asset optimisation program from the year 2014 to 2017 is shown in Figure 6.6:

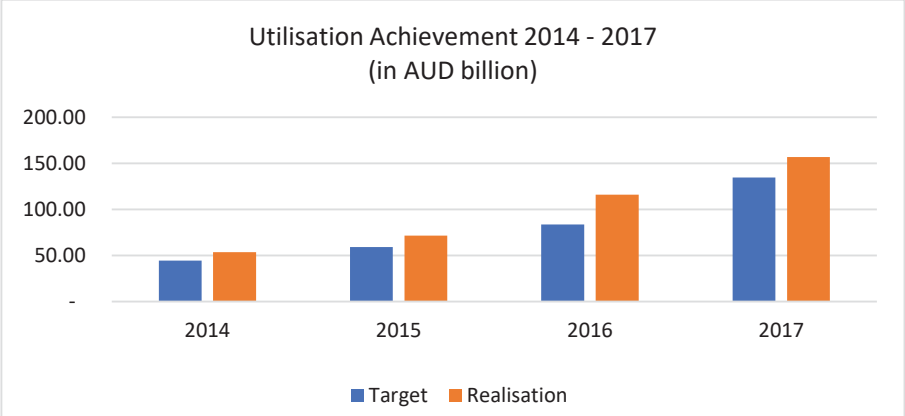


Figure 6.6 The Growth of optimisation asset program

Source: Annual Performance Report 2017 of the Ministry of Finance Republic of Indonesia (the number is in AUD billion)

Figure 6.6 highlights the results of the analysis of the best alternative of asset optimisation based on the view of respondents and documentary review in the test case. The respondents of the in-depth interview proposed asset utilisation as the best alternative either in rental or partnership scheme as well as asset refurbishment. Asset refurbishment is part of the implementation of performance or value improvement (alternative #3). According to the documentary review, utilisation of assets in rental or partnership's scheme is less favoured than the program of determination of asset use (PSP). This program was undertaken at least 9 times as the selected program. It is assigning land and/or building to be utilised by appointed units, governmental organisations or agencies. It can also reduce the number of existing idle assets resulting in the optimum use of assets to supporting the function of governmental organisations or agencies. In 2017, the total assets assigned under PSP programs reached more than AUD15.7 billion or 38% of total utilised assets of AUD 41 billion. However, the PSP program is not the most favourable option according to the results of the in-depth interview due to its minimum impacts in encouraging the national economy's activities, minimising costs as well as generating revenue for the

government. The results of validation from Survey in Stage 1, in-depth interview and documentary review, have positioned the asset utilisation program as the best choice as it is chosen by the majority of top managers involved in the research. Nonetheless, the survey revealed the highest priority in asset optimisation is maintaining assets efficiently, whereby this option is difficult to be proved in the real test case. Additionally, the test case found the difficulty in identifying the cost of maintenance of building separately, therefore the level of efficiency of asset maintenance is not available. This option is also less favoured to be positioned as one of the three best options. In contrast, the utilisation program can potentially minimise cost and generate income. It also has controllable risk as long as the process of utilisation is conducted in a prudent manner.

6.9. Key Finding of Test Case and Final Strategy after Test Case

Analysis of the test case scrutinised the key elements and their priority, alternative and the most affordable options and also the implementation of BSC as a strategy tool. Key findings of the test case can be derived from each segment of analysis as follows:

- The local policy within the strategy tool may influence the perspectives of BSC, therefore the alignment between key elements and the strategy tool or modification of BSC is necessary. This is to balance between financial and non-financial perspectives and how to set the appropriate prioritisation of the key elements.
- The test case analysis confirms the important role of each element in achieving the goal of optimisation. Therefore, supporting data of performance indicators of all key elements are required to be provided to support decision-makers to understand the current position of the organisation in achieving the goal.
- Test case analysis also confirms CHR as the most important element in developing asset optimisation strategy as its KPI achievement impacts on the current condition of asset optimisation and other key elements including AAA in establishing a reliable asset database.

- The best alternative of assets is asset utilisation, as the implication of this option utilisation program can potentially minimise cost and generate income. It also has controllable risk, as long as the process of utilisation is conducted in a prudent manner.
- The regulation as the umbrella of asset optimisation in the operational level is required to be flexible and comprehensive to cover the features and variations of optimisation programs.

These key findings then contribute to a finalisation process of the asset optimisation strategy. Before commencing into the final strategy, the existing strategy map as the preliminary condition of the research needs to be presented. So, how the final strategy is formulated to answer the existing gap can be described in the following paragraphs.

- **The element of strategy** based on the implementation of BSC the strategy to achieve the optimum asset has not been defined clearly. So, the optimisation programs are not aligned with the strategic objectives and performance measurement. Therefore, the elements of strategy have not been found as an important element to generate the optimisation strategy. This is the first element to be solved prior to the further strategy steps.
- **Strategy tool alignment** guides to set the strategy based on the priority of the organisation. According to the existing BSC the priority of strategy has not reflected in the perspective of BSC and its strategic objectives. Where the top priority is a stakeholder and followed by the customer perspective. These two perspectives are overlapped. Moreover, there is no strategy objective based on the stakeholder perspective, as a consequence, the stakeholder perspective has no measurements and KPI as well. As it is proved in the test case where some of the KPIs are not found (asset data and asset maintenance and monitoring system).
- **Key elements** as the criteria of asset based on the existing strategy are not clearly defined. As a result, the prioritisation of the program and its alternative are not constructed. The missing financial perspectives also

have made the incomplete strategy in measuring the role of financial aspects such as budget and cost are not proportionally measured. The other issues are the prioritising the elements and the alternatives where the strategic objective of each perspective is put in an array based on the whole organisation vision and the availability of resources.

- **Strategy awareness** is the important aspects to implement the strategy smoothly, with no conflicts among the elements, and practically applicable. According to the existing strategy and also as it reflected in asset management issues such as a high number of underutilised assets, existing idle assets, lack of database, lack of human resources and less integrative regulation of assets that cause a poor-designed policy to the stakeholder and less respect to the environment requires. These problems have not been investigated sufficiently. Therefore the integrative approaches take these issues in place as the strategy awareness that should be addressed.

These existing problems and preliminary findings, and also the local policy contribute to developments of the final strategy . The contextual and test case suggests modifying the current BSC implementation. In the generic level, the strategy tool should be scrutinised before the optimisation strategy is adopted. In this research, the modification of the strategy tool is optional as another strategy tool may not need to do so. The final strategy after the test case is shown in Table 6.5 below.

Table 6.5 Final Generic strategy of Asset Optimisation

Generic Asset Optimisation Strategy	Description of Research Recommendation
Elements of Strategy	There are key success factors of strategy that have to be prepared and maintained to generate the robust asset optimisation strategy
• Strategy tool alignment	Strategy tool sets the organisational structures, capabilities, and resources to achieve the organisation goal. Asset optimisation strategy focuses on and priorities the key element as the resources. Alignment process creates synergy in managing resources of the organisation in achieving the organisation goal.
• Key elements of optimisation as criteria of goal achievements: - Competitive Human Resources (CHR) - Stakeholder requirement and environmental fulfilment (SER) - Accountable Asset Administration (AAA) - Optimum budget (OB)	CHR comprises of human resources and other supporting aspects to improve skill and expertise of asset manager to achieve the main goal of asset optimisation. It includes quality and character of competitiveness such as professionalism, expertise, competency, and commitment. SER comprises external and internal stakeholders and their important requirements such as compliance of law and regulations, the standard of service, transparency and required physical performance. SER also include natural environment and built environment awareness in anticipating environmental factors such as disastrous / climatic events and at the same time implementing initiatives towards environmental-friendly policies on assets. AAA comprises basic characteristics that can enhance the value and performance of assets including layout, amenities, and physical and legal condition. This also includes how to manage or administrate these aspects and how to maintain it. OB consists of budgeted costs of maintenance, capitalised expenditure or renovations, and how assets can be maintained and operated or refurbished using the most affordable budget.

Generic Asset Optimisation Strategy	Description of Research Recommendation
• Prioritising of Key Element	The arrangement of key elements is to allocate resources of the organisation based on the level of importance of key element corresponding to the goal of optimisation. The priority order of key elements is CHR, SER, AAA, and OB.
• Alternatives to strategy options	Some options of alternatives to strategy implementation are available which are and are not limited to maintaining assets efficiently, utilisation or improvement of performance and value.
• Prioritising of alternatives	Among those alternatives considering the advantages of each alternative and its impact on the organisation and economy situation, it is necessary to prioritise alternative. The best alternatives proposed by this research is in the following order: 1. Utilisation 2. Improve asset performance and value 3. Maintain asset efficiently
• Strategy Awareness	Key elements, alternatives and prioritising them in strategy development are still not enough to build robust asset optimisation. It needs to understand the barriers and implementation aspects of strategy. Some recommendation and preventive solutions also are beneficial to build an applicative strategy
• Inherent Barriers	There are some barriers to implementation of optimisation strategy: Lack of update of the database of an asset, lack of human resources competency and unsupportive regulations.

Generic Asset Optimisation Strategy	Description of Research Recommendation
• Practical Recommendation	There are some recommendations to assure the optimisation such as: - Compliance of regulations or rule - Continuous improvement on the key elements - The innovation of optimisation enhancement (alternatives) and proposing flexible regulation. - Synergy among optimisation parties
• Preventive Solution	Some suggested solution needs to be considered as inspiring ideas such as: 1. Updating database 2. Training and educating program to improve CHR 3. Asset Valuation program 4. Building the thoughtful and prudent procedure in the optimisation program
• Strategy tool support – BSC modification	Developing strategy can utilise strategy tools. BSC is one of the tools that provide a balanced perspective of strategy and how to create focus and synergy among the elements of organisation and measure the achievement using performance indicators.
• Perspective Modification	The perspective of BSC should reflect the strategic objective to support the general strategic goal. Some suggestions that refer to the key elements of optimisation is: - Stakeholder perspective - Learning and goal perspective - Internal process perspective - Financial perspective
• Prioritising of Perspective	Amongst the perspectives, they can be prioritised based on the key elements' prioritisation, in the following order: 1. Stakeholder perspective 2. Learning and goal perspective 3. Internal process perspective 4. Financial perspective

Chapter 7 Conclusion

7.1. Introduction

The robust asset optimisation strategy of land and building in the public sector warrants the achievement of optimum asset management. The indicators of optimum asset management appear in the land and buildings: increasing the performance and value of assets, and minimising the amount of idle and underutilised assets. Economic indicators can also be found in increasing the benefits of land and building not only to obtain financial inflows but also in reducing costs of asset maintenance and operations as well as reducing the risks on asset management. However, to develop the robust asset optimisation strategy requires key elements or success factors and prioritisation of strategy and selection of the best alternatives of optimisation. It also profoundly needs to understand the inherent barriers and takes into account recommendation for more applicable optimisation strategy. This research use AHP survey and in-depth interview to develop an asset optimisation strategy. The result of the AHP survey is used to reveal the prioritisation of middle management. The validation of results of the survey (Stage 1) was undertaken by in-depth interview of top management to confirm the level of significance of the key elements and the prioritisation of alternative. A test case was also adopted in providing insight into strategy implementation. The analyses of qualitative and quantitative method in this research emerged in the triangulation process to develop the asset optimisation strategy.

This chapter describes the conclusion of this research by delineating the research objectives, featuring the contribution of the research, limitations, and suggestions for future research.

7.2. Response to Research Question and Review of Research Objectives

This research has answered two research questions and has achieved the research objectives.

Research questions:

1. What is the generic asset optimisation strategy for public land and buildings in Indonesia?
2. How can this strategy be adopted for public assets in Indonesia and what are the inherent barriers in implementing the strategy?

In order to answer these research questions, the following research objectives have been achieved:

1. To identify and examine the key elements essential for developing asset optimisation strategy in the public sector in Indonesia.
2. To identify inherent barriers of developing asset optimisation strategy in Indonesia.

The investigation of these two objectives of this research transmitted the development of a robust framework of asset optimisation of land and building in Indonesia. Identification of key elements provided the key focus of resources and the owners having a range of control with policy direction to achieve the goals of optimisation. Therefore, these elements have strong linkages to the perspective of organisations. The examination of each key element contributed to determining the priority to allocate the organisation resources to support the main goal. In order to prioritise it, this research involved four main stakeholders of asset management, which are internal and external asset managers, to perceive their views in regards to the key elements. They also gave an insight into their preferences in arranging the best alternative of optimisation strategy. Alternatives to strategy are potential programs in implementing the optimisation strategy according to the priority and focus of asset managers. In selecting the alternatives, key elements are used to prioritise the selection of optimisation strategy.

The barriers identified in this research are limit, obstacles, and factors that restrain or obstruct the progress of implementing asset optimisation. In other words, the barriers identified indicate the lack or shortage and lesser quality of key elements. To

overcome these barriers became the challenges of asset optimisation. Consequently, the identification process of barriers resulted in findings of preventive solutions to address the issues. There were also some recommendations to prepare a better strategy.

Identification of initial key elements and alternatives have been conducted through literature review. It also contributed to the applicable supportive strategy tool and endorsed the strategy development process of the Balanced Score Card. The identified key elements were transformed into the BSC perspectives as is shown in Figure 3.1. Subsequently, the empirical process was undertaking data collection and analytical process as follows:

- Quantitative surveys (presented in Chapter 4) examined the key elements of asset optimisation and their prioritisation from the view of stakeholders of governmental assets, specifically land and buildings. The stakeholders from government and private sectors expressed their views about the level of importance of each key element that has been perceived by BSC perspectives and the degree of importance of each alternative. The results of the Survey in Stage 1 (50% of total participants) were further validated through the in-depth interviews. The Survey in Stage 2 (remainder 50% of total participants were combined with the data collected in Stage 1 to get all participants results.
- Qualitative in-depth interview (presented in Chapter 5) validated the results of the survey in Stage 1 regarding the level of importance or prioritisation of key elements and alternatives in asset optimisation strategy. In addition, the outcomes from an in-depth interview include inherent barriers and preventive solutions as well as some recommendations for better implementation of asset optimisation strategy.
- The test case observed two complexes of governmental offices, which owned by central government (DGSAM building in Jakarta) and the provincial government (State Finance Building II in Semarang). The test case verified the result of the literature review, survey and in-depth interview in the implementation level. In addition, the test case also involved reviews of several annual reports and current

regulations that correspond to these two buildings, including urban planning and building codes. A triangulation analysis between three data collection approaches above is used to modify the asset optimisation strategy.

7.2.1 Response to Research Question 1

In this research the generic strategy of asset optimisation has been developed, consisting of key elements and alternatives of strategy. This strategy also has been examined based on the level of importance in contributing to the optimisation goal. The key elements based on the survey on prioritisation of AHP analysis are in the following order:

- Ranking 1 (36%) : Stakeholder Requirements and Natural Environment Fulfilment (SER)
- Ranking 2 (34%) : Competitive Human Resources (CHR)
- Ranking 3 (19%) : Accountable Asset Administration (AAA)
- Ranking 4 (11%) : Optimum Budget (OB)

And the order of the alternative strategy is:

- Ranking 1 (40%) : Maintain asset efficiently
- Ranking 2 (32%) : Improve asset performance and value
- Ranking 3 (28%) : utilise asset

After the validation process during the in-depth interview to the top managers and key decision-makers, and observation process in the test case, minor changes in order to the prioritisation of the key elements and alternative strategy is shown below. Then, this research confirmed that the perception of key persons in the organisation has been proved and supported based on the wider experience, roles, and more comprehensive insights. Therefore the key elements and alternative strategy are in the following order:

Key elements:

- 1. Competitive Human Resources (CHR)
- 2. Stakeholder Requirements and Natural Environment Fulfilment (SER)

- 3. Accountable Asset Administration (AAA)
- 4. Optimum Budget (OB)

Alternative strategy

1. Utilise asset
2. Improve asset performance and value
3. Maintain asset efficiently

Asset optimisation strategy has been developed by considering the level of importance of key elements and their derivatives. CHR is the most important element because a collective of attitudes, skills, commitment, and competencies contribute significantly in an organisation in order to develop strategy, including how the strategy should prioritise the element to achieve the goals of the organisation. The prioritisation of CHR also means that resources, focus, budget, evaluation, and programs should be taken into account to improve employee skills and capabilities and to provide opportunities for people to maximise their contributions to the organisation. A similar process needs to be conducted for other elements such as SER, AAA, and OB.

This arrangement of options was also supported by the evidence of the test case. The asset utilisation as the best option was recommended and practically achieved as the most favourable option in dealing with an optimisation program. The considerations of asset utilisation were also based on the economic impacts upon application of the utilisation, risk awareness, law, and financial aspects and how the utilisation can increase the asset performance and value at the same time. The example of the asset utilisation program includes determination of government asset uses an asset transfer from one government agency to another. The aim of this program is to ensure the new users of an asset can better manage and support better service delivery. Renting of assets is another example of asset utilisation with low risk that can reduce the number of idle assets and generate income to the government or reduce operational and maintenance costs of assets.

The improvement of performance and value of assets' option has two alternatives to be implemented for the asset, specifically buildings. Better use of assets can improve the performance of assets with small refurbishments or small upgrading of the building functions. Alternatively, refurbishment can be chosen to improve facilities and other betterment of the physical buildings. This refurbishment is categorised as capital expenditure as the number of costs is significant and at the same time can increase the economic life of buildings. Both alternatives can improve the value of assets.

Maintain assets efficiently focuses on how to maintain existing building by reforming the maintenance and operational costs. This option will be ideal for the buildings that currently achieve great performance, as an effort to keep them functioning at their best.

7.2.2 Response to Research Question 2

The answer of the second research question 2 (RQ2) is the inherent barriers of asset optimisation and adoption of recommendations to develop applicable strategy, which becomes the challenge of asset optimisation strategy because the barriers should be addressed. According to the in-depth interview, barriers potentially come from the **weakened key elements** such as:

- Lack of updated database of assets due to lack of asset administration that hinders the accountability and reliability in supporting the decision-making process.
- Lack of human resource competence means less competitiveness that is most likely due to inadequate training or skill improvements.
- Unsupportive regulations mean insufficient regulations to support the accountability of implementation of an asset optimisation program. There is a basic requirement for the government to comply with current relevant regulation as proof of accountability to the public.

These three barriers can be overcome by focusing on the roots of each barrier. If the database of assets is one of the solutions, it should be undertaken within the administration of the asset and there should be an investigation into how the database can be updated. In order to solve the lack of competency, training, and education to improve skill, competency and expertise would be the best solution. Regarding the unsupportive regulations, this can be addressed by building thoughtful procedures and mechanisms and then implemented in a prudent manner in real activities. Figure 7.1 illustrates this explanation.

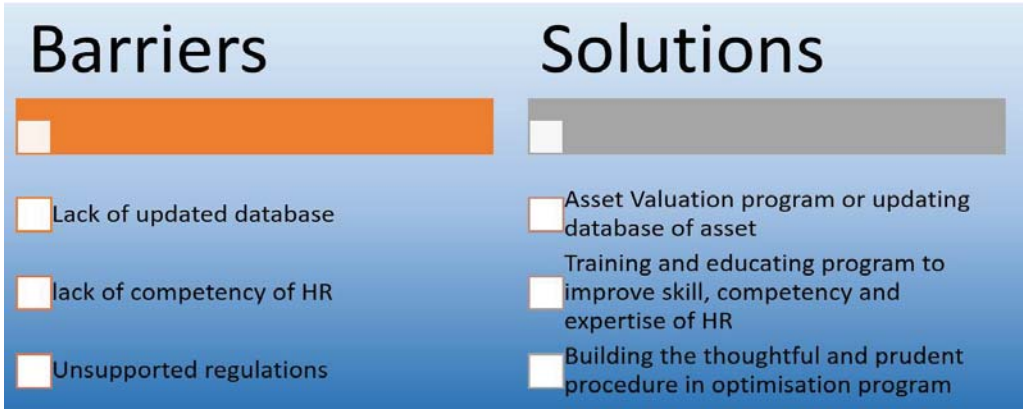


Figure 7.1 Inherent Barriers and Proposals for Solution

7.2.3 Asset Optimisation Strategy Development

This research adopts a mixed method of research (MMR) whereby the strategy of asset optimisation tends to be developed through a data collection method in the quantitative surveys and then validated in qualitative in-depth interview and test case. This MMR has potentially been challenging and validity issues have arisen (Kong et al., 2018). However, these challenges can enhance qualitative research (John W. Creswell et al., 2006). Recommendations of asset optimisation were derived from the facet role strategist, i.e. asset manager (top and regional and middle managers) and law advisor. These recommendations are supplementary results of the surveys. The surveys provided the ranking of key elements and options of optimisation and then were validated in the interview. As the supplementary result, recommendations were inspired by the ranks of key elements of results of the survey. The following recommendations have been proposed to develop asset optimisation strategy:

1. The synchronisation between the adopted strategy tool and the asset optimisation can effectively develop the application strategy. This research modified the existing BSC that corresponded to the transformed key elements. Therefore, the strategic objectives as the focus of each perspective can be concisely linked to the goal of asset optimisation.
2. The key elements as the key success factor of optimisation will enable the decision-maker to find the best solution because the barriers are the weakened key elements of asset optimisation. Therefore, focusing on the key elements means also focusing on how to find the best solution. The steps on how to undertake improvement refer to the respective placement of key elements. CHR, AAA, and OB in asset optimisation correspond to the internal organisation aspects. The evaluation of these aspects was performed by referring to the key performance indicator of each key element as shown in Table 3.7.
3. Selecting the best alternative of optimisation strategy requires consideration of the key elements. Each key element has a level of contribution to the best alternative. Therefore, prior to decision making, these three options should considerably match the current comprehensive condition of CHR, AAA, SER, and OB.

7.3. Original Contribution of This Study

The originality of the idea and significant contribution of this research study can be drawn from the following specific aspects according to (Sudha Rani et al., 2015):

1. This research has introduced a parallel data collection method between survey and interview. When 50% of respondents have participated, the researcher analyses the initial results which will be used for validation during a semi-structured interview with top management. At the same time, in order to increase the response rate of online survey, the researcher has used personal approach (face to face) to increase participation of the survey. In addition, the in-depth interview, it also included feedback from the participants to see the barriers and recommendations to develop a strategy and test case. Furthermore, the field data

collection for the test cases has been done at the same time period as the in-depth interview process. This will allow measuring how the strategy was implemented in real public buildings. Finally, the reminder online survey was combined and full analysis has been conducted to determine whether additional participants have different opinions. The study has shown that no changes or adjustment required from the initial outputs (50% of the participants) to the final outputs (100% of the participants).

2. This research integrated the key elements of asset optimisation with the strategic tools used for the core business of the Ministry of Finance of Indonesia. The slight modification of its strategic tool includes adjustment of perspectives of BSC based on the internal resources of the organisation. Adapting existing strategic tools will increase the possibility of adoption of the optimisation strategy. Furthermore, the generic key elements found in this research can be integrated with other existing strategic tools in other government organisation.
3. This research has extended the analytical hierarchy process (AHP) in examining the level of significance of key elements of asset optimisation and alternatives of strategy optimisation and in determining the weighted perspective of Balanced Scorecard (BSC) to reflect the level of contribution of key elements into the main goal of the strategy. AHP is one type of multi-objective analysis of decision making that quantifies relative priorities by a given set of alternatives on a ratio scale.
4. This research also filled the gap between academic researchers and asset managers in maximising the governmental asset that is more service-oriented, where most of the research in property management focuses on the commercial or profit-oriented property and investments.
5. The proposed strategy is more comprehensive and not just based on the built environment only but also natural environmentally friendly. Currently, the natural environment aspect is mostly part of social responsibility or solely a strategy of the natural environment.

7.4. The implication of Findings for Governance of Asset Management - Policy and Practice

This research suggested that for the governmental asset manager, without developing asset optimisation, the number of underutilised assets and idle assets will be problematic, risk on managing assets will be less mitigated as well as opportunity costs remaining high. The cost of maintenance and operation of assets will also be less controllable. The involvement of internal and external stakeholders also promotes awareness of the natural and built environment as one of the elements in the strategy development process that indicated the findings in this research will have wider implications.

7.4.1 The implication for Governmental Asset Manager

The governmental asset manager as the centre of the asset management system plays a significant role in optimising public land and building. One of the essential findings in this research is the importance of human resources in the contribution of robust asset optimisation strategy. This finding can encourage asset managers to focus on developing human resources in term of the capability of how to manage public assets efficiently, understand property market coherently, have the ability to analyse the market trend in property, enhancing the knowledge of asset optimisation options as well as how to utilise public assets. The element of asset optimisation that is critically important is human resources (CHR). As the most important element, barriers, and lack of human resources' capability, therefore, must be addressed properly. Some consequences of how to deal with human resources as the most important element are:

- An organisation should be able to provide human resources (HR) with adequate skills needed to meet the goals. This means that in optimising assets, the organisation has to improve the HR's skills and expertise in asset management (Claudiu-Catalin, 2015).
- Involving HR in determining strategy and decision-making process for the organisation (W. K. Huang & Wang, 2015).
- Selection means matching between jobs and the human resource capacity and capability, performance management including rewards, and

employee relation development to achieve competitiveness of human resources (2009).

- Strategic integration of human resources management (HRM) to incorporate the HR issues into the strategic plan to ensure aspects of HR are considered in the decision-making process (Sudha Rani et al., 2015).

Implementation of these HR recommendations influences the variety of stakeholders (internal and external), which means SER should meet their interests (D. Jackson, 2014). In regards to the asset optimisation strategy, these recommendations help an organisation to develop a more precise strategy to achieve the asset optimisation goal, which is optimum asset management. The successful HR enhancement also contributes to promoting other key elements. The accountable asset administration (AAA) is operated and controlled by highly competent people, therefore, data and condition of the asset are kept updated and relevant to support decision making. Optimum Budget (OB) is supported by the competent budget planner to control and allocate the budget optimally.

The governmental asset manager has an obligation in designing regulation and establishing flexible, simple and comprehensive regulations to accommodate the practical changes in the asset management field including the scheme of asset utilisation to mitigate the legal risks on assets as well as transaction or agreement on the asset. The regulation, therefore, needs to be innovative and continuously based on practical asset management through law and regulation assessments. The governmental asset manager is required to improve other elements of asset optimisation such as administration enhancement to build an updated database to support decision-makers.

7.4.2 The implication for Local Government

The awareness of local regulations corresponding to the surrounding area of an asset becomes one element in asset optimisation, such as urban planning, building codes and other local permits of new construction. The local government is required to

supervise these aspects in order to ensure that the implementation of asset strategy is compliant with relevant regulations.

Furthermore, the optimisation strategy is also applicable in local government assets, therefore, as an asset manager, local government needs to be aware to manage their asset compliant with the optimisation strategy.

Local government also has a role as an asset operator, in which one of the recommendations is building synergy amongst the involved parties. In this respect, the readiness to be part of the optimisation and willingness to support the optimisation program is essentially important.

7.4.3 The implication for Private and Social Community.

Natural environment aspects and external stakeholders become an element in strategy consideration. The private sector and community in the surrounding area of the optimised building need to oversee and provide their contribution for better strategy and increase their benefits regarding the quality of services of the public buildings.

7.5.Recommendation for Further Study

The range of public assets that currently have been managed by a governmental asset manager has similar requirements to be optimised, such as for infrastructure (roads, bridges, and dams), machinery and equipment. These assets have opportunity benefit if they could be managed optimally, an area which is not covered by this research.

This research emphasised the most important key element as being human resources and the best alternative as being the utilisation. These two highlights need to be extensively studied. Areas which are not specifically addressed are measurements such as qualification of the asset manager and specific expertise that needs to be fulfilled, and financial aspects or indicators to prove the best alternative is the most affordable choice.

The strategy of this research is proposed for Indonesia as one of the emerging countries; it may be considered applicable to other similar countries in social-culture and asset

condition. The proposed strategy is flexible and general, so could be adopted by other countries. Therefore, further study also needs to examine the advanced or developed countries, to build a specific strategy of optimisation that meets the requirements of these countries.

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Appendix 1 Survey Question.

SURVEY QUESTIONS

(DGSAM, SAMA/LMAN and Private Participants)

Respondent Identity

Organisation : DGSAM/LMAN/PEMKOT/PRIVATE

Position : Echelon I/II/III/IV/Staff

Introduction

Implementation of asset optimisation strategy on land and building contributes to optimising asset's life and productivity to supporting organisation in achieving goals. However, development of this strategy requires consideration deliberatively key elements of asset optimisation of land and building. Additionally, some inherent barriers also have to be scrutinised closely to achieve the benefits of asset optimisation strategy. The following statements are the key elements and barriers of developing asset optimisation strategy based on the benefits of asset optimisation as the goal of the strategy.

Benefits of asset optimisation as goal of asset optimisation strategy

The benefits of implementation of asset optimisation strategy are optimum benefit in increasing asset value and improving asset performance, optimum asset risk management, efficient repair and maintenance of asset (delay or reduce capital expenditure) and improve the quality of public service.

Criteria of Optimum Asset Management

The main goal of asset optimisation strategy is to achieve optimum asset management. In dealing with this goal, based on balancing the four perspectives in Balanced Scorecard (BSC), there are four strategy objectives (SO) as criteria to be considered in developing asset optimisation strategy which is:

1. Stakeholder satisfaction and natural environment fulfilment
2. Optimum budget
3. The accountable administration and control of Assets
4. Competitive human resources and reliable human resources

Alternatives to asset optimisation strategy

After considering the strategical objectives (SO) of optimum asset management there are alternatives of strategy to be implemented respect to the main goal of optimum asset management, they are

a. Improve asset value and performance
b. Utilise asset
c. Maintain asset efficiently (include reducing costs and risks)

Instruction:

1. The scale of 1 to 9 indicates the level of importance and priority (degree of preference) of each key element or alternative.
2. Degree of preference between each key element has been scaled based on the following descriptions:

Scale	Degree of Preference

1	Equal importance of one key element over another key element
3	Moderate importance
5	Strong importance
7	Very strong importance
9	Extremely importance
2,4,6	Values for inverse comparison

3. Results of the comparison for each key element pair are described in term of an integer value from 1 to 9, where the higher number means the chosen key element is considered more important in greater degree than other key element being compared with.

Example:

Questions:

In order to achieve the goal of asset optimisation strategy which **is increasing land and building value**, what is the most important key element corresponds to your perception:

Key Elements	**1= equal, 3= moderate, 5= strong, 7=very strong, 9 extremely strong**																**Key Elements**
Asset Data	9	8	7	6	5	4	3✓	2	1	2	3	4	5	6	7	8	9	Budgeted fund

If you think the number 3 means that developing asset data is more important three times than budgeted fund (moderate) in order to achieve the goal of increasing value of land and building.

QUESTION Level 01:

In order to achieve the goal of asset management for land and building, during the strategy development process, which one of the following objective is more important to be achieved than another:

No.	Objective	1= equal, 3= moderate, 5= strong, 7=very strong, 9 extremely strong																	objective
1.	Optimum in budget utilisation of operation and maintenance land and buildings	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Stakeholders satisfaction (including customer, employee and government) and natural environment fulfilment
2.	The Accountable and reliable in administration and control of land and buildings	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Stakeholders satisfaction (including customer, employee and government) and natural environment fulfilment
3.	The Accountable and reliable in administration and control of land and buildings	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Optimum in budget utilisation of operation and maintenance land and buildings
4.	Competitive human resources and reliable information system	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Stakeholders satisfaction (including customer, employee and government) and natural environment fulfilment
5.	Competitive human resources and reliable information system	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Stakeholders satisfaction (including customer, employee and government) and natural environment fulfilment
6.	Competitive human resources and reliable information system	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	The Accountable and reliable in administration and control of land and buildings

QUESTION Level 02:

Which one of the following alternatives that can appropriately be adopted refers to the accountable administration and control of assets?

No.	Alternative of asset optimisation strategy	1= equal, 3= moderate, 5= strong, 7=very strong, 9 extremely strong																	Alternative of asset optimisation strategy
1.	Improve value and performance of assets	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Maintain assets efficiently (including reduce cost and risks)
2.	Improve value and performance of assets	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Utilise assets
3.	Maintain assets efficiently (including reduce cost and risks)	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Utilise assets

Which one of the following alternatives that can appropriately be adopted refers to the competitive human resources?

No.	Alternative of asset optimisation strategy	1= equal, 3= moderate, 5= strong, 7=very strong, 9 extremely strong																	Alternative of asset optimisation strategy
1.	Improve value and performance of assets	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Maintain assets efficiently (including reduce cost and risks)
2.	Improve value and performance of assets	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Utilise assets
3.	Maintain assets efficiently (including reduce cost and risks)	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Utilise assets

Which one of the following alternatives that can appropriately be adopted refers to the optimum budget?

No.	Alternative of asset optimisation strategy	1= equal, 3= moderate, 5= strong, 7=very strong, 9 extremely strong	Alternative of asset optimisation strategy

1.	Improve value and performance of assets	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Maintain assets efficiently (including reduce cost and risks)
2.	Improve value and performance of assets	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Utilise assets
3.	Maintain assets efficiently (including reduce cost and risks)	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Utilise assets

Which one of the following alternatives that can appropriately be adopted refers to the stakeholder requirements and natural environment fulfilment?

No.	**Alternative of asset optimisation strategy**	**1= equal, 3= moderate, 5= strong, 7=very strong, 9 extremely strong**																	**Alternative of asset optimisation strategy**
1.	Improve value and performance of assets	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Maintain assets efficiently (including reduce cost and risks)
2.	Improve value and performance of assets	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Utilise assets
3.	Maintain assets efficiently (including reduce cost and risks)	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Utilise assets

THANK YOU FOR YOUR TIME

Appendix 2 Interview Question

IN-DEPTH INTERVIEW QUESTIONS

1. Can you tell me briefly about yourself and how long have you have been with the organisation and what is your primary role in the organisation?
2. Can you explain the land and building optimisation benefits and potential advantages in accordance with properties itself including
   - *the value of an asset,*
   - risk management,
   - reduction costs of maintenance,
   - Capital expenditure
   - Quality of service
3. According to the survey that has been done, the most important strategic objective that contributes in achieving the main goal of asset optimisation strategy is….. (the result of survey) .....what is your opinion regarding this matter
4. The strategic objective of asset optimisation to support the main goal is in the following order:

   I. Stakeholder satisfaction and natural environment fulfilment
   II. Optimum budget
   III. The accountable administration and control of Assets
   IV. Competitive human resources and reliable human resources

   Do you agree with this order and why?

5. The survey also shows that the achievement of KPIs…….is the most important compared to the other achievement? Is it relevant to your organisation, why?

6. What is the real constraint when your organisation is developing asset optimisation strategy and how is your organisation policy deal with the constraint?

7. What is the implemented technique or program of asset optimisation in your organisation? How does it work?

8. Do you feel that the current strategy of asset optimisation taken presently are appropriately applied and consider all factors or do you have a better recommendation?
9. Do you have other important information or message in developing asset optimisation strategy?

THANK YOU FOR YOUR TIME

Appendix 3 Calculation of Survey Stage 2

A. Calculating the weight of priority

In weighting the priority, there are four calculations:

1. Pairwise comparison in decimal, where there are 4 criteria that mean ¼ or 0.25
2. Calculate the Eigenvalue (EV) = squaring the matrix of criteria or K^2. (Column 6).
3. Calculate the Weighted priority of criteria as shown in column 7 of Table below, where EV : total of EV

Table of Weighted Priority of Criteria

Criteria	AAA	OB	CHR	SER	Eigen Value (EV)	Weighted Priority
1	2	3	4	5	6 = K^2	7= EV : Total EV
AAA	1.0000	1.8033	0.5627	1.2687	1.0652	0.1880
OB	0.5545	1.0000	0.2808	0.9619	0.6221	0.1098
CHR	1.9071	3.5608	1.0000	2.0478	1.9311	0.3408
SER	1.5995	1.0396	0.4883	1.0000	2.0478	0.3614
Total	5.0611	7.4037	2.3319	5.2784	5.6662	1.0000

Each weighted priority of criteria of AAA = 0.1880, OB= 0.1098, CHR = 0.3408, SER = 0.3614 becomes the weight of **alternative** considering each criteria.

B. Checking consistency.

There are six steps in order to check the consistency of pairwise in order to be accepted which is Consistency Index (CI) < 10 %:

1. Calculate the weighted synthesis:

In order to calculate the weighted synthesis, we need to calculate the total comparison of criteria. It can be done by dividing each row in column 2 (table 4-11) by total column. The following row and column refer to table 4-12. Therefore, the content of column 8 as the following order:

AAA = 1.0000: 5.0611=1.0652

OB = 0.5545: 5.0611= 0.6221

CHR = 1.9071: 5.0611= 1.9311

SER = 1.5995: 5.0611= 2.0478

This calculation should be done for column 9, 10 and 11 in the same formula

Weighted synthesis is total column 8 + 9 + 10 + 11, therefore row AAA the weighted synthesis = 0.1976 + 0.2436 + 0.2413 + 0.2404 = 0.9228, similarly for the following rows.

Then, calculate the Eigen Maximum or X. X is calculation of each row in column 12 divided weighted priority (table) which is column 7. Therefore, the column 13 or X as the following order:

AAA = 0.9228 : 0.1880 = 4.9088

OB = 0.5473: 0.1098 = 4.9847

CHR = 1.6746: 0.3408 = 4.9135

SER = 0.8553: 0.3614 = 2.3667

The complete calculation of weighted synthesis and Eigen maximum as table below:

Table Weighted Synthesis and Eigen Maximum (X)

Criteria	AAA	OB	CHR	SER	Weighted Synthesis	Eigen Max (X)
	8= col 2:∑ col 2	9= col 3:∑ col 3	10= col 4:∑ col 4	11= col 5:∑ col 5	12 = (8+9+10+11)	13=12:∑12
AAA	0.1976	0.2436	0.2413	0.2404	0.9228	4.9088
OB	0.1096	0.1351	0.1204	0.1822	0.5473	4.9847
CHR	0.3768	0.4809	0.4288	0.3880	1.6746	4.9135
SER	0.3160	0.1404	0.2094	0.1895	0.8553	2.3667

2. Calculate the consistency Index (CI) and Consistency Ratio (CR)

CI is the result of λ (Lambda) max deducted by the number of criteria which is 4 divided by the number of criteria minus 1 or 4-1. While λ max is sum of Eigen max (X) that is in column 13 divided by number of criteria. Therefore, λ max is

(4.9088+ 4.9847+ 4.9135 + 2.3667): 4 = 4.2934

CI = (λ max -4): 3

CI = (4.2934-4): 3 = 0.0978

CR is consistency index (CI) divided by Random Index (RI), where the random index is as the following table:

n (criteria)	1	2	3	4
RI	0	0	0.58	0.9

CR = 0.0978 : 0.9 = 0.1087 or 10 % that means accepted

In this step the ranking of criteria as shown in the table weighted priority, where the highest score of criteria is Stakeholder requirement and natural environment fulfilment (SER) with a score of 0.3614

C. Selecting the best alternative.

The calculation of priority of weight of alternative as the following steps:

1. Pairwise comparison in decimal, where there are 3 alternatives that mean 1/3 or 0.3333
2. Calculate the Eigenvalue (EV). The eigenvalue is the square of matrix or K^2. The matrix of alternative depends on the criteria where the alternative is referring to. The EV of alternatives corresponds to the criteria as shown in column 5 table of Priority of weighted alternative.
3. Calculate the Weighted alternative as shown in column 6 of table Priority of weighted alternative.
4. , where the formula of weighted alternative is EV : total of EV

Table of Priority of weight of alternative corresponds to the AAA

AAA	Improve Performance And Value	Maintain Asset Efficiently	Utilise Asset	Eigen Value	Weighted Alternative
1	2	3	4	5	6
Improve Performance And Value	1.0000	0.6944	1.6905	1.0549	0.3326
Maintain Asset Efficiently	1.4400	1.0000	2.2223	1.4736	0.4646
Utilise Asset	0.5915	0.4500	1.0000	0.6433	0.2028
Total				3.1718	

Table of Priority of weight of alternative corresponds to the OB

OB	Improve Performance And Value	Maintain Asset Efficiently	Utilise Asset	Eigen Value	Weighted Alternative
1	2	3	4	5	6
Improve Performance And Value	1.0000	1.3393	0.5473	0.9017	0.2929
Maintain Asset Efficiently	0.7467	1.0000	1.8191	1.1074	0.3597
Utilise Asset	1.8271	0.6692	1.0000	1.0693	0.3474
Total				3.0784	

Table of Priority of weight of alternative corresponds to the CHR

CHR	Improve Performance And Value	Maintain Asset Efficiently	Utilise Asset	Eigen Value	Weighted Alternative
1	2	3	4	5	6
Improve Performance And Value	1.0000	0.7608	0.5133	0.7310	0.2356
Maintain Asset Efficiently	1.3143	1.0000	2.0089	1.3821	0.4454
Utilise Asset	1.9483	0.4978	1.0000	0.9898	0.3190
Total				3.1029	

Table of Priority of weight of alternative corresponds to the SER

SER	Improve Performance And Value	Maintain Asset Efficiently	Utilise Asset	Eigen Value	Weighted Alternative
1	2	3	4	5	6
Improve Performance And Value	1.0000	1.0989	1.4702	1.1734	0.3864
Maintain Asset Efficiently	0.9100	1.0000	1.2989	1.0573	0.3482
Utilise Asset	0.6802	0.7699	1.0000	0.8060	0.2654
Total				3.0367	

5. The last step to choose the best alternative is the summation of the weighted alternative of each criterion as shown in the following table:

Table of Matrix of Value of Alternatives

ALTERNATIVES	AAA	OB	CHR	SER	Matrix Value	Ranking
Improve Performance And Value	0.3326	0.2929	0.2356	0.3864	0.3146	2
Maintain Asset Efficiently	0.4646	0.3597	0.4454	0.3482	0.4045	1
Utilise Asset	0.2028	0.3474	0.3190	0.2654	0.2809	3

Appendix 4 Implementation of Orcon of echelon 2.

Converting inconsistent into a consistent matrix as shown below

Inconsistent matrix

$$\begin{bmatrix} 1 & 5 & 1 & 1 \\ 0 & 1 & 1 & 0 \\ 1 & 1 & 1 & 5 \\ 1 & 5 & 0 & 1 \end{bmatrix}$$

$$\begin{bmatrix} 0 & 5 & 2 & 2 \\ 0 & 0 & 2 & 0 \\ 2 & 2 & 0 & 5 \\ 2 & 5 & 0 & 0 \end{bmatrix}$$

After implementing the Orcon the consistent matrix is:

$$\begin{bmatrix} 1 & 5 & 0 & 1 \\ 0 & 1 & 0 & 0 \\ 1 & 1 & 1 & 5 \\ 1 & 5 & 0 & 1 \end{bmatrix}$$