4. Discussion and conclusion

This final section surveys the findings of the present work, summarises the contribution and forwards some concluding remarks. The first phase of this study literature to generate variables and indicators of research as listed in the table below.

Table 1. Indicator/ variable measurement for PLS-SEM Analysis

No	ID	Indicator/ Variable	Laten Variable
1	X1.1	Documenting internal maintenance policy	Planning and Development (X1)
2	X1.2	Determine the standard index condition	
3	X1.3	Prepare maintenance department strategy	
4	X1.4	Develop a strategic maintenance plan	
5	X2.1	Develop a condition assessment	Implementation (X2)
6	X2.2	Make a maintenance needs assessment	
7	X2.3	Allocate sufficient budget maintenance	
8	X2.4	Develop annual maintenance program	
9	X2.5	Develop maintenance supervision	
10	X2.6	Monitor and observe maintenance performance	
11	X3.1	Gather relevant asset information	Information and System (X3)
12	X3.2	Ensure proper data collection	
13	X3.3	Using a computer maintenance management system	
14	X3.4	Establish maintenance reporting capabilities	
15	X4.1	increase in ongoing maintenance with the use of updated techniques	Improvement (X4)
16	Y1.1	Structural foundation	Safety (Y1)
17	Y1.2	Roof and floor	
18	Y1.3	Column	
19	Y1.4	Pre-cast	
20	Y1.5	Evacuation path dimension	
21	Y1.6	Width, length, distance between stair	
22	Y1.7	Door quality and emergency stair size	
23	Y1.8	Routine maintenance in emergency stair	
24	Y1.9	Safety in fire stair	
25	Y1.10	External lightning protection system	
26	Y1.11	Internal lightning protection system	
27	Y1.12	Fire emergency active protection	
28	Y1.13	Fire emergency passive protection	
29	Y2.1	Natural air ventilation	Health (Y2)
30	Y2.2	Artificial ventilation	
31	Y2.3	Natural light	
32	Y2.4	Artificial lighting	
33	Y2.5	Emergency lighting	
34	Y2.6	Clean water system	
35	Y2.7	Waste water system	
36	Y2.8	Drainage system	
37	Y2.9	The use of not dazzling material	
38	Y2.10	The use of material causing high temperature	
39	Y2.11	The use of green material	
40	Y2.12	The use of material align to environment	
41	Y3.1	Investment in protection	Security (Y3)
42	Y3.2	Parking	
43	Y3.3	Safety fence	
44	Y3.4	Emergency lamp	
45	Y3.5	CCTV	
46	Y3.6	Utilites	
47	Y3.7	Security outpost	

No	ID	Indicator/ Variable	Laten Variable
48	Y3.8	Storage building	
49	Y3.9	Electronic safety system	
50	Y4.1	Room function for accessibility	
51	Y4.2	Accessibility in room	
52	Y4.3	Number of user for accessibility in room	
53	Y4.4	Furniture in room for accessibility in room	
54	Y4.5	Safety and health requirement for accessibility in room	
55	Y4.6	Room function within room	
56	Y4.7	Access within room	
57	Y4.8	Number of user within room	Comfort (Y4)
58	Y4.9	Furniture in building	
59	Y4.10	Safety and health requirement within room	
60	Y4.11	Stair and corridor access	
61	Y4.12	Humidity condition	
62	Y4.13	Visual condition	
63	Y4.14	Noise	
64	Y4.15	Air condition	
65	Y5.1	Door access horizontally	
66	Y5.2	Corridor access horizontally	
67	Y5.3	Stair access vertically	
68	Y5.4	Ramp access vertically	
69	Y5.5	Lift access vertically	
70	Y5.6	Escalator access vertically	
71	Y5.7	Travelator access	
72	Y5.8	Way to emergency exit	
73	Y5.9	Emergency sign	Amenity (Y5)
74	Y5.10	Prayer room	
75	Y5.11	Change room	
76	Y5.12	Baby room	
77	Y5.13	Toilet	
78	Y5.14	Parking area	
79	Y5.15	Recycle bin	
80	Y5.16	Communication facility	
81	Y6.1	Energy consumption	
82	Y6.2	Water consumption	
83	Y6.3	Food waste	
84	Y6.4	Paper waste	
85	Y6.5	Plastic waste	Environment (Y6)
86	Y6.6	Garden waste	
87	Y6.7	Air Condition	
88	Y6.8	Water condition	
89	Y6.9	Soil condition	

4.1 Discussion of the maintenance policy and strategic implementation

Based on literature review on maintenance policy to identify maintenance policy in government building in Indonesia, conclude in this table below;

Table 2. Maintenance Building Policy in Indonesia

NO	Rules and Policy	Building	Information Maintenance	Reliability
1	Law no.28 of 2002	✓	✓	✓
2	Government Regulation no.36 of 2005	✓	✓	✓
3	Government Regulation no.27 of 2014	✓	✓	-

4	Rule of the Minister of Public Work no.24 of 2008	✓	✓	✓
5	Rule of the Minister of Public Work no.45 of 2007	✓	✓	✓
6	Rule of the Minister of Public Work no.5 of 2016	✓	✓	✓
7	Rule of the Minister of Public Work no.6 of 2017	✓	-	-
8	Rule of the Minister of Public Work no.6 of 2007	✓	-	-
9	Rule of the Minister of Public Work no.29 of 2006	✓	-	✓
10	Rule of the Minister of Public Work no.25 of 2007	✓	✓	✓
11	President Decision no.73 of 2011	✓	✓	✓

According the literature review conducted through the process of division between norms, standards, guidelines and criteria (government regulation no.38 of 2007), it is found that almost all policy variables have been regulated in these laws. But on information and system variables, there is no policy that regulates the IT-based maintenance management system

Table 3. Maintenance Building Policy related to Variable

Factor	Variables	N	S	P	K
Planning and Development (X1)	Documenting internal maintenance policy	✓	-	✓	-
	Determine the standard index condition	-	✓	✓	✓
	Prepare maintenance department strategy	✓	-	✓	✓
	Develop a strategic maintenance plan	✓	-	✓	-
Implementation (X2)	Develop a condition assessment	✓	✓	✓	-
	Make a maintenance needs assessment	✓	-	✓	✓
	Allocate sufficient budget maintenance	✓	-	✓	-
	Develop annual maintenance program	✓	-	✓	-
	Develop maintenance supervision	✓	✓	✓	-
	Monitor and observe maintenance performance	-	✓	✓	-
Information and System (X3)	Gather relevant asset information	✓	✓	✓	-
	Ensure proper data collection	-	-	✓	-
	Using a computer maintenance management system	-	-	-	-
	Establish maintenance reporting capabilities	✓	-	✓	-
Improvement (X4)	increase in ongoing maintenance with the use of updated techniques	✓	-	✓	✓

4.2 PLS-SEM Analysis

In this research model, reliability testing uses three types of path models. Model 01 is a model with interrelated and latent interrelated policy and functional linkages (see Fig. 2). Model 02 is a model with a policy relations path in any latent functionality feasible, but between latent policies unrelated, whereas the latent interconnected functionality is related. The 03 model is the simplest with an unrelated policy latent path, and latent functionality unrelated, except in some latent. Reliability Test Results shows the existence of 31 variables that are considered not reliable. It appears that the first analysis indicates that the measured variables of preparing the maintenance strategy (X1.3) and the short and long term strategic plan (X1.4) are not sufficiently reliable in describing the policy variables in the planning. The results of the data also show that the variables of maintenance needs assessment (X2.2), budget allocation (X2.3), routine maintenance program (X2.4), and supervision and performance evaluation (X2.6) on latent variables of policy implementation quite reliable. Furthermore, on latent variables Information and System shows that computer management system (X3.3) and maintenance reporting (X3.4) is not reliable enough.

In the latent variables of safety, it appears that the roof and floor structure (Y1.2), column structure (Y1.3), pre-pressed concrete connection (Y1.4), evacuation line dimensions (Y1.5), emergency ladder treatment (Y1 .8), the external lightning protection system (Y1.10), passive fire protection system (Y1.13), are not sufficiently reliable to describe latent safety variables in functional functions. In the latent variables of health, it appears that emergency lighting (Y2.5), the use of energy-efficient building materials (Y2.11), and the use of harmonized building materials (Y2.12) are not sufficiently reliable to describe health in building functional functions.

In the latent security variables, it appears that the safety fence (Y3.3), guard post (Y3.7), and building penyimpannan (Y3.8) are not reliable enough in describing the security on the functional of the building. In the latent variable of comfort, it can be seen that the space function of the space (Y4.1), the number of occupants between spaces (Y4.8), the intermediate safety and health requirements (Y4.10), and the visual conditions (Y4.13) quite reliably in describing the convenience of building functionality. In the latent variables of ease, it appears that horizontal access corridors (Y5.2), roads leading to the emergency stairs (Y5.8), worship space (Y5.10), and dressing room (Y5.11) are not reliable enough to describe ease of use building function. And on latent variables environmental sustainability shows that energy consumption (Y6.1) and soil conditions (Y6.9) are not reliable enough to describe environmental sustainability in functional functions.

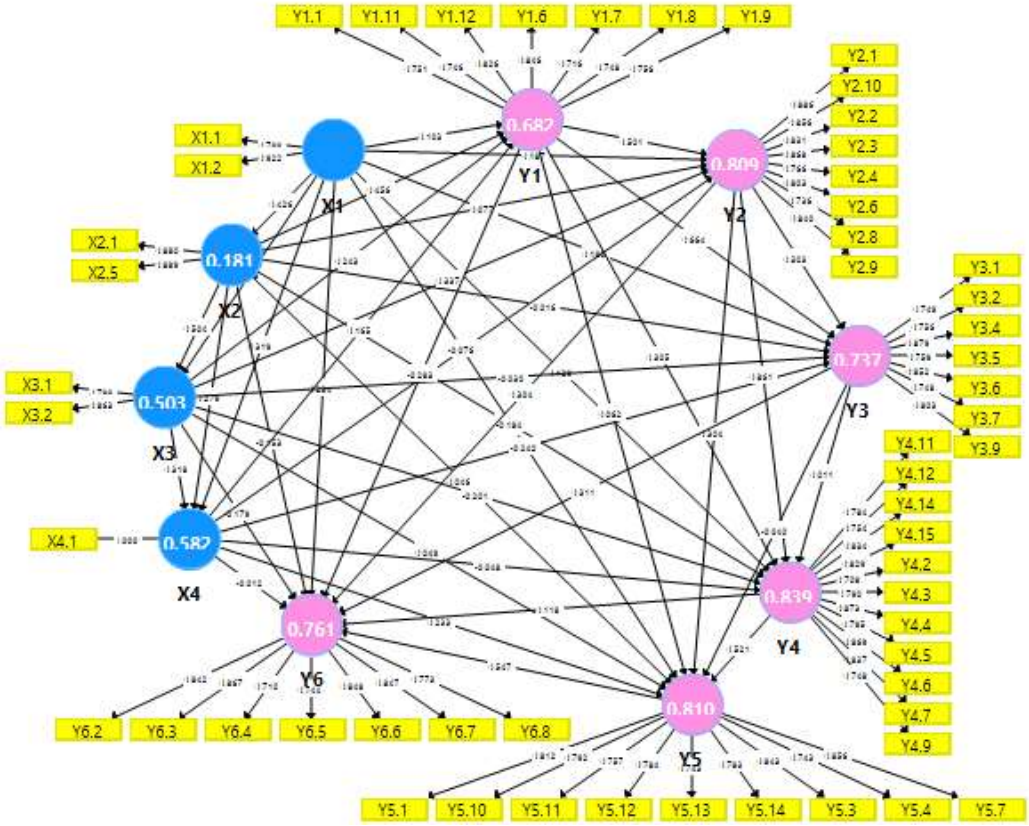

Figure 2. PLS Algoritm – Full Process model

Table 4. Smart-PLS Bootstrapping Analysis

	Original Sample	Sample Mean	(STDEV)	T Statistics	P Values
Implementation -> Information & System	0.504	0.495	0.152	3.320	0.001
Implementation -> Safety	0.456	0.424	0.140	3.268	0.001
Information & System -> Health	0.337	0.321	0.140	2.400	0.017
Health -> Comfort	0.861	0.825	0.178	4.826	0.000
Safety -> Security	0.664	0.629	0.197	3.367	0.001
Safety -> Health	0.501	0.515	0.152	3.294	0.001
Planning & Development -> Implementation	0.426	0.439	0.180	2.372	0.018
Planning & Development -> Information and System	0.328	0.310	0.163	2.013	0.045

Based on literature to support PLS-SEM result (see Table. 4), In order for a successful maintenance implementation one can be achieved using Computerized Maintenance Management Software (CMMS) (Wienker,

Henderson, & Volkerts, 2016). Information systems in the medical world can help facilitate implementations that may lead to improved patient safety in hospitals (Weiner, Alexander, Baker, Shortell, & Becker, 2006). According to Krishnan and Singh (2007), the basic assessment of information needs is in the form of what features are needed, concern for safety and customization required with the system offered. For example, with the use of information and systems it can be seen that maintenance work has health-related impacts of implementing maintenance activities. Health can be affected when the physical comfort of the environment does not meet the minimum requirements (Ali, Chua, & Lim, 2015). Safety and beauty of building are often difficult to achieve simultaneously, but the combination of plant use as a substitute for fencing can improve safety sense (Schroeder & Anderson, 1984). In the food processing industry, process and outcome safety is one of the important things needed to ensure public health (Lin, Huang, & Wahlqvist, 2009). People who survive to come home from work every day are not necessarily healthy, but healthy people get home from work accident (Duma, Husodo, Soebijanto, & Maurits, 2011). According to Issa and Abu-Eisheh (2017), the implementation of maintenance work can be carried out according to plan if supported by various aspects such as allocation of funds, and others and recommended to plan priorities on maintenance work. Issa and Abu-Eisheh (2017) recommends that planning be accompanied by software development that can transform maintenance work into easy-to-use computerized systems. All the connection that contribute significantly into reliability variable shows below (see Fig. 3).

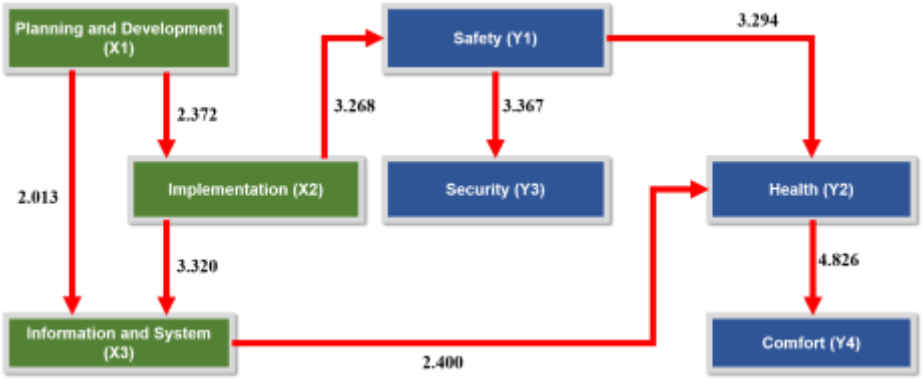

Figure 3. PLS Algoritm – Full Process model

4.2 Improvement

In order to contribute to the development of the scientific world, the authors make improvements by developing the results of a significant variable related to functional factors. The development scheme is as follows to evaluate low building functional performance ;

a) If No Policy

It is recommended to formulate policies based on maintenance policy factors (X1-X4) that have a significant influence on functionality. Based on regulation review in Indonesia, it is recommend to formulate policies related to IT-based maintenance management systems that do not exist today. The use of computer-based maintenance management systems can improve overall efficiency (Eva & Kateřina, 2013). E-maintenance is the synthesis of two major trends of the present: the increasing need for maintenance and the rapid development of communication and information technology (Borissova and Mustakerov, 2013). Some standards could be use in formulate IT-based maintenance management system as follows;

- IEEE 802.11x, EN457:1992-ISO7731.
- IEC 62264 (enterprise—control system integration) based on ANSI/ISA S95.
- ISO 15745 (industrial automation application integration framework).
- MIMOSA6 (Machinery InformationManagement Open System alliance)-IEEE 1232.7
- ISO 13374 (condition monitoring and diagnostics of machines).
- EN60204-1:1997/IEC60204-1 (safety of machinery).

(Muller, Marquez, Iung (2007)

b) If Policy has been made

Controlling and improving the performance of existing policies based on significant factors influences. Examine compliance with policy implementation on maintenance work. Another way by improving

government policy by adding criteria and standard for maintenance performance measurement could help increase functional building performance.

4.3 Conculsion

Based on the results of research, in government buildings there are now various policies that guide maintenance work and also policies that regulate the functionality both in the law, the rules of the minister of public works, government regulations to presidential regulations. In general, the Minister of Public Works Regulation no.24 of 2008 is sufficient to describe the maintenance policy required. In detail, existing regulations is not contain maintenance policies that using computer-based maintenance management systems. Future research could be develop computer-based maintenance management system for governement building. The current Maintenance policy mentions that maintenance reports are the basis of consideration in the extension of a functional-worthy certificate, but no policy clearly defines maintenance report standards as references to be associated with function eligibility.

Based on statistical analysis, the most dominant factor or influence the functional function of government building is planning and development policy, implementation policy and information and system policy. This is also supported by the results of analysis on PLS-SEM model. All the factors obtained require policies in order to implement appropriate strategies for the feasibility of building functions. So it is important that factors related to it can be controlled and monitored as consideration determines the maintenance policy. For the government policy that doesn't exist as indicator shown before, it is recommend to create a policy based of these indicator.

Based on the results of the identification of the maintenance policies studied have significant effect but not on all aspects of functionality, such as environment and amenity. The aspects of functionality that are significantly related to the policy studied are aspects of safety, health, security and comfort.

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