Analysis of Maintenance Management Implementation and Strategy: A Case Study of Airport Maintenance Management in Indonesia

Aqil Athalla Reksoprodjo, Bonang Ananta and Haikal Rastinggi
Department of Industrial Engineering
University of Indonesia
Salemba, Indonesia
aqil.athalla@ui.ac.id, bonang.ananta@ui.ac.id, haikal.rastinggi@ui.ac.id

Abstract

In this research, we want to examine maintenance management for the building / building field, especially in this case it is maintenance for airports. The research focuses on implementing a strategy of digitizing airport maintenance. We want to check whether it is necessary to digitize airport maintenance, and focus on digitizing such maintenance. The research will be carried out by conducting surveys to people who work in airport management companies, from the survey results obtained, then we will determine how important digitalization is in airport maintenance management. The end results of this research will be a recommendation of how to implement an digitalized airport management system, and what strategy should be adopted to digitalize the airport maintenance management system.

Keywords
Predictive Maintenance, Maintenance 4.0, Airport, BIM (Building Information Modelling) and Information System.

1. Introduction
Maintenance is one of the important keys to the successful operation of a facility, equipment, and building. Poor maintenance systems are a very big problem in the industrial world, especially in the building and construction service industry. Therefore, in the current era, all operators of facilities, equipment, and buildings need good maintenance management to overcome the main problem. The main objective of Maintenance Management according to Au-Yong et al., (2014b), is to reduce and even anticipate *reactive maintenance* by planning and carrying out maintenance properly using materials and equipment that are timely, appropriate, and targeted. Usually, when a building operator does not have a targeted maintenance strategy caused by several factors such as the absence of equipment performance standards, lack of equipment performance monitoring data, and others; then the activities of planning and carrying out maintenance will be difficult to carry out. All of these factors are preventive efforts to carry out reactive maintenance which in fact will cause more costs than preventive maintenance. So today, companies will strengthen the preventive maintenance system to improve the performance of the equipment.

Maintenance is crucial for companies today. Damage can occur in equipment that is minimal for maintenance which will then lead to repairs which results in the functionality of the tool not being in accordance with the original capacity, so maintenance is needed to prevent this from happening (Nurcahyo et al., 2022). When a company is unable to maintain the performance and performance of these characteristics, it will be more difficult for the company to compete in this digitalization era. All companies are competing to improve the efficiency and effectiveness of maintenance activities by always monitoring the performance and performance of the above characteristics, and industry players also make innovations or breakthroughs to improve company performance, especially in the field of maintenance. The innovation that is most done by none other than is technology-based innovation with the concept of Industry 4.0. The impact of the Industry 4.0 concept itself is the digitalization and automation of the amount of magnitude in all systems in a company, not to be separated from the maintenance system. The 4.0-based Maintenance System will greatly help management to monitor and develop maintenance activities, especially preventive maintenance, to make it better and more detailed (Šváb et al., 2019)..

Airport service management companies are one of the companies that need to digitize the maintenance system because the airport itself has several equipment and facilities that are very important to support flight operations and also aviation safety. Thousands of such equipment are required to be carried out for regular maintenance. With a large quantity and high standards applied to flight operations, it will be very difficult to maintain equipment performance and Preventive Maintenance characteristics at a good level without the help of system digitalization. The introduction of information systems to help with this has advantages in the context of costs, the level of aviation security, has consistency in terms of resource allocation and maintenance scheduling (Guerra de Oliveira et al., 2019). This journal will tell about how employees understand and assess the importance of preventive maintenance characteristics and how important digitalization needs to be done. After the answer is known, the author will suggest a 4.0-based preventive maintenance system as an effort to maintain equipment performance.

1.1 Objectives
This study aims to determine the characteristics of preventive maintenance in airport facility maintenance and to investigate the need of digitalized maintenance system of airports in Indonesia.

2. Literature Review
2.1 Preventive maintenance
Preventive maintenance is a key to success to ensure effectiveness, reliability, and certainty of a machine working in optimal conditions (Chua et al. 2018; Au-Yong et al. 2014; Basri et al. 2017). However, in carrying out a preventive maintenance (PM), it is necessary to focus on several aspects and characteristics in the PM itself so that its implementation can run optimally. According to several references, the characteristics of PM itself are divided into several points based on the things that most affect the performance of a maintenance, namely:
- Labored Skills
- Spare Parts and Materials
- Maintenance Downtime
- Planned Interval for Maintenance

According to Ahmad and Kamaruddin (2012), Preventive Maintenance has 2 categories that are commonly used, namely Condition-Based Maintenance and Time-Based Maintenance. Time-Based Maintenance (TBM) is a traditional periodic-based maintenance technique. The estimated maintenance time is determined based on failure time analysis. In other words, the time is estimated by processing failure-time data and TBM assumes that the failure behaviour of the equipment is predictable. While Condition-Based Maintenance (CBM) is a maintenance program that plans maintenance based on information collected through the condition monitoring process. The lifetime of the equipment and its components is monitored through the condition of the equipment while it is operating by measuring several parameters such as vibration, temperature, lubricating oil, contaminants, and noise levels. The background of CBM implementation is that 99 percent of equipment failures begin with the emergence of some indications that damage will occur. CBM is also widely applied by several companies to get lower life cycle costs, catastrophic failure avoidance, etc.

2.2 Preventive maintenance characteristics
The labor factor is a factor that plays an important role in preventive maintenance activities (Chua et al. 2018). For the labor factor, there are three aspects that need to be considered to achieve optimality of maintenance activities, namely wages from the workers involved, qualifications and expertise of the workforce and the availability of labor for maintenance activities (Chua et al. 2018; Au-Yong et al. 2014). Of the three aspects, the expertise and qualifications of the workforce are points that need to be considered mainly because to get maximum output and prevent errors in maintenance activities (Chua et al. 2018; Au-Yong et al. 2014). Fatoni et al. (2018) said that the skills and competencies of the maintenance team are the main concerns in terms of maintenance management.

The next factor is spare parts and materials where factors also play a role that is no less important than the labor factor (Chua et al. 2018; van Horenbeek et al. 2012). This is because each component in the equipment or system has its own service life and a replacement component is needed to still ensure that the tool or system runs properly (Chua et al. 2018). In the spare parts factor, there are three aspects that play a role, namely the allocation of spare parts procurement budget, availability of spare parts and quality of spare parts (Au-Yong et al. 2014). The important role of spare parts is inseparable from the aspect of budget allocation which is the largest factor in determining expenditures for maintenance activities (Chua et al. 2018; Au-Yong et al. 2014; van Horenbeek et al. 2012).

Then the next factor is the scheduling of maintenance intervals. Scheduling also plays a role in maintenance because scheduling is carried out to prevent the risk of damage and conduct periodic checks (Chua et al. 2018). Proper scheduling is very necessary to obtain optimization of the lifespan of a component in a tool or system (Chua et al. 2018). There are two aspects to the interval factor, namely the allocation of additional budgets for the procurement of subcontractors and the scheduling of routine inspections (Au-Yong et al. 2014).

The last factor is downtime where downtime needs to be considered specifically because when the maintenance process is ongoing, the tool or system being processed can experience disruptions in the optimal function of the tool or system so that it cannot be used optimally (Chua et al. 2018). This downtime must be predictable to be able to determine how long the time for a tool or system cannot be used temporarily and (Chua et al. 2018). There are two aspects to downtime, namely the allocation of additional budgets and minimization of failures during downtime (Au-Yong et al. 2014).

Thus, by explaining the characteristics of preventive maintenance, it can be considered specifically in the future for planning maintenance activities. All factors, both labor, spare parts, intervals and downtime both have an important role and complement each other.

2.3 Digital Innovation for Maintenance

Lin & Su, (2013) conducted research on *Developing Mobile- and BIM Integrated Visual Facility Maintenance Management System.* In the study, they talked about a new *facility maintenance management* (FMM) method using *Building Information Modeling* (BIM) technology. Set in Taiwan, the system was implemented to determine the effectiveness of the BIMMFMM (*BIM-based facility maintenance management*) method in the implementation of FMM. It is hoped that with BIMMFMM, maintenance staff can review and update maintenance activities into 3D BIM format. The result obtained is that BIMFMM can be *an effective visual tool* for the application of FMM.

Miah et al (2020) in her research discussing street maintenance management systems at airports tries to discuss several things that must be considered in the maintenance of runways at airports. In their research, they argued that to achieve good runway maintenance requires help from specialized *software* that focuses on runways. The *software* records the repairs that have been made, in which parts the repairs are carried out, to schedule and determine the ordering of the parts needed in runway maintenance, using special *software*, making runway maintenance more controlled.

The same thing about special *software* for runway maintenance was also discussed by Di Mascio (2019) in his research, it was found that a runway maintenance approach is needed so that airport workers can control the condition monitoring of the runway. It is stated that the use of *software* can improve the ability of workers to monitor the condition of the runway at the airport. The use of *software* can also make better scheduling of runway maintenance, as discussed by Babashamsi (2022) that by using LCCA or *Life Cycle Cost Analysis*, it can be determined when is the best time to carry out runway maintenance. This refers to the frequent discovery of maintenance scheduling that is not on time, or not yet timely, so that maintenance that is carried out prematurely will make the company more wasteful in spending money to carry out maintenance and make maintenance less effective. This is in line with the research conducted by Ragusa (2022) In his research, it was explained that to improve the accuracy of runway maintenance planning, it is necessary to use special algorithms, algorithms are needed to reduce company losses caused by poor maintenance planning.

Šváb et al. (2019) conducted research on the use of *information systems* in *winter airport maintenance.* The information system is used to coordinate and plan airport maintenance activities during the snowy season. The most important thing in this study is how the authors want to find a key component to the success of airport maintenance during the snowy season. Park et al. (2014) conducted research on *identification of applications of mobile devices to ImprAirport BHS Maintenance.* This research tells about the development of a mobile device-based application to run facility maintenance operations on BHS (Baggage Handling System) equipment. The development was carried out by first identifying 26 activities and 6 *phases* of maintenance on the baggage handling system equipment. The results of this research are expected to contribute to the development of Mobile IT Systems for BHS operations and maintenance, especially at the airport.

In practice already many companies have begun to direct their maintenance systems in maintenance systems 4.0 (maintenance 4.0), this maintenance system involves the use of IoT (Internet of Things) in maintenance activities carried out in factories / enterprises. According to El kihel et al.(2022) the use of an IoT-based 4.0 maintenance system will help companies in controlling the economic, risk and environmental sides and can make the company concerned more *sustainable* in its operations. Furthermore, the paper states that the effects that can be obtained by taking the example of companies engaged in the FMCG (*Fast-Moving Consumer Good)* industry, the effects that can be obtained include:

1. Environment: increase the effectiveness of the company in energy use because the company can control energy use in *real-time*
2. Economy: Reduce *losses* that occur due to engine damage, because engine performance can be controlled properly.
3. Social: with the application of maintenance technology 4.0 the company can reduce machine damage, so as to make employees not have to do work that is repetitive in nature, thus making employee morale increase.

3. Methods
The method used in this study is a questionnaire-shaped survey and literature review. The research steps that will be carried out are as follows:
1. Conduct a Literature Review of some of the characteristics of preventive maintenance
2. Conduct a survey of preventive maintenance characteristics
3. Make a proposal for a maintenance system 4.0 to improve the performance of preventive maintenance characteristics

The survey that will be given to respondents contains 8 questions as follows:
1. How important is it for airports to digitalize maintenance? (Scale 1 - 5)
2. What parts of airport maintenance need to be digitalized?
3. What are the factors that can hinder the digitalization of airport maintenance?
4. Do preventive maintenance factors also play an important role in the digitalization of the maintenance?
5. How big is the impact of Labor factor towards the digitalization of the maintenance? (Scale 1-5)
6. How big is the impact of spare parts and material factors towards the digitalization of the maintenance? (Scale 1-5)
7. How big is the impact of the maintenance downtime factors towards the digitalization of the maintenance? (Scale 1-5)
8. How big is the impact of the planned interval factors towards the digitalization of the maintenance? (Scale 1-5)

Questionnaires will be given to approximately 30 respondents. Where the respondent is an employee of one of the airport service operators in Indonesia.

4. Data Collection
Our team used a questionnaire for data collection for this paper. We asked 30 respondents that work in the airport industry about their opinion regarding the digitalization of maintenance in airports. Our data collection later will be used to determine the factors that need to be viewed when companies want to apply digitalization in airport maintenance. After given the respondent the questionnaire, here are the result of the questionnaire distributed:

Table 1 Respondent 1-10

No	Question	Responden									
		1	2	3	4	5	6	7	8	9	10
1	How important for airports to digitize maintenance ? (scale 1 - 5)	4	5	4	3	4	4	5	5	5	5
2	What parts of maintenance need to be digitized ?	Schedule	Budget	Schedule	Budget	Spare part	Repair	Report	spare part	spare part	Schedule
3	What are the factors that can hinder the digitization of airport maintenance?	Managerial	Money	Money	Money	Money	Human	Human	Managerial	Regulation	Managerial
4	Do preventive maintenance factors also play an important role in the digitization of maintenance ?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
5	How big is the impact of labor factor towards the digitalization of the maintenance ? (scale 1 - 5)	4	4	5	4	5	5	3	4	4	5
6	How big is the impact of spare parts and material factors towards the digitalization of maintenance ? (scale 1-5)	3	4	3	5	5	5	4	4	4	4
7	How big is the impact of the maintenance downtime factors towards the digitalization of maintenance ? (scale 1-5)	5	4	4	4	5	5	3	4	4	5
8	How big is the impact of the planned interval factors towards the digitalization of maintenance ? (scale 1-5)	4	3	4	3	4	5	4	5	4	5

Table 2 Respondent 11-20

No	Question	Responden									
		11	12	13	14	15	16	17	18	19	20
1	How important for airports to digitize maintenance ? (scale 1 - 5)	3	4	4	4	5	5	5	4	4	4
2	What parts of maintenance need to be digitized ?	History record	Analysis	Budget	Schedule	Spare parts	Spare parts	Overhaul	Repair	Data analysis	Repair
3	What are the factors that can hinder the digitization of airport maintenance?	Human	Human	Money	Human	Managerial	Managerial	Human	Money	Money	Regulation
4	Do preventive maintenance factors also play an important role in the digitization of maintenance ?	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	No
5	How big is the impact of labor factor towards the digitalization of the maintenance ? (scale 1 - 5)	4	4	4	5	5	4	5	4	4	5
6	How big is the impact of spare parts and material factors towards the digitalization of maintenance ? (scale 1-5)	5	4	4	5	5	5	4	4	4	5
7	How big is the impact of the maintenance downtime factors towards the digitalization of maintenance ? (scale 1-5)	3	5	5	5	3	4	5	5	4	3
8	How big is the impact of the planned interval factors towards the digitalization of maintenance ? (scale 1-5)	5	4	4	5	4	5	5	4	4	4

Table 3 Respondent 21-30

No	Question	Responden									
		21	22	23	24	25	26	27	28	29	30
1	How important for airports to digitize maintenance ? (scale 1 - 5)	3	2	4	4	5	5	3	4	4	5
2	What parts of maintenance need to be digitized ?	Budget	Report	Data analysis	Data analysis	Spare parts	Schedule	Overhaul	Analysis	Budget	Spare part
3	What are the factors that can hinder the digitization of airport maintenance?	Money	Managerial	Managerial	Money	Human	Regulation	Money	Human	Money	Managerial
4	Do preventive maintenance factors also play an important role in the digitization of maintenance ?	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
5	How big is the impact of labor factor towards the digitalization of the maintenance ? (scale 1 - 5)	4	3	4	4	5	5	3	4	4	5
6	How big is the impact of spare parts and material factors towards the digitalization of maintenance ? (scale 1-5)	3	3	4	3	5	4	4	3	4	5
7	How big is the impact of the maintenance downtime factors towards the digitalization of maintenance ? (scale 1-5)	3	4	4	5	5	4	4	5	4	4
8	How big is the impact of the planned interval factors towards the digitalization of maintenance ? (scale 1-5)	4	4	5	4	3	5	4	4	4	5

Tables 1, 2, and 3 show the results of the questionnaire survey of 30 respondents that have been collected and recorded. As previously known, the questions given are 8 with details of questions 2 and 3 djiawab with the essay method while the rest are answered using a likert scale (1-5). The survey was taken to airport employees in 3 locations, namely Soekarno-Hatta International Airport, Halim Perdana Kusuma Airport, and Husein Sastranegara Airport.

5. Results and Discussion

Our first questionnaire, we asked the 30 respondents about "how important that they think for an airport to digitize their maintenance activity" In this question, it include the daily activity for maintenance itself, starting from reporting, scheduling, and other activity that had been done by the maintenance team daily. We asked the respondent to give a score base from 1 - 5. The scale we used means:

1 : Not necessarily
2: Needed but low priority
3 : Needed but middle priority
4 : Needed and high priority
5 : Urgent , need to apply fast

As seen in the pie chart in Figure 1, it can be seen that 46% of respondents chose scale 5, 40% chose scale 4, 11% chose scale 3, 3% chose scale 2 and 0% chose scale 1. Based on the survey, it can be concluded that most of the people thinks that it's important to do digitalization in maintenance area. Many of the respondents feel the urge for maintenance airport to go digital
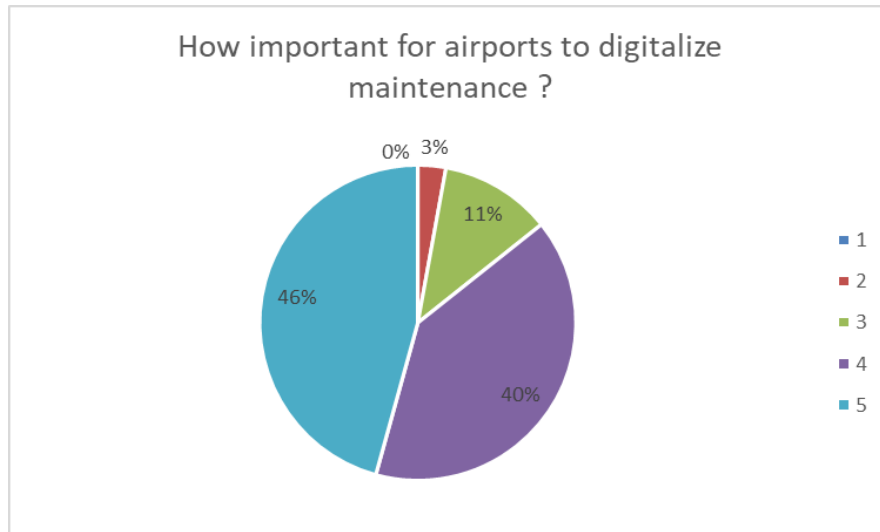
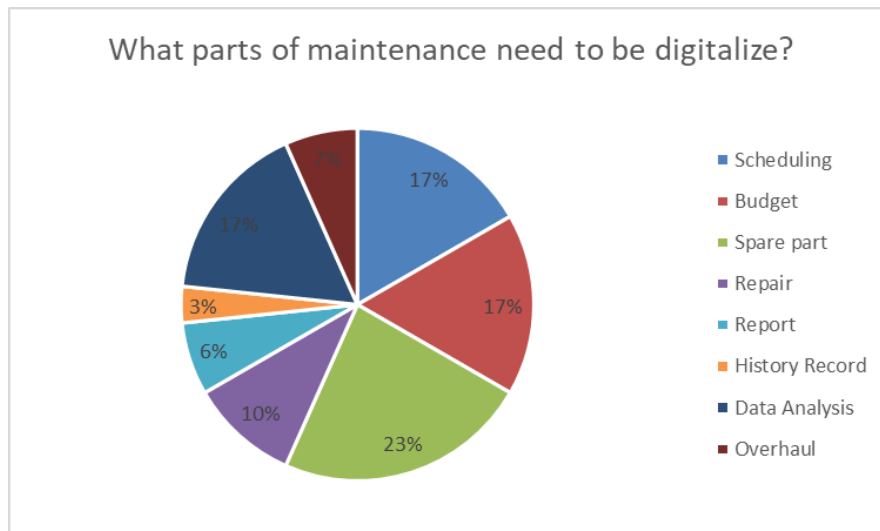Figure 1. The Importance of Airport to Digitalize their Maintenance Responden Results

Figure 2. The Part of Maintenance that need to be digitalized Responden Results Chart

On our second question, we asked 30 respondents about "which parts of maintenance that they think need to be digitized?" This question's objective is to let the focus of maintenance digitalization be based on the urgency needed. As we know that the digitization process needs time for creating the program to implement in the fields. So knowing which part to focus on is important, as to keep the efficiency of the project. The order of the number of respondents was 23% in the spare part section, 17% budget function, 17% Scheduling, 17% Data Analysis, 10% repair function, 7% overhaul function, 6% report and 3% history record as seen on Figure 2.

Based on our respondents, we do find that 23 % of the respondents think that digitalization of spare part is important to do. What included in spare parts digitalization are :
1. Recording of spare parts usage
2. Spare parts forecasting
3. Spare parts repair analysis
4. Spare parts record
5. Other activity that include in spare parts activity and distribution

Many of the respondent thinks that the spare parts is played such an important role in maintenance activity, so it became the reasons to put spare parts to be digitized at the first place.
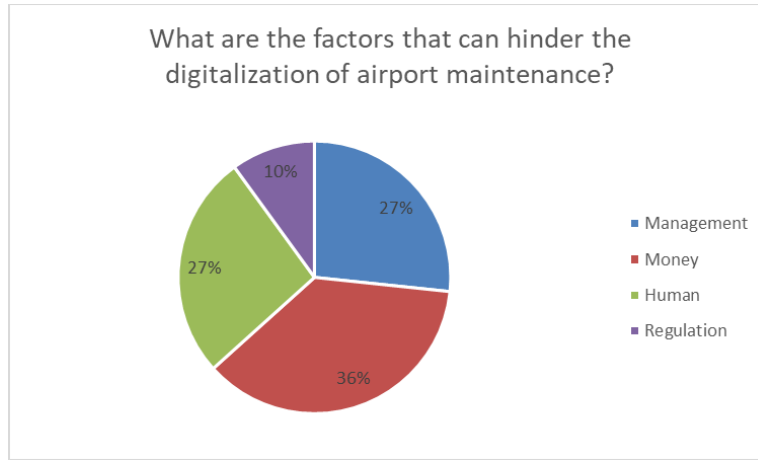

Figure 3. The Factors that can hinder the digitalization of airport maintenance Responden Results Chart

The third question we asked our respondents "What are the factors that can hinder the digitalization of airport maintenance". The objective of this question is to identify the main factors that can affect the airport maintenance digitalization. We want to make sure that if we apply digitalization, we want the implementation process run smoothly, so identifying the main factors that can hinder the digitization process is important. Based on figure 3, 36% of respondents answered money, 27% human, 27% management, and 10% regulation.

After asking our respondent, we got that the majority of the respondents (36 %) thinks that money is the main issue in the implementation process of airport maintenance digitalization. Because it needs quite a lot of money to create a complete digital maintenance system. During the implementation process, it also had a risks of failure in the middle of process or trouble, so that factor also can create an increase in budget of the digitization project.
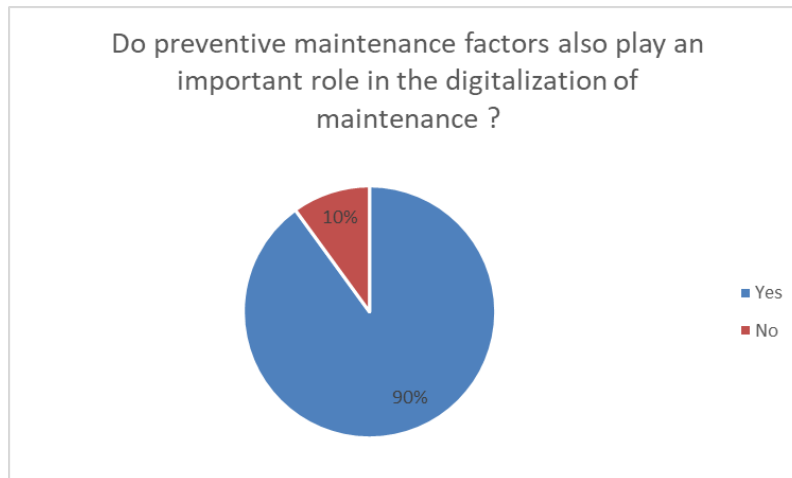

Figure 4. The Importance of Preventive Maintenance Factors in Digitalization of Maintenance Responden Results Chart

In our fourth question, we asked our respondents about "the importance of preventive maintenance in maintenance digitalization". As we can see in the graphic above, almost all of our respondents do agree that preventive maintenance had an important role in airport maintenance digitalization. In figure 4, 90% of respondents revealed

that preventive maintenance factors play an important role in the digitalization of maintenance and the rest answered no.

Most of the respondents told us that preventive maintenance should or need to be a main part of the digitization process, because it's different from reactive maintenance that focuses more on the work in fields. Preventive maintenance used data in their daily activity, so finding ways to use the maintenance data they had more efficiently is important.
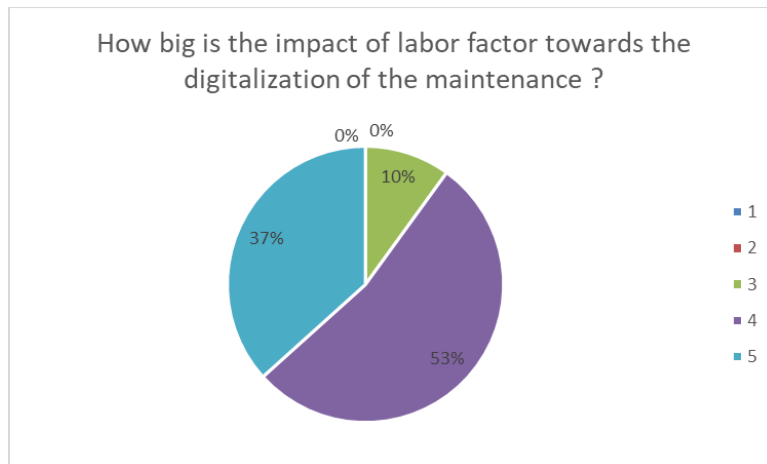

Figure 5. Labor Factor Impact Towards Digitalization of Maintenance Responden Results Chart

Based on the data from figure 5, we can conclude that 53% the majority of the respondents for measuring the impact of labor factor towards the digitalization of maintenance with the scale of 1 to 5 answered 4 and 37% answered 5 and 10% answered 3. The labor factor will be impacted if the digitalization of the maintenance occurs, this will make the labor force in terms of workforce to be more efficient in numbers. However, the complexity of the digital tools for maintenance require certain operating skills by the maintenance operator therefore the labor skill still plays an important part in the digitized maintenance.
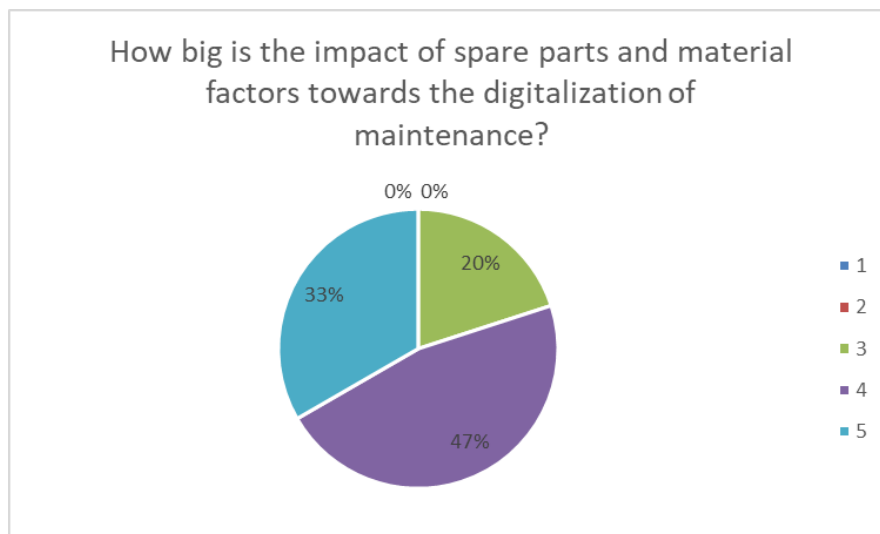

Figure 6. Sparepart and Material Factor Impact Towards Digitalization of Maintenance Responden Results Chart

Based on the data from figure 6, we can conclude that 53% the majority of the respondents for measuring the impact of spare parts and material factors towards the digitalization of maintenance with the scale of 1 to 5 answered 4 and 33% answered 5 and also 20% answered 3. Since maintenance will heavily involve rejuvenating and will still need the availability of spare parts and material even though the maintenance has been digitalized .
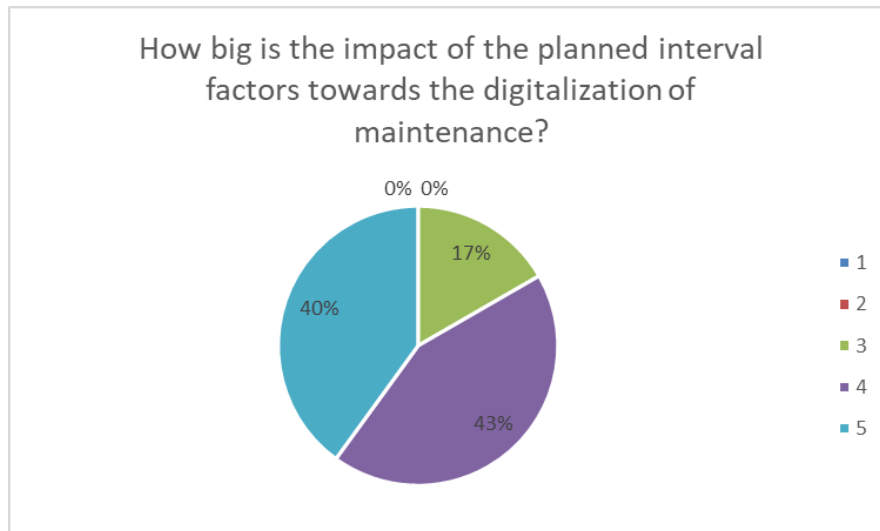

Figure 7. Planned Interval Factor Impact Towards Digitalization of Maintenance Responden Results Chart

Based on the data from figure 7 we can conclude that 43% the majority of the respondents for measuring the impact of spare parts and material factors towards the digitalization of maintenance with the scale of 1 to 5 answered 4 and 40% answered 5 and also 17% answered 3. The planned interval will be much affected by the digitalization, this is because most of the scheduling for maintenance is controlled by the system and mostly based on previous data and reference. Hence, makes the scheduling more efficient and will make the planned interval as well more efficient.
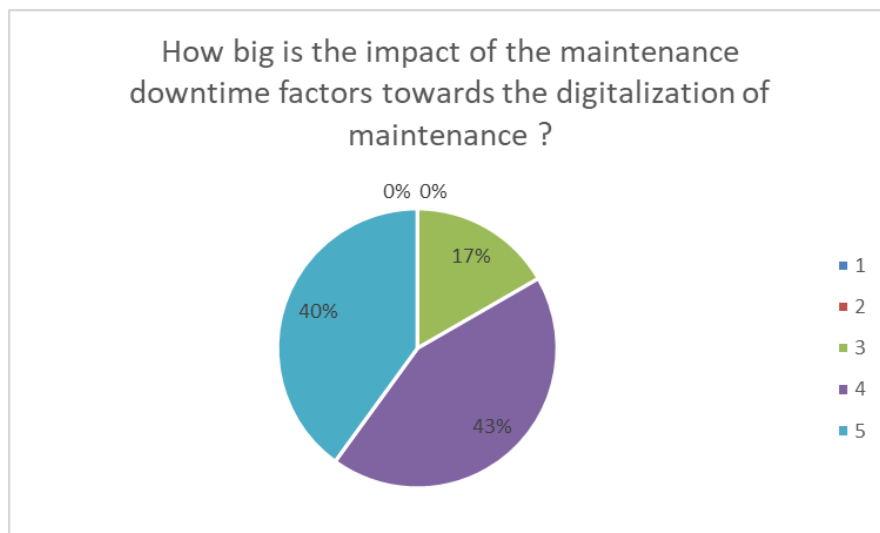

Figure 8. Downtime Factor Impact Towards Digitalization of Maintenance Responden Results Chart

Based on the data from figure 8, we can conclude that 43% the majority of the respondents for measuring the impact of downtime factors towards the digitalization of maintenance with the scale of 1 to 5 answered 4 and 40% answered 5 and also 17% answered 3. With a digitalized system, downtime factor may have an impact. As part of the

preventive maintenance characteristics, downtime will still occur and can affect the maintenance even when it is digitalized.

5.1 Implementation of Computerized Maintenance Management System (CMMS)

Referring to the importance of implementing digitalization maintenance, a platform that functions to carry out maintenance management is needed to make it easier for industry players to record, schedule, and carry out maintenance. CMMS implementation is a technology that functions as monitoring and controlling maintenance management operating systems in a company. Referring to the results of the survey that has been carried out above, employees at airport service operator companies revealed that digitalization is important to be carried out on many of the factors that have been mentioned, namely scheduling, budgeting, spare part management, repair, report, data analysis, etc. The implementation of CMMS aims to maintain the on-going integrity of the facilities, minimize human errors, and maximize the efficiency of facilities. A computer information system enables us to perform many kinds of statistical analyses and may provide diagrams to allow decision-makers to more efficiently obtain the important information for better decision making.

The biggest challenge for maintenance staff has been a lack of sufficient maintenance data for analysis. In addition, with information scattered around in many different systems and idiosyncratic personal recording habits, maintenance staff have often been frustrated while conducting failure and cost analyses. An excellent maintenance management information system should be well equipped with sufficient analytical data and a shared common language for easy access and reference (Hwang et al. 2007). The application of CMMS will also answer the huge impact of several factors that have been asked in the questionnaire above such as worker factors, spare part and material factors, maintenance downtime factors, and interval factors.

5.2 Building Information Modelling

Building Information Modelling (BIM) is a platform that functions to model a detailed picture of buildings and their facilities. BIM can be applied during construction and post-construction. In the post-construction period, BIM is used to manage and inventory all facilities and buildings in detail to find out the maintenance history and technical performance. BIM can be applied as an answer to spare part and material factors; planned interval maintenance factor; as well as the worker factor in building maintenance. When BIM is integrated with information systems both cloud-based and server-based, maintenance management in the above factors will become easier. In the spare part and material factors, the scheduling and maintenance arrangements of each component can be recorded properly and decision-makers can make decisions quickly. For example, the Indonesia Ministry of Public Works and Public Housing's Building has implemented the Building Information Modelling platform which is integrated with a web-based information system. The application of this can improve maintenance performance, integrate information from various sources, automate and facilitate communication between systems and users (Arisanti et al. 2019).

5.3 Maintenance Control Center

The creation of a Maintenance Control Center serves to integrate between maintenance officers and operation officers. This serves to synchronize maintenance activities with operations. The synchronization is expected to help coordinate maintenance activities with operational activities as an effort to optimize equipment performance so that it does not conflict with operational and maintenance activities. In this way, multiple synergies of knowledge will occur between the operating technicians and the maintenance technicians. The organizational and physical separation in the companies between the operation and the maintenance continues to generate dysfunctionalities that prevent the improvement of the results of activity, since the personnel that operate the assets have a deep knowledge of their behavior and of the usual symptoms that precede the failures, and this knowledge is not used by the maintenance staff, unless all resources are shared. Similarly, asset maintenance personnel with technical knowledge can help resolve real-time operational events by providing technical support to operators.

6. Conclusion

After analyzing the data we had from questionnaires on our 30 respondents and literature review about maintenance digitalization, we can conclude that it's important for an airport to have a digitalized maintenance system. The part that needs to be focused on the effort of digitalized airport maintenance is spare part utilization. Meanwhile when trying to implement the new maintenance system, it is important to keep an eye on how the money is spent, so that the project is not overspent. Preventive maintenance needs to be the airport's main priority because there's a lot of activity in preventive maintenance that can be digitized, so the process will be optimal. The digitization process will

make an impact in the use of the labor force because there will be a lot of processes that will be efficient in the long run. It will also make an impact in how the spare part is consumed in the maintenance process and impact how the maintenance will be scheduled. In the end, the airport maintenance digitalization it's important to implement and will made change in the industry process

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Biographies

Aqil Athalla Reksoprodjo currently a graduate student of Industrial Engineering in Universitas Indonesia. Earned his bachelor degree from Universitas Indonesia majoring Naval Architecture. His research interest in information management, information security management and strategic management.

Bonang Ananta is a second year postgraduate student at University of Indonesia, Salemba, Indonesia, majoring in Industrial Engineering, minoring in Industrial Management. He earned his B.Eng (S.T.) in Mechanical Engineering at University of Brawijaya, Malang, Indonesia. His research interests include (but not limited to) strategic management and Multi-Criteria Decision Making (MCDM).

Haikal Rastinggi is a second year postgraduate student at University of Indonesia, Salemba, Indonesia, majoring in Industrial Engineering, minoring in Industrial Management. He earned his B.Eng (S.T.) in Mechanical Engineering at University of Brawijaya, Malang, Indonesia. His research interests are supply chain management, and industrial management.