



Ali and Chua (2016) mentioned that facility managers are currently faced with problems in carrying out building maintenance due to unclear and unsystematic planning. Excessive expenditure on maintenance budget and re-building work is one of the consequences of the problem. This is one of them due to the absence of quality standards used in maintenance of buildings. Quality is a description and overall characteristics of goods / services that demonstrate its ability to meet the specified or implied requirements (Ministry of Public Works Decree No.4 Year 2009). In PU Ministry Regulation No.4 of 2009 also mentioned that the Quality Management System is an organization management system to direct and control the implementation of construction and non construction work in each work unit, Implementing Unit and service provider in achieving the quality.

Starting from the background of problems that have been described above, the author tries to identify some problems that appear on the object of research Government Building. Problems such as inadequate building maintenance staff also hamper maintenance activities. The maintenance staff function is to help the building owner to maximize asset value throughout the cycle to achieve sustainability and continued use of the building. According to Brunetto (2014), the problem that often arises lies not in asset managers who do not plan a good maintenance program, but from lower levels of employees who handle the building every day.

According to Macek and Dobias (2014), problems in the maintenance of public buildings is a problem of many parties, because it is related to public needs. The process of renovation and maintenance of buildings can not be separated from the management of building facilities. Government Building as a case study in this study was selected because of some of the following problems, in most Government Buildings in Indonesia found many buildings that are not feasible for government workers to use the move.

Based on interviews with one of the Government's maintenance bureaus (August 19, 2017), many Government House buildings functioned not in accordance with the standard of initial function, so they could not function optimally. The difficulty of finding documentation and information on buildings during the operational period became one of the problems that arose in the maintenance management in the Government House. Inadequate staff and budget maintenance of the building, hampering maintenance activities, and lack of awareness of building users on the condition of the buildings they occupy.

Building damage problems arise because until now there is no system and procedures that become the reference in the implementation of maintenance of government buildings buildings to always be feasible functions. So the purpose of this research is to develop a risk-based Quality Management System that can be used as guidance for the building managers in doing maintenance work to achieve the standards and quality objectives according to the wishes and needs of users.

To answer these objectives made a research questions in this study are:

1. What is the organization structure and the job description at the stage of implementation building maintenance work of government buildings?
2. What is the business process and activity in the implementation phase of the maintenance work of the government building?
3. What are the inputs, outputs, and durations required in each activity at the stage of implementation of maintenance work of government buildings?
4. Who is responsible for every activity at the stage of implementation of maintenance work of government buildings?
5. What are the risk events that may result in inadequate output at the implementation stage of the maintenance work of government buildings?
6. How is the development of communication flow, SOP, IK, list of references, and quality records at the stage of implementation of maintenance work of government buildings?
7. How is the development of a risk-based Quality Management System at the stage of implementation of building maintenance work of government buildings?

## **2. Literature Review**

### **2.1 Maintenance of Government Building**

Based on Presidential Regulation No. 73 of 2011, the meaning of a state building is a building for official purposes that belongs to a state / region and is held with funding sources derived from APBN, and / or APBD funds, or other legal proceeds. The classification of state building buildings is based on the complexities described in Government Regulation Number 45 of 2007 covering simple buildings, non-simple buildings, and special buildings. The technical requirements of the building as mentioned include the requirements of building codes and building reliability requirements including the requirements of designation and intensity of buildings, architecture, environmental impact control, building reliability, safety, health, comfort, convenience, and special function building.

Sustainable development has become a central principle in today's modern industry, building maintenance has a vital role in making this happen (Sodangi et al, 2013). Protecting buildings at an early stage and maintaining the investment value of the buildings, as well as maintaining the condition of the buildings in order to meet the development objectives is one of the objectives of maintenance (Pukite et al, 2017).

Building Maintenance and Care work is divided into two classifications, namely preventive maintenance and corrective maintenance. Preventive maintenance is usually done routinely to maintain the quality of the elements maintained. While corrective maintenance or which can also be called maintenance is a repair work done when the element is damaged. According to Government Regulation no. 45 Year 2007, Maintenance of buildings is an attempt to maintain the condition of the building in order to continue to meet the requirements of functionality or in an effort to improve the shape of the building, and guard against damaging effects. Maintenance of buildings is also an attempt to avoid damage to components / building elements due to obsolescence / riot before the age ends. While the maintenance of buildings is an attempt to repair the damage that occurred so that the building can function properly as it should. Building maintenance can be classified according to the level of damage to the building that is mild, moderate, and severe damage.

Maintenance is defined as an activity to maintain, repair and maintain buildings and services with the aim of ensuring the building performs its functions throughout the life of the building according to the standards (Yong & Sulieman, 2015). To meet these standards required good maintenance management to meet user satisfaction. Maintenance and renovation of buildings is a term that can not be separated in facility management. Maintenance and renovation have an important role in terms of cost in the life cycle of buildings (Macek & Dobias, 2014). According to Pukite et al (2017), building and maintenance management is an effectively organized system consisting of operations, repairs and maintenance to ensure the building is functioning optimally and used for the purpose. According to Yong and Sulieman (2015), proper application of maintenance management will be able to extend the life span of the building and avoid unnecessary damage to building elements.

## **3. Research Design**

This research uses archive analysis strategy which then done content and construct validation to experts who have experience in building maintenance work, then conducted questionnaires to respondents related to risk, then conducted case study on government building as object of implementing developed qms document. Here is the flow of research done in achieving research objectives:

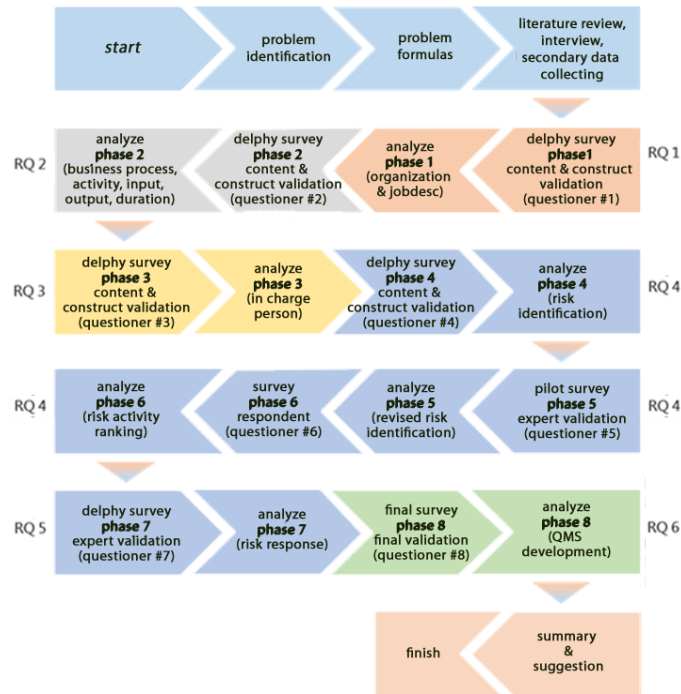


Figure 1. research process

The initial stage is to identify and formulate the problem, then conducted a review of literature related to the maintenance of government buildings. In the data collection and data analysis phase, the first step is to validate the content and construct to the organization's experts and job descriptions of the stakeholder related to the implementation of building maintenance. The second stage is the validation of experts related to business processes, activities, inputs, outputs, and duration on every activity of government building maintenance. The third stage is to collect data and RACI analysis to determine who is responsible for each activity. In developing risk-based qms, risk identification is possible for each activity in the fourth stage. Once the risks are identified, pilot surveys are conducted to determine the suitability and understanding of the identified risks prior to the spreading of the risk rating questionnaire to the respondents. Once the risk ranking results are analyzed and the highest risk is obtained, expert validation of the risk response needs to be done in reducing the impact and frequency of risk in the seventh stage. The eighth stage is the development of risk-based qms for the implementation of maintenance work of government buildings.

Experts and respondents involved in this study consist of 5 experts who have at least 5 years experience in building maintenance to answer expert validation questionnaires. While 2 experts from the internal government building x institutions are involved in the study related to the organization and the person in charge of work. For risk respondents consist of 44 respondents spread in several government agencies and private in conducting the implementation of building maintenance.

#### 4. Result and Discussion

From the results of data feeding through archive analysis, expert validation, and interviews, found 4 business processes in the implementation phase of building maintenance work of government buildings, which consists of 41 activities supporting the implementation of building maintenance work. Where the business process is happy for the implementation of construction services procurement is divided into three business processes for the procurement of general selection, simple, and direct selection, and monitoring monitoring implementation.

Table 1. Business Processes and Activities

<b>Procurement Process of Construction Services</b>		<b>X3</b>	<b>Procurement Process of Direct Construction Services Under 200 Million</b>
<b>X1</b>	<b>Procurement Process of General Selection Construction Service (Above 5 Billion Rupiah)</b>	X3.1	Making KAK, material specification to be used
X1.1	Making KAK, material specification to be used	X3.2	Making KAK, material specifications to be used
X1.2	Making KAK, material specifications to be used	X3.3	Checking RAB, RKS, Drawing and making HPS
X1.3	Checking RAB, RKS, Drawing and making HPS	X3.4	Make SPT to procurement official
X1.4	Application of General Procurement Plan to ULP	X3.5	Submit procurement documents
X1.5	Creating a RUP Invitation Letter	<b>Maintenance Implementation Process</b>	
X1.6	Implementation of RUP (Discussing KAK)	<b>X4</b>	<b>Implementation Process of Maintenance Monitoring</b>
X1.7	Letter of Invitation Procurement Plan Implementation	X4.1	Create contract documents
X1.8	Implementation of RPP (Discussing the draft contract and HPS)	X4.2	Check the contract documents
X1.9	Auction Application to ULP	X4.3	Approve the contract documents
X1.10	Providing Auction Documents To ULP	X4.4	Coordination with Contractors, and Supervision Consultants
<b>X2</b>	<b>Proses Pengadaan Jasa Konstruksi Seleksi Sederhana (200 Juta Sd 5 Milyar Rupiah)</b>	X4.5	Conducting coordination meetings for improvement implementation
X2.1	Making KAK, material specification to be used	X4.6	Monitoring and supervising the implementation of activities
X2.2	Making KAK, material specifications to be used	X4.7	Create an evaluation report recap
X2.3	Checking RAB, RKS, Drawing and making HPS	X4.8	Check the recap of evaluation report of the implementation of the activity
X2.4	Application of General Procurement Plan to ULP	X4.9	Examine the results of the activities
X2.5	Creating a RUP Invitation Letter	X4.10	Submit a letter of application to PPHP
X2.6	Implementation of RUP (Discussing KAK)	X4.11	Conducting job inspection activities
X2.7	Letter of Invitation Procurement Plan Implementation	X4.12	PPHP Events Report
X2.8	Implementation of RPP (Discussing the draft contract and HPS)	X4.13	BAST 1
X2.9	Auction Application to ULP	X4.14	Submit a letter of application to FHO if there is a maintenance period
X2.10	Providing Auction Documents To ULP	X4.15	Carry out the job inspection activities for

				maintenance
		X4.16	BAST 2	

In each activity required raw quality consisting of input, output, and duration of activity. In order to meet the objectives of the quality standard, risk identification is needed to determine what factors will affect the incompleteness of the target. Then a quantitative analysis is conducted based on the following risk matrices:

Table 1. Risk Matrix

Threats Probability	0.05 Very Low	0.10 Low	0.20 Moderate	0.40 High	0.80 Very High
0.10	0.01	0.01	0.02	0.04	0.08
0.30	0.02	0.03	0.06	0.12	0.24
0.50	0.03	0.05	0.10	0.20	0.40
0.70	0.04	0.07	0.14	0.28	0.56
0.90	0.05	0.09	0.18	0.36	0.72

From the results of data collection, 77 risks were identified with the highest 8 risks with 4 high categorical risks and 4 moderate risks, each business process has different activity risk with the following details:

Table 2. The highest risk in the implementation stage of building maintenance

Var	Activity	Risk	Scor	
X60	Monitoring and supervising the implementation of activities	Pelaksanaan pekerjaan tidak sesuai spesifikasi teknis	0.171	High
X6	Checking RAB, RKS and Images	Pengawasan tidak dilakukan secara benar	0.169	High
X26	Carry out the job inspection activities for maintenance	Terjadi kesalahan perhitungan volume dan item pekerjaan	0.164	High
X75	Carry out the job inspection activities for maintenance	Opname yang dilakukan tidak benar	0.162	High
X4	Letter of Invitation Procurement Plan Implementation	Surat tidak terkirim tepat waktu	0.157	Moderate
X29	Checking RAB, RKS and Images	RAB tidak di cek secara tepat	0.148	Moderate
X73	Submit a letter of application to FHO if there is a maintenance period	Penyedia jasa tidak menyerahkan pedoman pemeliharaan	0.145	Moderate
X59	Supervision is not done correctly	Pengawasan tidak dilakukan secara benar	0.144	Moderate

Once found the highest risk in the implementation phase of building maintenance, risk responses are made at each high risk which will later be used in the development of building maintenance maintenance qms. Here are 24 quality management system development actions based on the results of risk resolutions:

Table 3. Quality Management Syssten Development Actiob

No	QMS Maintenance Imolementation	Tindakan Pengembangan
SOP Implementation of Selection of Selection Providers of General Selection		
1	SOP Selection of Selection of General Selection Service Providers	Increase the volume and workflow inspection flow by the boss before going to the next stage
2	SOP Selection of Selection of General Selection Service Providers	Increase the flow of RAB and RKS inspection before the next stage
3	SOP Selection of Selection of General Selection Service Providers	Adding checkpoints RAB and RKS by the boss, then add activity "recalculation repair if there is an error"
4	SOP Selection of Selection of General Selection Service Providers	Add a list of job references in the form of a database
5	Procurement documents list	Create a detailed list of documents for auction submission
SOP Implementation of Selection of Simple Selection Providers		
6	SOP Implementation of Selection of Simple Selection Providers	Add a workaround for volume and work item checks by your supervisor, then add a "recalculation fix if there is an error"
7	SOP Implementation of Selection of Simple Selection Providers	Increase the volume and workflow inspection flow by the boss before going to the next stage
SOP Implementation of Selection of Direct Implementing Service Providers		
8	SOP Implementation of Selection of Direct Implementing Service Providers	Adds a HPS checkout flow, then adds a "recalculation fix event if there is an error"
9	SOP Implementation of Selection of Direct Implementing Service Providers	Adds HPS checks by the boss before going to the next stage
SOP Implementation of Maintenance Monitoring		
10	SOP Implementation of Maintenance Monitoring	Added activity "do repair work if needed"
11	SOP Implementation of Maintenance Monitoring	Adding activity "reopen by field condition if not match field condition"
Work Instruction Field Review and Progress and BAST Checking		
12	Work Instruction Field Review and Progress and BAST Checking	Make a checklist of supporting documents when doing the hospitalization
13	Work Instruction Field Review and Progress and BAST Checking	Add periodic field review timings together
14	Work Instruction Field Review and Progress and BAST Checking	Create a joint Field Review News Event
15	Work Instruction Field Review and Progress and BAST Checking	Add periodic field review timings together.

No	QMS Maintenance Imolementation	Tindakan Pengembangan
16	Work Instruction Field Review and Progress and BAST Checking	Create a checklist for completion of work
17	Work Instruction Field Review and Progress and BAST Checking	Create details of field review activities and progress checks.
Work Instruction for HPS Checking		
18	Work Instruction for HPS Checking	Create details of field review activities and HPS checks.
Work Instruction of Making and Checking RAB, RKS, Gambar, and HPS		
19	Work Instruction of Making and Checking RAB, RKS, Gambar, and HPS	Create details of RAB and RKS making activities
Work Instruction of Opname Checking		
20	Work Instruction of Opname Checking	Increase the volume and workflow inspection flow by the boss before going to the next stage
Checklist for personnel		
21	Checklist for personnel	Make the competency requirements of the document planning personnel
22	Checklist for personnel	Added as information "If the personnel involved do not have the required competencies then the personnel must be replaced" in the list of references to personnel
23	Checklist for personnel	Added information "Any personnel who will perform these activities should get clear direction from the boss first.
24	Checklist for personnel	Added as information "If the personnel involved do not have the required competencies then the personnel needs to be trained" in the list of references to personnel

## 6. Conclusion

Based on data collection and data analysis conducted, obtained some conclusions tabulated in the following table:

Research Question	Existing	Result
1 Organbinzation & Jobdesc	Organizational structure in accordance with the rules applicable in Government Institutions X	There are 3 organizational structure changes related to the equalization of workload
2 Business Processes and Activity	4 Business Processes with 44 Activities	4 Business Processes with 41 Activities
3 Input, Output, Duration	None	Customize activity
4 Penanggung Jawab	Tidak terstruktur	Telah dilakukan analisa RACI
5 Risk	77 risk identifikastion	8 highest risk of further response
6 Communication Flow, SOP, WI, Checklist, Quality Record	None	Conducted initial development
7 Risk Based Quality Management System	Nothing and yet risk-based	24 qms development actions



## **Acknowledgements**

Add acknowledgement if need

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**See below guidelines for citations:**

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