PLANNING OF SELF BAGGAGE DROP SYSTEM IN FACILITATING PASSENGER MOVEMENT AT MUTIARA SIS AL-JUFRI AIRPORT PALU

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ABSTRACT

The research conducted is related to the planning of a self baggage drop system in facilitating passenger movement at Mutiara Sis Al-Jufri Airport Palu. The method in this study uses quantitative, namely by calculating and observing the object then the results are used to describe the situation that is happening at the object of research. The sample in this study were 64 citilink airline passengers and 42 pasasi officers who worked at the check in counter. Some things that need to be improved and developed are socialization to the public about how to use the self check in and self bag drop system, as well as procurement of three self baggagedrop units.

Keyword *: Self baggage Drop, Check in, SPSS, Passenger Movement*

1. INTRODUCTION

Mutiara SIS-Al Jufri Airport (IATA: PLW, ICAO: WAFF), previously the airport was named Masovu which means dusty. The airport is located on Jl. Abd Rahman Saleh, South Palu, Palu City, Central Sulawesi, Indonesia. The airport is located at an altitude of 86 meters (282 ft) above sea level, has one runway with a length of 2,500m and in use is 2,250m. In 2014, the largest airport in Central Sulawesi was officially renamed from the previous MUTIARA Airport in addition to MUTIARA SIS AL-JUFRI PALU Airport in accordance with the Decree of the Minister of Transportation Number KP 178 of 2014. In 2022 the number of passengers recorded a 40% increase compared to the previous year. Currently there are six airlines operating, namely Garuda, Lion Group, Susi Air, and Citilink as well as cargo aircraft operating on certain days. Seeing the rapid growth of passengers does not rule out the possibility that in the next five to ten years this airport needs modern facilities so that it can accommodate a larger number of passengers plus if this airport turns into an international class airport. Reviewing this issue, the airport requires additional modern facilities to anticipate various possibilities that occur such as passenger surges.

One of the modern facilities that have been implemented at Mutiara SIS-Al Jufri Airport is the self check in center, where passengers can independently print boarding passes so they don't need to go to the manual check in counter, this can shorten passenger time so that passengers can go directly to the waiting room. Self Baggage drop is intended so that passengers can independently deposit luggage so that it can speed up the process of passengers to the waiting room and reduce

queues at manual check in counters. This self baggage becomes one with the self check in counter so that the process of printing boarding passes and depositing luggage can be done in one series. The problem that occurs is that many airports including Mutiara SIS-Al Jufri Airport have provided self-check in facilities but are not equipped with self baggage drop facilities so that passengers are reluctant to use the self-check in facility because they have to keep depositing luggage at the manual check-in counter. Self check in facilities tend to be neglected because there are rarely passengers who are interested in using them.

Another research conducted by Kang-Seok Lee and Ha-Na Kim in 2018 was about Improving The Security And Efficiency Of Self Bag Drop System Proposals Based On The Current State Of Technology And Aviation Accident. This research discusses the Self Bag Drop System which is synonymous with passenger independence in self- checking, making it possible to smuggle dangerous goods because baggage deposit is done independently. This research uses a literature review method using data obtained from the Korean Ministry of Land and Transportation and comes to the conclusion that it is necessary to improvise security in the Self Bag Drop system. The first deficiency found was that someone could deposit baggage that did not match their identity if they obtained another passenger's ticket. Second, lack of supervision by security officers can cause people to check in instead of using their personal data. The solution obtained to solve this problem is to strengthen the information system in the Self Bag Drop system, tighten security officers, combine databases between organizations, strengthen procedures to strengthen security.

Meanwhile, research in a national journal by Aro'ah Hardianika in 2023 entitled Self Check-In System in the Efficiency of Citilink Airline Check- in Services at Soekarno Hatta International Airport. The research uses a survey method obtained from direct observation, discussing the implementation of self-check-in machines which still have problems, one of which is that passengers have to deposit their baggage again at the manual check-in counter.

The results obtained are that repairs are needed on the self check-in machine to overcome technical problems such as paper running out, the touch screen not working, and not being able to be operated by all categories of passengers.

Based on the description above, researchers are interested in researching the planning of the Self Baggage Drop System in Facilitating Passenger Movement at Mutiara SIS Al-Jufri Airport, Palu. Using quantitative descriptive methods using surveys and questionnaires carried out by direct observation at the research location. The desired result in this research is to obtain data on how long the queue is at the check-in counter so that it can predict the amount of self- baggage needed to serve passenger movements for the next 5 years.

2. METHODE

The research method is the process used by researchers to conduct research. The research method can be interpreted as a scientific way to obtain data with specific purposes and uses (Sugiyono, 2019). So in simple terms, the research method is a process or method used in research both in the process of data collection, data processing, data analysis and presentation of research data. In this research process, the research methods outlined in this chapter include research design, instrument design, data analysis techniques, and place and time of research.

The validity test is used to measure whether a questionnaire is valid or not. A questionnaire is said to be valid if the questionnaire is able to reveal something that will be measured by the questionnaire. A question is said to be valid if the significance level is below 0.05 (Ghozali, 2012). This validity test uses Pearson correlation, namely by calculating the correlation between the values obtained from the questions. In this validity test, researchers use degree of freedom (df) = n
- 2 = 2, so the degree of freedom value is 64 - 2 = 62.

In this study the authors used the Likert Scale. The Likert scale is used to measure the attitudes, opinions, and perceptions of a person or group of people about social phenomena (Sugiyono, 2018). The answer choices from this Likert Scale will be scored, so respondents must describe and support the questions.

Regression analysis is an analysis to predicthow far the value of the dependent variable changes, if the value of the independent variable is manipulated / changed or increased or decreased. The benefit of the regression analysis results is to make a decision whether the increase and decrease in the dependent variable can be done through an increase in the independent variable or not. Simple Linear Regression is based on the functional or causal relationship of one independent variable with one dependent variable (Sugiyono, 2007: 262)

3. RESULT

In observing the performance of baggage deposit services at check-in counters, it is necessary to estimate the number of passenger arrivals at Mutiara Sis Al-Jufri Airport Palu, in order to know the performance capabilities of the check-in service. Flight schedule data obtained through www. https://bandaramutiarasaj.com/

The flight schedule at Juanda Airport is obtained from www. https://bandaramutiarasaj.com/ which is in accordance with the existing schedule. The following figure 1 is the result of the recapitulation of the Citilink flight schedule:

Figure 1 schedule

1. Passenger Movement according to IATA

Passenger movements are needed to determine the number of passengers arriving within 1 (one) hour within 10 minutes. Before getting the peak hour of passengers, the author must know the pattern of passenger arrivals. Where the pattern is obtained based on IATA provisions. The following is the pattern of passenger movement according to IATA:

Time of day	Percentage of passenger per flight arriving at the check-in counters by 10-minute periods prior to flight												
	120	110	100	90	80	70	60	50	40	30	20	10	0
06.00 - 10.00	0	0	1	2	6	10	20	26	20	12	3	0	0
10.00 - 18.00	0	1	3	8	11	15	17	18	15	10	2	0	0
18.00 - 24.00	3	4	6	9	11	14	15	15	15	7	1	0	0

Figure 2 passenger movement

Then, based on the data from figure 2, the following calculations can be made:

Waktu	Penumpang yang datang (penumpang/jam)	Waktu	Penumpang yang datang (penumpang/jam)
4:00:00 AM	0	8:10:00 AM	93
4:10:00 AM	0	8:20:00 AM	150
4:20:00 AM	4	8:30:00 AM	115
4:30:00 AM	106	8:40:00 AM	143
4:40:00 AM	45	8:50:00 AM	72
4:50:00 AM	203	9:00:00 AM	0
5:00:00 AM	168	9:10:00 AM	2
5:10:00 AM	90	9:20:00 AM	0
5:20:00 AM	42	9:30:00 AM	0
5:30:00 AM	7		
5:40:00 AM	1		
6:00:00 AM	0		
6:10:00 AM	0		
6:20:00 AM	1		
6:30:00 AM	0		
6:40:00 AM	0		
6:50:00 AM	0		
7:00:00 AM	1		
7:10:00 AM	0		
7:20:00 AM	3		
7:30:00 AM	5		
7:40:00 AM	4		
7:50:00 AM	51		
8:00:00 AM	62		

Figure 3 Peak Hour

Due to the Citilink airline flight schedule in 1 (one) week is the same, the results of the calculation of thedistribution of passenger arrivals per hour in 1 (one) week are the same. The calculation results can be seen and can be seen in the graph in Figure 4.1. Citilink airline passenger peak hour is 203 passengers / hour at 4:50 AM

2. Validity Test

The validity test is the accuracy or accuracy of an instrument in measuring what you want to measure. The purpose of using the validity test is to see whether the statement items from each questionnaire are valid, valid, and reliable. Before the questionnaire is distributed to respondents, it must pass the validity test first. The following are the results of the validity test using the SPSS application.

By using the r table (df = 64-2 = 62; alpha = 5%) of 0.250 (variable X) while (df = 42-2 = 40; alpha = 5%) of 0.344 (variable Y), all pearson correlation values > r table so that all indicators arevalid. The following is the result of the Rhitung and Rtabel comparison table of Variables X and Y.

VARIABEL	PERTANYAAN	Rhitung	Rtabel	KETERANGAN
PERENCANAAN SISTEM SELF BAGGAGE (VARIABEL X)	X1	0,467	0,250	VALID
	X2	0,530	0,250	VALID
	X3	0,497	0,250	VALID
	X4	0,574	0,250	VALID
	X5	0,533	0,250	VALID
	X6	0,300	0,250	VALID
	X7	0,347	0,250	VALID
	X8	0,379	0,250	VALID
	X9	0,604	0,250	VALID
	X10	0,513	0,250	VALID
	X11	0,423	0,250	VALID
PERGERAKAN PENUMPANG/ANTRIAN (VARIABEL Y)	Y1	0,431	0,312	VALID
	Y2	0,669	0,312	VALID
	Y3	0,617	0,312	VALID
	Y4	0,618	0,312	VALID
	Y5	0,317	0,312	VALID
	Y6	0,721	0,312	VALID
	Y7	0,744	0,312	VALID
	Y8	0,531	0,312	VALID
	Y9	0,588	0,312	VALID

Figure 4 Validity Test

3 Reliability Test

The principle of the Reliability test to show the instrument is said to be reliable if a person's answerto a statement is consistent or stable over time anda variable is said to be reliable if it provides a Cronbach's Alpha value> 0.60. Based on the results of processing the reliability test data using the SPSS program, the following output is obtained:

Variabel	Cronbach's Alpha	Keterangan
PERENCANAAN SISTEM SELF BAGGAGE (VARIABEL X)	0,658	RELIABEL
PERGERAKAN PENUMPANG/ANTRIAN (VARIABEL Y)	0.841	RELIABEL

Figure 5 Reability Test

3. Forecasting Queue Length and Check-In Counter Requirements for the Next 10 Years

Forecasting in this final project is used to determine the length of the queue and the need for self-check in and baggage drop counters in the next 5 years. Before that, first find out the percentage of the number of Citilink airline passengers in 1 (one) year to the number of passengers at Mutiara Sis Al- Jufri International Airport in 1 (one) year. In knowing the number of passengers in 1 (one) year, using the flight schedule along with the type of aircraft and aircraft capacity. The following is the calculation of the number of Citilink airline passengers in 1 (one) year:

- Citilink airline Number of passengers / year = Number of passengers / day x 7 days x 52 weeks

Number of passengers/year = 360 x 7 x 52 = 131,040 passengers

TAHUN	TAHUN KE-	JUMLAH PENUMPANG BANDARA	TPHP as a% of Annual Passenger	Peak hour passenger (penumpang/jam)	
				BANDARA	CITILINK
2023	1	759.463	0.080%	607	105
2024	2	886.081	0.080%	709	122
2025	3	983.157	0.080%	787	136
2026	4	1.100.233	0.080%	880	152
2027	5	1.217.309	0.080%	974	167
2028	6	1.334.385	0.080%	1.067	184
2029	7	1.451.461	0.080%	1.161	200

Figure 6 Peak hour/year

PERHITUNGAN PENYEDIAAN CHECK IN COUNTER CITILINK		
a	Jumlah keberangkatan penumpang (1 *flight, load factor* 100%)	180 Orang
b	Alokasi waktu *check in* per fligt	90 menit
c	Alokasi waktu *check in* per pax	2,5 menit
d	Jumlah penumpang transit	0
t^1	Waktu proses	2,8 menit (menurut survei dan pengamatan langsung)
	Jumlah *counter check in* tersedia	3
	Kebutuhan *check in counter*	$\frac{a}{(x.y)}=\frac{180}{(90:2.8)}=5,6$ Dibutuhkan 6 check in counter
	Kebutuhan *check in counter* menurut banyaknya jumlah penumpang yang berangkat (rata-rata waktu proses)	$N=\frac{(a+b)t^1}{60}counter+10\%$ $N=\frac{(180+0)2,8}{60}+10\%$ $=9,4$ Dibutuhkan sekitar 9 check in counter
	Realisasi waktu proses check in counter (<90 menit : sesuai standar)	$=\frac{(a\,x\,t^1)}{jumlah\ counter}$ $=\frac{180\ x\ 2,8}{3}=168\ menit$
	%Realisasi ketersediaan check in counter	$=\frac{jumlah\ counter\ check\ in\ existing}{kebutuhan\ check\ in\ counter}\ x\ 100\%$ $=\frac{3}{8}\ x\ 100\%=37,5\%$

Figure 7 Calculating of item

4. Forecasting the needs of the Self Baggage Drop system 5 years in the future

	Travel Time	Manned Counters	Kiosk	SBD Operating Time	Ticketing
Manned Counter	120 Sec	60 Sec	X	X	X
2-Step (Kiosk + Bag Drop)	120 Sec	60 Sec	30 Sec	X	Adult: 180 Sec Old: 300Sec
1-Step (SBD)	120 Sec	X	30 Sec	30 Sec	Adult: 180 Sec Old: 300Sec
Manned Counter +SBD	120 Sec	60 Sec	30 Sec	30 Sec	Adult: 90 Sec Old: 150Sec

	Operating Airport
1-Step	Orly Airport, Charles de Gaulle Airport, Frankfurt Main Airport, Amsterdam Airport Schiphol, Brussels Airport, Heathrow Airport...Operating Primarily in the Europe
2-Step	Los Angeles International Airport, Dallas Fort Worth International Airport, Chicago O'Hare International Airport, Philadelphia International Airport, Lester B.Pearson International Airport...Operating Primarily in North America

Figure 8 previous calculation

Based on previous research sources researched by Kang Seok Lee by taking data directly from airports as shown in the figure with an average number of passengers reaching 5-15 million per year. The airports are divided into two, namely one step which only provides check-in and baggage drop kiosks while two steps are only self baggage drop systems.

From research conducted on 100 passengers, it was found that the combination of the use of manual check-in counters and the self baggage drop system would cut the check-in process time in half. So based on previous research, it can be analyzed the need for a self baggage drop system using citilink airline passenger samples, then an example can be made with the existing check-in counter, which is 3 units, while with a maximum number of passengers of 180 passengers per flight, 5 check-in counters are needed to maximize the check-in process. Considering that Mutiara Sis Al- Jufri airport already has three self-check in systems, it can be made an example by procuring three self baggage drop systems.

So that from the previous calculation, six pieces are needed if with the effectiveness of the check-in counter and the self baggage drop system, the check in process time which was previously 168 minutes can be 84 minutes (exemplary only on citilink airlines), so it can be concluded that it is necessary to add three units of self baggage drop machines to be able to overcome the queue of the check in process for passengers.

In addition, Mutiara Sis Al-Jufri Palu Airport has a linear or elongated Check In counter model with a luggage lane system extending to the back. Mutiara Sis Al-Jufri Airport has 3 self check in machines on the left after SCP 1 and 20 manual check in counters.

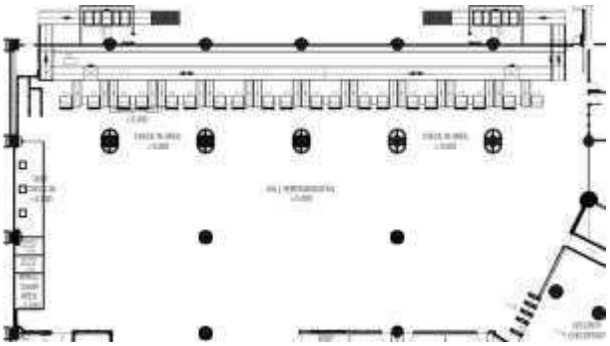

Figure 9 Mutiara Sis Al-Jufri Airport Layout

In comparison, Narita Airport has 12 check-incounters with different quotas for each airline. Smart check-in was launched in all terminals at Narita Airport with the aim of reducing passenger time in queuing.

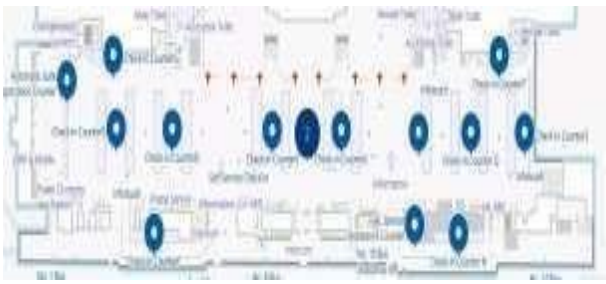

Figure 10 Narita Airport Layout

Based on references from Narita International Airport, the position of the self Bag Drop at Mutiara Sis Al- Jufri Airport Palu can be placed at counter 20 due to the baggage conveyor model that has been displayed sothat it is easier to design the concept of baggage flow without the need to increase the area of the check-in counter or by replacing 3 manual check-in counters into smart check- in counters, namely at counters number 18, 19, and 30 considering that these counters are rarely used and there are no fixed airlines that place them.

4. CONCLUSION

Based on the results of passenger data at Mutiara Sis Al-Jufri Airport and Citilink airlines that have been obtained, it can be concluded that, the number of passengers at Mutiara Sis Al-Jufri Palu Airport in 2029 will reach 1,451,461, while the number of Citilink passengers for a year is around 131,040 passengers for five years. In the future, in 2029, Citilink passengers at Mutiara Sis Al-Jufri Airport in Palu could reach 250,337 passengers.

The results of observing the process of passengers checking in are divided into two, namely passengers who directly check in and deposit luggage at the manual check in counter and passengers who first printboarding passes on the self-check machine and then deposit luggage at the manual check in counter, the dataobtained are as follows:

- manual check in counter is 170 seconds or 2.8 minutes

- self check in is 126 seconds or 2.06 minutes

Based on these data according to the calculation of SKEP 77 of 2005 and the results of observations ofpeak hour passenger observations in 2029 for citilink airlines there are 200 passengers per ten minutes while the passenger surge is 1,451,461 then the check in counter needed by citilink airlines is 6 check in counters. Mutiara Sis Al-Jufri Airport has three self check in machines, so if the combination of self check in, baggage drop and manual check in machines are combined, the passenger check in time which previously almost reached 168 minutes per route can be reduced to 84 minutes.

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