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FACTORS INFLUENCING AIRPORT PERSONNEL'S USE OF GLOBAL POSITIONING SYSTEM FOR GROUND SUPPORT EQUIPMENT AT KUALA LUMPUR INTERNATIONAL AIRPORT

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Abstract

Aircraft On-Time Performance (OTP) is one of the critical issues in the aviation services performance. A high OTP record indicates operational efficiencies in engineering and maintenance as well as ground handling at KLIA. This research investigates the factors that influence the use of GPS for Ground Support Equipment (GSE) at Kuala Lumpur International Airport (KLIA) in improving the performance service. There are three variables involved in this study that are physical security, relative advantage and perceived ease of use. A hundred and fifty-two individuals with more than twelve years of work experience, spanning from executive to management level, were surveyed. Based on the survey, it was found that, from ease of use and physical security, the adoption of GPS is favorable. This research, which was grounded on the Technology Acceptance Model, finds that the acceptance of GPS technology will create awareness and contribute to the safety culture in the organization.

Keywords: Global Positioning System, Relative Advantages, Physical Security and Perceived Ease of Use, Technology Acceptance Model, Aviation Industry.

1.0 INTRODUCTION

The Global Positioning System has been in growth in view of the fact that the Sputnik age in 1957 (Mai, 2017). GPS employs object placement when a satellite broadcasts in sequence about its spot and current instance at standard intervals. This indication then travels and is captured by a GPS tool to locate an individual's present location utilizing the trilateration method, which has more than 30 satellites orbiting the earth (IPO, 2019). Previous studies have found that the implementation of GPS to the aviation companies had a positive impact and improved their service performance (Mason, 2019).

Ground Support Equipment (GSE) tracking, in particular, is critical whenever aircraft are on the ground. Schulz (2017) asserted that while they were able to identify the type of GSE equipment with ease, they had no idea where it was located or what it was doing. By deploying a tracking device such as a GPS system, each member of staff would be able to instantly know the actual position of the equipment as well as its serviceability state via mobile apps and the web. The use of GPS improves the OTP rate by making it easier to identify, maintain and monitor the equipment which in alternate gives to an add to in staff productivity (AeroDarat, 2019). Therefore, it is significant to take out investigate on the acceptance of Global

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Positioning System, in order to determine how it can benefit the related industry.

2.0 LITERATURE REVIEW

In the aviation industry, especially commercial airlines, the Aircraft On-Time Performance (OTP) is not only vital but also critical. On-Time means arriving or departing within 15 minutes of the allotted time (OAG, 2019). As a crucial indication of service performance, the OTP indicates the company's performance (airlines and airport). Ground Support Equipment (GSE) resource optimization, aircraft ramp damage avoidance, and ground staff incident and accident minimization are only a few of the factors which contribute to a successful operation. Working scope, pricing, and quality level standard are all aspects of ground handling performance that are determined by the Service Level Agreement (SLA) (Alonso Tabares & Mora-Camino, 2017).

Singapore Airlines and Qantas Airlines are two airlines which have successfully implemented GPS on their ground equipment (Mason, 2019). It was found that the system can re-align the equipment maintenance to the appropriate engine running hours rather than the three-monthly equipment servicing that is currently required. This results in a 10% reduction in fuel costs, a more user-friendly monitoring system, a lower rate of ground collisions, less equipment vandalism, and better resource allocation.

ADS's average service ability rate of position tools at KLIA in 2018-2019 remained at 88 percent, although causative 99 percent of OTP to MAB in 2019 (AeroDarat, 2019). Because of the strict contract structure, failure to satisfy the SLA, particularly while managing FOCA aircraft, results in revenue loss and SLA fines.

Figure 1 depicts the GSE equipment serviceability rate over the last five years (2015-2019), with an average of 86 percent. To ensure that there are no glitches in the operation, a good service ability should always be at 100% serviceability, especially when there is a strong demand for FOCA at KLIA. Failure to meet entire equipment demand would result in flight delays, a tarnished reputation, and a financial risk for the organization. Therefore, the study is relevant and it will further examine how, perceived ease of use, physical security influences and relative advantages the acceptance of GPS in KLIA.

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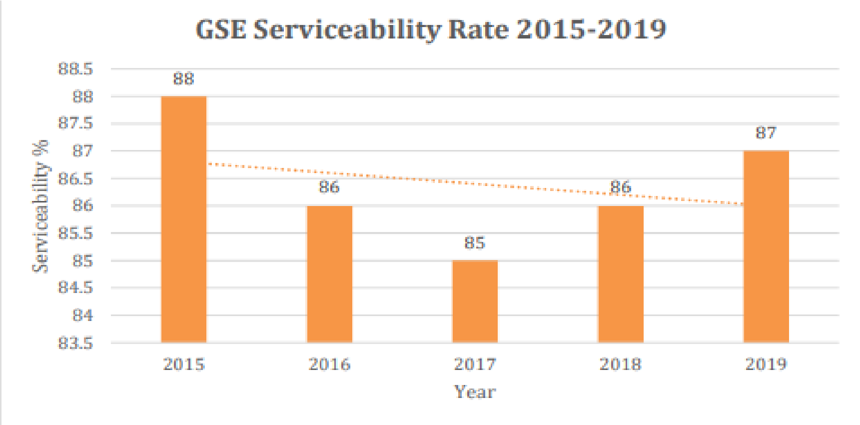

Figure 1: GSE serviceability rate

2.1 Application of GPS in Aviation Industry

The application of GPS in Aviation Industry shows a constructive improvement in most airlines. The Singapore Airport Terminal Services, the main opinion handler and in-flight food service at Singapore Changi landing field, reported that labour accounts for 30%-40% of total operating costs (Hungate, 2018). SATS achieved 9%-13% in productivity over the course of four years by installing the fleet management system, which translates into additional cost savings. According to SATS, the investments they made in recent years are now beginning to yield attractive returns to shareholders. This demonstrates that deploying the GPS system with adequate monitoring will result in cost savings for the organisation as a result of real data recorded and real-time equipment data location supplied, in addition to an increase in employee productivity.

The adoption of GPS by Qantas Airlines', referred to as fleet monitoring system, had a significant impact on the ground equipment, especially on the maintenance component. It also enhanced productivity compared to the previous manual equipment location identification. (Mason, 2019). Qantas Airlines found the fleet monitoring system made it easier for users to locate usable equipment while also saving 10% on maintenance costs after three years of operation.

Improving vehicle fuel usage, according to (Klier et al., 2016), is part of international efforts to combat climate change. The usage of diesel fuel for airport ground equipment would likewise be harmful to the environment. According to (Stancel & Surugiu, 2017), deploying a fleet management system can reduce fuel usage and save money. Furthermore, driver behaviour such as rapid acceleration, rough movement, and consistently exceeding the speed limit will have a substantial impact on fuel consumption per equipment (GPSWOX, 2019).

2.2 Relative Advantages

This study will attempt to show the benefit of the relative advantages of the device or system. Relative advantages, also known as device or system attractiveness (Eisend et al., 2016),

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influences the system's ability to be accepted or rejected. Bandara & Amarasena, (2018) found that having a good relative advantage encouraged the implementation of a new system at the target location, but the awareness of how good the system is must be shared concurrently.

Additionally, they asserted that a fleet tracking system with automatic tracking is unquestionably more convenient than manual tracking, allowing for increased productivity and time savings (Bandara & Amarasena, 2018). This is also demonstrated by the new system's relative advantages, which are always superior to traditional methods, from task monitoring through fully automated work completion (Boamah, 2018). It is therefore clear that, for users, a good system will make their work easier, reduce the time it takes to accomplish tasks, and boost productivity. These benefits will always be an added incentive for users, especially workers, to accept new systems when they are installed in their workplace.

2.3 Perceived Ease of Use

According to Syah and Attiq (2016), people adopt new systems if they are useful and simple to use. This is also supported by Samson & Sumi, (2019) who found that people were more accepting when the system or monitoring platform is user friendly and simple to utilise on a daily basis. Perceived ease of use is critical because it is the primary contributor to every new system implementation that aims to reduce human effort. According to a study by Fischer et al., (2018), the new gadget or new system deployed must be genuinely accurate in the sense of data correctness and the system must be dependable.

This demonstrates that, while the system must be simple to use, the device's longevity, data validity, and accuracy must all be aligned in the same pipeline (Normalini, 2019). This study showed the importance of perceived ease of use on the acceptance of new equipment for the consumer in future. In order to make the system stand out from others and have its own competitive advantages, this variable needs to be substantiated by credible sources of information.

Similarly, according to Permana & Setianto (2019), it is necessary to look at the perceived ease of use of a changeable in order to decide the value of the variable in a investigate study. Thus, perceived ease of use as distinct by the Technology Acceptance Model is suitable for testing in this research, as the respondent's usefulness will be questioned.

2.4 Physical Security

According to Willemsen & Cadee, 2018, physical security of the system device and the system as a whole plays an essential role, which is then linked to the cyber security issue if the prevention source is limited. Furthermore, without sufficient physical protection, users are less likely to employ technology because it disrupts their personal data and records. Physical security systems can also refer to the controlling and monitoring of human-made systems that are regulated by physical laws via computer-based algorithms (Gifty et al., 2019). Thus, the user may need share their personal information, especially data provided by the corporation, in order for their supervisor to watch them via the system.

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Data such as employee identification numbers, the validity of passes, and other information is provided by the organisation. Furthermore, data openness and resistance to manipulation would make the system more secure to utilize (Wang et al., 2019), as the data captured is real-time data that cannot be easily hacked by outsiders. Having a good system but not having a robust security system will result in the system failing. It was further said that a tracking system must always be protectable in order to make certain that the data could not be altered. This will protect industries from unauthorized privacy intrusions (Johnson et al, 2020). Thus, the system security must be foolproof from hacking to ensure that only authorised individuals can access the device or system.

2.5 The Benefits of Adopting the GPS

The adoption of a new system, such as equipment tracking, must take into account the various aspects that influence the systems acceptability level (Edge et al., 2018). Skoumpopoulou et al. (2018) stated that the stronger the user's intention and courage to utilise the new system, the higher the possibility of adoption.

Moreover, Liu et al., 2017 highlighted that besides social influence, the GPS system's functionality plays an essential role. If the device is beneficial, the user is more likely to use the system. Also, adopting a new system must include a technical performance bundle that encourages users to use the gadget (Chhabra et al., 2020).

According to Alonso Tabares & Mora-Camino (2017), by implementing an automation system, a company will benefit from cost savings, workforce optimization, fuel cost savings, and a reduction in the possibility of accidents and human mistake. In order for the system to be widely accepted, it must be dependable, secure, and simple to use for all parties involved. As such, the implementation of GPS must take a range of elements into account, counting relative advantages & reliability, ease of use and physical security, in arrange to ensure user acceptance.

2.6 Technology Acceptance Model (TAM)

The Technology Acceptance Model (TAM2) will be employed in this study. It is an expansion of the Technology Acceptance Model developed by Venkatesh & Davis, (2000), and it is an additional hypothetical assemble incorporating social persuade process and cognitive involved processes (Sullivan, 2016). TAM also aids in understanding why employees accept technology (QUT IFB101, 2015) when the equipment is helpful for their occupation and easy to use. This will next be turned into a want to utilize equipment and finally into a daily habit.

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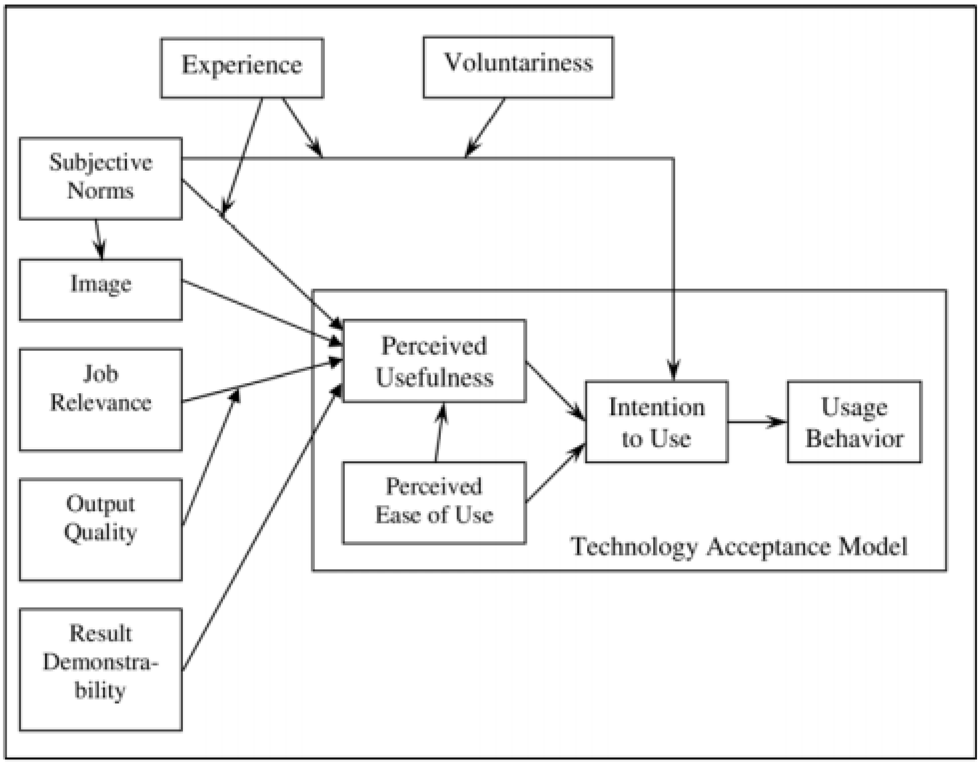

Figure 2: TAM2 model (Sullivan, 2016)

TAM2 will be more helpful for users due to the adding of supporting criteria such as Subjective Norm, and Result Demonstrability, Image Quality, Job Relevance and Output (Sargolzaei, 2017). Acquah et al. (2018) discovered that when a professional's opinion of ease of use of technology grows, so does their perceived usefulness. A positive attitude towards technology is developed when it is easy to use and is useful. Thus, technology must be user-friendly, simple to use, and useful to make daily tasks easier.

Therefore, the next hypotheses are developed:

H_1: Relative advantages have optimistic influence towards the acceptance of Global Positioning System for Ground Support Equipment Department at KLIA.

H_2: Perceived ease of use has an optimistic influence towards the acceptance of Global Positioning System for Ground Support Equipment Department at KLIA.

H_3: Physical security has a positive influence towards the acceptance of Global Positioning System for Ground Support Equipment Department at KLIA.

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3.0 RESEARCH METHODOLOGY

The research was conducted via online survey. The development of the questionnaire was based from previous research (Edge et al. (2018), Skoumpopoulou (2018), Liu et al. (2017), Alonso Tabares & Mora-Camino (2017), and Chhabra et al (2020). The online survey is divided into five parts. Section A includes information on the working section, age, department, gender, and position. There was a total of 152 respondents aged 18 to 60 in a range of positions from executive and operations level. Sections B, C, and D examine the independent variables of, perceived ease of use, physical security and relative advantages. The questionnaires for the dependent variable are contained in Section E.

A question based on a Likert scale with five points was used, with scale grades extending from one (strongly disagree) to five (strongly agree), with one suggesting strongly disagree and five suggesting strongly agree. Convenient sampling was employed to obtain data from workers working in KLIA as the target group (Etikan, et al., 2016). The data was tabulated and analyzed using SPSS software, beginning with the reliability and validity test, then moving on to cross-tabulation, the KMO and Bartlet test, and lastly Multiple Regression.

4.0 RESULTS

4.1 Description Analysis

The sample for this study consisted of 152 employees, as shown in Table 1. The sample was primarily selected from the Ground Support Equipment Department, with the vast majority of the attendees being male were between the ages of 31 and 40, with more than 15 years of experience at Executive and Senior Executive level.

Table 1: Cross-tabulation between age and working experience

Age * WorkingExp Crosstabulation

Count

		WorkingExp						
		0-5 years	6-10 years	11-15 year	16-20 years	20-25 years	26 years and above	Total
Age	18-25 years Old	8	0	0	0	0	0	8
	26-30 years old	27	7	4	2	0	0	40
	31-40 years old	2	19	30	15	0	0	66
	41-50 years old	0	0	8	20	5	1	34
	51-60 years old	0	0	0	1	1	2	4
Total		37	26	42	38	6	3	152

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4.2 Validity and Reliability

Both independent and dependent variables achieved a value of 0.924 on the Kiser-Meyer-Olkin Index of Sampling Adequacy , which can be seen in Table 2, says that the sampling was adequate.. As a result, we can demonstrate that the sampling size (152) is sufficient for further study investigation. A value of 0.05 or less is considered to be noteworthy. This substantiates the reliability of the information that was gathered and the factor analysis is valid.

Table 2: Factor analysis

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.924
Bartlett's Test of Sphericity	Approx. Chi-Square	3115.747
	df	190
	Sig.	0.000

Tables 3, 4, and 5 indicate that all of the independent variables have positive Pearson correlation coefficients when compared to the dependent variable. On the contrary hand, the perceived simplicity of use and the physical security have a greater connection to the adoption of the technology of GPS for GSE at KLIA. This is demonstrated by the Physical Security rating of .725 versus the Relative Advantages value of .597. In comparison to Relative Advantages and Perceived Ease of Use, Physical Security has the most optimistic association with the acceptance of GPS Implementation for GSE at KLIA.

Table 3: Correlation of relative advantages and adoption of GPS

Correlations			
		Relative Advantages- Mean	Adoption of GPS- Mean
Relative Advantages- Mean	Pearson Correlation	1	.597**
	Sig. (2-tailed)		0.000
	N	152	152
Adoption of GPS-Mean	Pearson Correlation	.597**	1
	Sig. (2-tailed)	0.000	
	N	152	152
**. Correlation is significant at the 0.01 level (2-tailed).			

Table 4: Correlation of perceived ease of use and adoption of GPS

Correlations			
		Perceived Ease of Use- Mean	Adoption of GPS- Mean
Perceived Ease of Use- Mean	Pearson Correlation	1	.608**
	Sig. (2-tailed)		0.000
	N	152	152
Adoption of GPS-Mean	Pearson Correlation	.608**	1
	Sig. (2-tailed)	0.000	
	N	152	152
**. Correlation is significant at the 0.01 level (2-tailed).			

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Table 5: Correlation of physical security and adoption of GPS

Correlations			
		Physical Security- Mean	Adoption of GPS- Mean
Physical Security- Mean	Pearson Correlation	1	.725**
	Sig. (2-tailed)		0.000
	N	152	152
Adoption of GPS- Mean	Pearson Correlation	.725**	1
	Sig. (2-tailed)	0.000	
	N	152	152

**. Correlation is significant at the 0.01 level (2-tailed).

The Cronbach Alpha technique is used to determine the reliability of the questionnaire's instruments. As shown in Table 6, all variables have a value greater than 0.70, indicating that the data is reliable.

Table 6: The value of Cronbach's Alpha

Scale and Factors	Items	Cronbach's Alpha
Overall	20	0.963
Relative Advantage	5	0.956
Perceived Ease of Use	5	0.940
Physical Security	5	0.920
Adoption of GPS for GSE at KLIA	5	0.916

4.3 Multiple Regression Analysis

All independent variables provided a significant result with an F- value of 60.498 and a significant and less than 0.05 threshold of p=0.000, according to Table 7. This demonstrates that the model is substantial, with at least one variable predicting the adoption of GPS for GSE at KLIA.

There is no autocorrelation between the observations, according to the Durbin-Watson statistic of 2.180, because the safe value is between 1.5 and 2.5. The resulting R-square value is 0.551, indicating that the predictors explained 55 percent of the variation in GPS adoption, as reported in Table 8.

Table 9 shows that the value of Statistics VIF is less than 10, indicating that there is no difficulty with multi co linearity among the independent variables. Only two of the three independent variables exhibit a significant value where $p \leq \alpha$ (0.05). This demonstrates that perceived ease of use and physical security had a substantial impact on KLIA's decision to adopt GPS for GSE.

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Table 7: ANOVA result for Multiple Regression Test

ANOVA[a]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	22.489	3	7.496	60.498	.000[b]
	Residual	18.338	148	0.124		
	Total	40.827	151			
a. Dependent Variable: Adoption of GPS- Mean						
b. Predictors: (Constant), Physical Security- Mean, Perceived Ease of Use- Mean, Relative Advantages- Mean						

Table 8: Model summary

Model Summary[b]					
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.742[a]	0.551	0.542	0.35201	2.180
a. Predictors: (Constant), Physical Security- Mean, Perceived Ease of Use- Mean, Relative Advantages- Mean					
b. Dependent Variable: Adoption of GPS- Mean					

Table 9: Coefficients Value

Coefficients[a]								
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	1.147	0.261		4.398	0.000		
	Relative Advantages-Mean	0.075	0.080	0.080	0.931	0.353	0.411	2.434
	Perceived Ease of Use-Mean	0.173	0.065	0.202	2.651	0.009	0.524	1.910
	Physical Security- Mean	0.505	0.093	0.525	5.435	0.000	0.325	3.074
a. Dependent Variable: Adoption of GPS- Mean								

The research looked into whether relative benefits, perceived ease of use, and physical security have a helpful effect on the practice of GPS for GSE at KLIA. The following regression model formula was found to be relevant to the current study:

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$$\gamma=\beta 0+\beta 1X1+....+\beta nXn+\varepsilon$$

where:

γ=*Dependent Variable*

Xi=*Independent Variable*

$\beta 0$ *and* $\beta 1$ =*Regression Coefficient*

ε=*Error*

Hence,

Resultant Equation from the analysis is:

Adoption of GPS for GSE at KLIA: 1.147 + 0.173 (PE) + 0.505 (PS)

In summary, Table 10 describes that perceived ease of use and physical security have the highest influence factors to the adoption of Global Positing System (GPS).

Table 10: Summary of hypothesis evaluation

Hypothesis	Standardize Coefficient Beta Value	Significant Value	Result
H1- Relative advantages have positive influence towards the adoption of GPS for GSE at KLIA.	0.080	0.353	Rejected
H2- Perceived ease of use has optim istic influence towards the acceptance of GPS for GSE at KLIA.	0.202	0.009	Accepted
H3- Physical security has positive influence towards the adoption of GPS for GSE at KLIA.	0.525	0.000	Accepted

5.0 CONCLUSION

The study found that the adoption of GPS technology is influenced by the users' perceptions of its benefits as well as physical security concerns. Launching regular safety campaigns to raise knowledge about the need of GPS technology adoption will instill a safety culture and this can be done through regular email distribution, awareness campaigns, or more discussions among workers to get greater involvement in the new system installation.

6.0 FUTURE RESEARCH

It is recommended that adopting an incentive rewards system based on GPS data would boost employee motivation for individuals who have good equipment tracking records. To facilitate smooth adoption by all levels of personnel, it would be preferable to build a user-friendly interface in the GPS site. The system must be supported by a backup system to ensure a smooth transition in the case of a failure. The system will be improved by including a fuel monitoring option on the GPS device as well as the status of the equipment's maintenance. Additionally, training and a trial period would be required to ensure a seamless implementation and acceptance. This will guarantee that all users are fully trained and that all processes and procedures are recorded, ensuring that the project is completed from beginning to end.

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