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Asset Management Based on Risk Control and Information Systems

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Abstract. Asset management is needed in asset inventory. The preparation of an asset inventory is taken into account the aspects of asset management and risk management. The measurement results with SEM obtained APC values and values < 0.05 and AVIF < 5 so that the relationship between the criteria for asset management and risk management has a significant effect on the design of asset information systems. Measurement of risk management obtained 4 critical risks that affect the design of asset information systems. One of the asset information systems that meet the criteria of being integrated, easy to manage, and easy to update the data is a QR code-based check sheet. Its use in a small scope is easier to implement than using a database system.

Keyword: Asset Management, Risk Management, Asset Management System

Abstrak. *Pengelolaan aset dibutuhkan dalam inventarisasi aset. Penyusunan inventarisasi aset dipertimbangkan aspek manajemen aset dan manajemen risiko. Hasil pengukuran dengan SEM didapatkan nilai APC dan bernilai < 0,05 dan AVIF < 5 sehingga hubungan antar kriteria pada manajemen aset dan manajemen risiko berpengaruh signifikan terhadap rancangan sistem informasi aset. Pengukuran manejemen risiko didaptkan 4 risiko kritis yang mempengaruhi rancangan sistem informasi aset. Salah satu sistem informasi aset yang memenuhi kriteria terintegrasi, mudah pengelolaan dan kemudahan dalam pembaruan data tersebut adalah check sheet berbasis QR code. Pengunaannya dalam lingkup kecil lebih mudah diterapkan daripada mengunakan sistem data base.*

Kata Kunci: Manajemen Aset, Manajemen Risiko, Sistem Pengelolaan Aset

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1. Introduction

All organizations, both private and government, are inseparable from asset ownership. Assets owned can be either tangible or intangible [1]. Non-comsumable assets have a lifetime of more than 12 months for the running of the organization [2]. The organization can run well with objective benchmarks of the existence of assets [3] [4]. The existence of assets is a form of organizational investment. The organization will get results from the utilization of assets in the form of economic, commercial, and exchange value in achieving goals [5] [6]. Organization

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main purpose is to provide the maximum service according to the life cycle of assets. Without support of a proper asset, it causes constraints on the organization's operational activities [7].

Operational activities in the organization trigger assets to enter and exit. This condition can overwhelm some parties if asset management ranges from planning to elimination if there is no integrated system [8]. An asset management system that is still manual has the impact of swelling operational costs and difficulty monitoring assets [9]. Difficulty monitoring assets makes the timing of asset turnover difficult [10]. The difficulty is not only the change of assets but also the lending of assets. Constraints on asset lending, among others, information that is less updated makes the lending process need to meet the relevant parties so as to prolong the time [11]. Other facts, such as human resources, indicate that an organization does not have a supportive background and that mutation process errors trigger poor asset management [12]. Alternative solutions to these problems with the ease of asset management through humans, as asset managers require an information system. The use of information systems is expected to regulate operational activities and ensure they are structured and run well in accordance with Standard Operating Procedures (SOP) [13].

Industrial engineering department at University of XYZ Madiun began to use asset management information systems. The state of industrial engineering department, which are still relatively new in 2017, necessitates asset management improvements. It has had various assets scattered among lecture halls, classrooms, and laboratories for the past four years. The assets owned by industrial engineering department at University of XYZ Madiun are shown in Figure 1. Every year, the assets owned by industrial engineering department at University of XYZ Madiun grows. Asset management is currently in a disorganized state. When it comes to loans or the use of assets, there is still a lot of room for improvement in terms of recording and tracking. If the assets owned have not undergone a good management process, there is a greater risk of losing money and even being confused with another department.

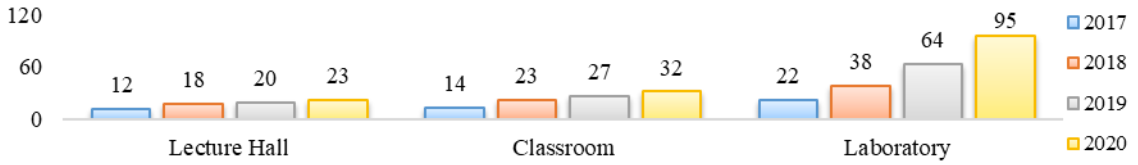

Figure 1 University of XYZ Madiun Industrial Engineering Department's Assets

Asset management process in Industrial Engineering Department at University of XYZ Madiun is expected to provide transparency and accountability to the management, review, and control [14]. Repair of asset management systems is certainly a risk. Risks pose reasonable consequences [15]. Possible initial risks that arise include a limited budget, the unclearness of the person in charge, and technology from asset management. The case of accreditation may be one that can be felt by Industrial Engineering Department at University of XYZ Madiun. Confusion in finding the goods needed for field assessment resulted in draining of time and energy for lecturers and employees of the department involved. Risk should be avoided or

overcome through asset management decisions [16] with the help of information systems that pay attention to the obstacles that occur. The implementation of an asset information system is expected to help record asset amounts and asset damage risk.

2. Literature Review

2.1. Asset Management

Asset management includes a number of relatively new disciplines, as well as the goal of increasing organizational competence. Significant developments in the asset management sector began to permeate the industrial sector and pique its interest. The development of asset management in the industrial sector can be seen from the start of the implementation of the ISO standard 55000 [17]. Some industrial sectors that have implemented 55000 ISO standards include the petrochemical industry, electricity-producing industry (generation, transmission, and distribution) [18], transportation industry, and mining industry [19]. The following are some of the benefits that asset management can provide for the industry [20]:

- Improved financial performance, services and reputation for the industrial sector.
- Increased efficiency and effectiveness have a direct impact on decision making.
- Providing information on asset investment decisions.
- Risk management.
- Demonstrate social responsibility and compliance for the industrial sector.

Asset management in a broader scope is a multidisciplinary-oriented science covering life cycles, processes, and strategies of a sustainable nature. The entire life cycle of an asset depends on the type of asset under management. Asset processes have a direct impact on assets, but the management system contributes indirectly to realizing the value of the asset, increasing the efficiency and effectiveness of the process [21]. Asset valuation strategies and policies consist of standards, knowledge, valuation methodologies, conceptual models and more.

2.2. Risk Management

Risk management in asset management requires identification, extent, and possible comparison or consequences of risk tolerance criteria to determine risk treatment options [22]. Risk management in asset management requires identification, extent, and possible comparison or consequences of risk tolerance criteria to determine risk treatment options [23]. Risk management involves decision-making related to the application of risk behavior. Risk management can be a tool for asset priorities related to better management and rehabilitation [24]. Risk management stages include [25]:

- Risk identification, relevant risks can be identified by exchanging ideas, looking at previous data or conducting interviews with several relevant experts.
- Risk analysis, probability calculation on events and impact of each identified risk.
- Risk connection, nodes are created for each risk and linked to related quantities.
- Risk mitigation, the response to highest risk is designed in such a way that a large degree of probability will be transmitted to a lower level. Total cost associated will be lowered.

2.3. Asset Information System

Business form makes organizations develop capabilities in managing data, information, and knowledge effectively. Asset information systems refer to processes and procedures in asset management as well as gaining business insights at the right time and form [26]. Asset information systems ensure that data, information, and content are treated as assets to avoid risks and costs associated with misuse due to lack of oversight. Asset information systems drive organization performance so that every activity, process, and decision can be managed properly. The role of asset information systems affects many aspects including employee retention, profit margins and productivity [27]. The development of asset information systems becomes more effective and efficient at making improvements (revenue, compliance, and competitiveness advantages) and reductions (risk and cost). In addition, asset information systems support collaboration between several parts of the organizational structure so that information collection can be mutually beneficial.

Management information systems are a key pillar in organizational transformation and change in the context of digital business [28]. Trend of digital businesses focuses on consistency and willingness to share information, with the ultimate goal of increasing customer satisfaction [29]. Therefore, stakeholders in the organization must understand the importance of asset information systems [30]. This important factor is related to the successful implementation of strategies, especially digital transformation strategies. It should be underlined that the state of digital transformation poses risks. Some of the risks that may occur include loss of revenue, increased costs, reduced profits, loss of productivity and adjustments by working staff [31].

3. Research Methodology

This research was conducted at Industrial Engineering Department, University of XYZ Madiun. Research is focused on asset management in lecturers' rooms, classrooms, and laboratories. This research is classified as semi-research (quantitative and qualitative) because it combines the two elements. Observation activities on research continued for 4 months from October 2020 to January 2021. The flow of this study can be seen in Figure 2.

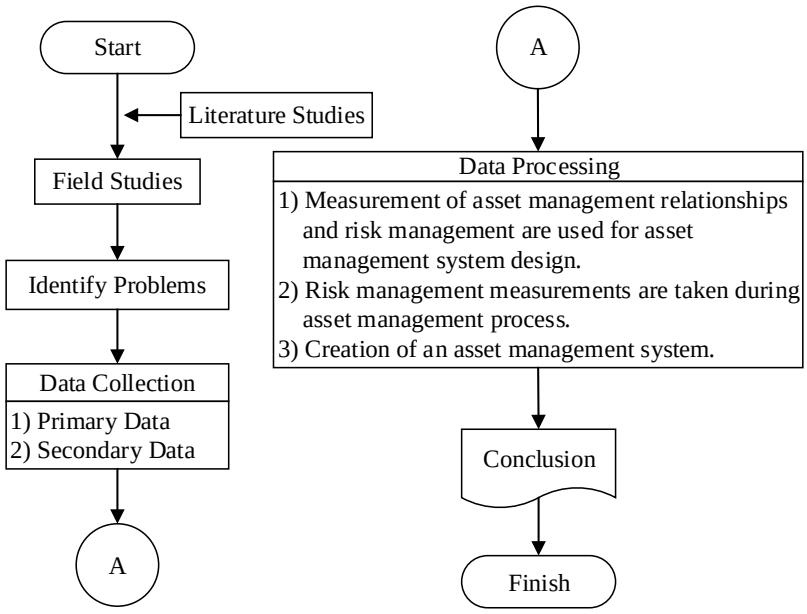

Figure 2 Research Steps

This research begins with literature studies and literature studies on problems that are still related to problems in research. Problems identification is done after stages of literature studies and literature studies are completed. Problems identification can be known to study problems in research. Data collection takes place at the end of the problem identification stage. Data collection aims to collect information in the form of both historical and observational data. The results of data collection are then processed.

Data processing is carried out in 3 stages. The first stage is to take measurements of asset management relationship towards risk factors and asset management system's design. The scope of respondents is everyone at the Engineering Faculty, consisting of lecturers and laborers. Selection of lecturers and laborers to get best verdict from the relationship. The second stage is risk management measurement for the asset management process, which has not been good. The third stage is the creation of an asset management information system to facilitate the asset inventory process at the Industrial Engineering Department, University of XYZ Madiun. The last step is a conclusion drawn from the research results of what has been conducted.

4. Results and Discussions

Data collection is carried out by census to all lecturers in the scope of Engineering Faculty, University of XYZ Madiun which consists of 5 majors namely informatics engineering, information systems, electrical engineering, chemical engineering, and industrial engineering. Respondent numbers are 40 people. Initial measurement process is carried out measuring influence of Asset Management (AM) and Risk Management (RM) on the design of Information Systems (IS) asset management through relationship model in Figure 3. Initial measurements are used Structural Equation Modeling (SEM) methods.

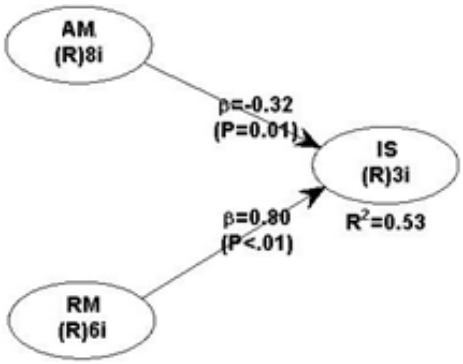

Figure 3 Criteria Relationship Model

SEM measurement is divided into 3 stages. Initial stage is calculated outer model. Model outer results are known that loading value, Average Variance Extracted (AVE) value, Composite Realiability (CR) and discriminant validity test have met the limits specified under Table 1. Second stage is to test inner model. Inner model reults are known that AM and RM have a positive effect on IS with p *value* < 0,05 so as to explain variation from variables reaching 53,4 %. Effect size of the AM in IS is worth 0.15 classified as medium while RM in IS is worth 0.684 is quite high based on practitioner views. Third stage is to test significance influence. Significance influence results show values of APC and ARS signification at < 0.05 and AVIF < 5 so that proposed model has been fit.

Table 1 SEM Measurement Results

Testing	Test Results				
Outer Model	Loading value > 0,7				
	MA1 > 0,7 (0,964 > 0,7)	MA2 > 0,7 (0,964 > 0,7)	MA3 > 0,7 (0,964 > 0,7)		
	MA4 > 0,7 (0,964 > 0,7)	MA5 > 0,7 (0,964 > 0,7)	MA6 > 0,7 (0,957 > 0,7)		
	MA7 > 0,7 (0,957 > 0,7)	MA8 > 0,7 (0,957 > 0,7)			
	MR1 > 0,7 (0,970 > 0,7)	MR2 > 0,7 (0,927 > 0,7)	MR3 > 0,7 (0,927 > 0,7)		
	MR4 > 0,7 (0,927 > 0,7)	MR5 > 0,7 (0,928 > 0,7)	MR6 > 0,7 (0,858 > 0,7)		
	SI1 > 0,7 (0,876 > 0,7)	SI2 > 0,7 (0,879 > 0,7)	SI3 > 0,7 (0,922 > 0,7)		
	Average Variance Extracted (AVE) value > 0,5				
	MA > 0,5 (0,924 > 0,5), MR > 0,5 (0,853 > 0,5), SI > 0,5 (0,797 > 0,5)				
	Composite Realiability (CR) value > 0,7				
	MA > 0,7 (0,990 > 0,7), MR > 0,7 (0,972 > 0,7), SI > 0,7 (0,922 > 0,7)				
	Discriminant validity testing				
	$\sqrt{\text{AVE MA}}$ > AM correlation value with RM, AM correlation value with IS 0,961 > 0,511; 0,965 > 0,146				
	$\sqrt{\text{AVE MR}}$ > RM correlation value with AM, RM correlation value with IS 0,923 > 0,511; 0,923 > 0,745				
	$\sqrt{\text{AVE SI}}$ > IS correlation value with AM, IS correlation value with RM 0,893 > 0,146; 0,893 > 0,745				
Inner Model	Influence	Path Coefficient	P Value	R Square	Effect Size
	MA => SI	-0,316	0,014	0,534	0,150
	MR => SI	0,796	< 0,001		0,684
Significance influence	Average Path Coefficient (APC) =0,556, P < 0,001				
	Average R-Squared (ARS) = 0,534, P < 0,001				

Average block VIF (AVIF) = 1,044 acceptable if <= 5, ideally <= 3.3

Management on assets can be a risk to industrial engineering department at University of XYZ Madiun. Risk data in this study was obtained by questionnaires. Risk factors are obtained with two stages of questionnaire distribution. Open questionnaire results can be obtained information related to asset risk. Second stage is core questionnaire. Core questionnaire results are used for asset risk assessment. Risk management in this study is divided into 3 stages, namely risk identification, risk assessment, and risk management.

Identification of risks from asset management into information systems is obtained from predecessor questionnaires. Risk identification process uses the Risk Breakdown Structure (RBS) method. RBS method helps identification process become simpler through risk categories into more specific sub-risks based on level orders [32]. Risk identification results can be seen in Table 2. Risk identification results are obtained 2 risk indicators and 17 sub-risks.

Table 2 Risk Identification Results

Level 0	Level 1		Level 2		Level 3	
Asset management risk becomes information system form	I	Sistem pengelolaan aset berjalan belum baik	I.A	The systems are not yet integrated.	I.A.1	Difference in asset encoding.
			…	…	…	…
					I.A.5	Asset management process is still paper document.
			…	…	…	…
			I.C	Assets have not been optimally utilized.	I.C.3	Increase costs in asset management..
	II	Asset workers make human errors.	II.A	HR is not used to system renewals.	II.A.1	Additional training for new users.
			…	…	…	…
			II.B	Negligence and indiscretions in asset management.	II.B.4	Lack of understanding and planning in asset management.

Risk assessment uses risk matrix method. Risk assessment is measured based on risk level by calculating the opportunities and impacts that come from core questionnaire [33]. Core questionnaire were obtained based on answers from the expert person, namely the lecturer of course at Engineering Faculty, University of XYZ Madiun. Table 3 shows risk measurement results. Risk level from asset management can be seen in Figure 4. Risk category is classified as low numbering 8, risk is classified as moderate number 5 and risk is classified as high numbering 4. Risk selection is limited only to sub-risks that are classified as high risk based on recommendations from Industrial Engineering Department, University of XYZ Madiun.

Table 3 Risk Level in Asset Management when is Changed to Information System Form

Number	Risk Variable	Value		Risk Level	Assessment Scale
		Probability	Impact		
1	Difference in asset encoding.	4	4	16	High
2	There have been many corrections.	2	4	8	Medium
3	Asset condition, asset location and asset procurement will be difficult to know.	1	1	1	Low
…	…	…	…	…	…
15	Asset maintenance is not regularly scheduled.	5	2	10	High
16	Operators don't understand how to treat idle assets.	4	1	4	Low

Number	Risk Variable	Value		Risk Level	Assessment Scale
		Probability	Impact		
17	Asset planning has not been implemented properly.	4	2	8	Medium

Risk response results are divided into 3 categories, namely triggers, probability and contingency plans. Trigger column contains why critical risks can arise. Probability column contain what things will be done if asset management risk becomes form of information system. Contingency plan contains actions so that the risks are not repeated. Table 4 shows risk response results. Risk response results are known to have 9 critical risk triggers, 8 possible critical risk management plans and 8 contingency plans.

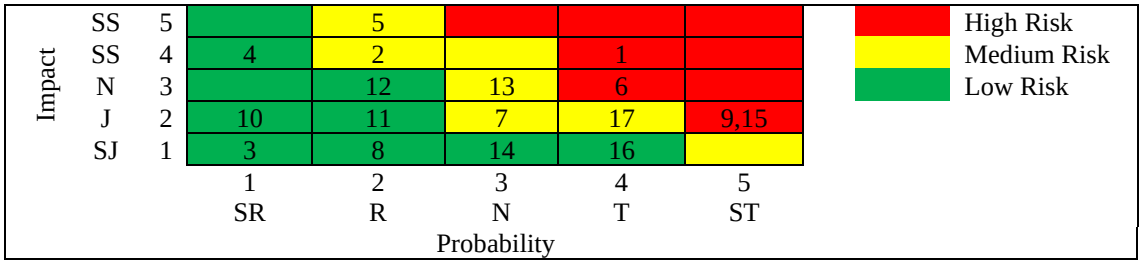

Figure 4 Risk Position from Risk Matrix Results

Table 4 Critical Risk Response in Asset Management when is Changed to Information System Form

Risk Response	Trigger	Probability	Contingency Plan
Difference in asset encoding	1) There was no coordination among staffs 2) Inaccuracy when new assets are added.	1) Avoid 2) Reduce	1) Assets are checked periodically, at least once every month. 2) Staff look guidebook when doing asset records.
When assets are audited, there are numerous findings	1) There is a difference in amount and realization of assets. 2) Recording error.	1) Switch 2) Reduce	1) New assets are assigned different codes. 2) Similar assets are placed in the same location.
Asset damage	1) Assets are rarely used. 2) Assets are incorrectly placed when they are used. 3) Assets are used without the correct procedures.	1) Share 2) Avoid	1) Periodic asset checking. 2) Staff are given knowledge of asset management before asset is received by office.
Asset maintenance is not regularly scheduled	1) The use of asset is not being monitored. 2) Assets are rarely serviced and components replaced.	1) Reduce 2) Retain	1) Assets are serviced regularly. 2) There is a schedule for the use of assets.

Table 5 Examples of Contents from QR Code-Based Check Sheets

Goods Name	Quantity	Goods Code	Goods Number	Goods Location	Purchase Date	Goods Age	Service Time	QR Code
…	…	…	…	…	…	…	…	…
Hand Grinding Machine	2	P1	P1_1	Manufacturing Systems and Product Design Laboratory	10 July 2018	5 years	6 months	
…	…	…	…	…	…	…	…	…

Previous measurement results required asset information system with criteria such as integrated, easy management and easy data updates. Asset information system that matches these criteria is QR code-based check sheets. QR codes are affixed to item that becomes asset. Table 5 is one example of asset system planning at Industrial Engineering Department, University of XYZ Madiun. QR code contents in these research results are goods name, goods number, goods code, goods location, purchase date, goods age, and service time. QR code results are easy when we look for assets and we know assets condition during accreditation process at Industrial Engineering Department, University of XYZ Madiun. QR codes can be easily tracked with QR code application on the smartphone.

Measurement results based on data processing show that the relationship between asset management and risk management has an effect on asset information system model. Model measurement with SEM methods is obtained APC and ARS values worth < 0.05 and AVIF < 5, so that the relationship between criteria in asset management and risk management has a significant influence on design of asset management information systems. Asset management will have some risks. Risk management results are obtained for four critical risks, namely: differences in asset coding, many findings when audited, asset damage, and periodic unscheduled asset maintenance. The results of four critical risks are considered in an asset management system that has criteria such as cheap, easy, and can be used by ordinary people. One of them is used QR code-based check sheets. In a simple context, QR code-based check sheets are easier to revise than database systems in asset management. QR Code makes verification process easy [34]. New data can be done with microsoft excel only without coding improvements. Therefore, QR code-based check sheets are applied more easily to a small scope on assets in Industrial Engineering Department, University of XYZ Madiun.

5. Concluison

The conclusion of the research results is known that relationship between Asset Management (AM) and Risk Management (RM) in design of Information Systems (IS) has a positive effect. This is indicated by the APC and ARS signification values at values of 0.05 and AVIF 5. Risk management results there are high category risks, namely: differences in asset coding, many findings when audited, asset damage, and periodic unscheduled asset maintenance. Considerations in asset management are integrated, easy management, and ease of updating data, and then QR code-based check sheets are selected based on those criteria. In the future, it is expected that there will be additional parameters and respondents to model measurements in the SEM method. Risk management analysis requires additional cost parameters when asset management becomes a database system. There are other alternatives to asset management systems that use QR code-based check sheets that are more integrated.

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