The Cause And Effect Of Commercial Flight On-Time Performance (Case Study : Citilink)

Devi Ratnasari, Anggi Nurul Amanda*, Farhan Darmawan, Tito Warsito, Siska Amonalisa

Institute of Transportation and Logistic Trisakti, Jakarta, Indonesia

*Email: anggimandanda@yahoo.com

Abstract. The needs of the air transportation is increasing day by day. In order to meet the demand, airline industries made full service, medium service and low cost carrier airline concepts. However, airline concepts might have some risk factors, notably the safety factor. Not only safety factor but The time factor is also a crucial factor in airline. Sometimes airline needs to do schedule changes due to some reasons. But, in fact the airline sometimes has to delay the schedule, and will affect the on-time performance (OTP) . This research is aimed to find out the cause and effect of OTP in citilink airline used exploratory descriptive research with the cause and effect diagram method. The identify categories of causes used 5M, particularly regarding Manpower, Method, Mother Nature, Machine and Management. Researchers' data collection methods are observation, interviews, and documentation, using three phases of data analysis, namely data collection, data classification, and drawing of conclusions.

1. Introduction
Citilink is a subsidiary of Garuda Indonesia and low-cost airline. The company was founded in 2001 as a Strategic Business Unit (SBU) and functioned as one of the low-cost flight alternatives in Indonesia. Since 30 July 2012 Citilink officially operates as a business entity separate from Garuda Indonesia after obtaining an Air Operator Certificate (AOC).

There is many factors in a flight, like safety, time, etc. And there are used as a quality standard for airline which engaged in the air transportation services. Of course safety factor is a high priority because if the airline was inadequate to maintain safety in flight, then it can be critical to people who need to make a journey by the air transportation. But, not only safety factor but the time factor is also an essential factor in airlines. Based on that, the airline used the on time performance as one of the key performance indicators (KPI). This OTP reflected the realibility and the productivity of an airline. On the other side, public claimed the airlines to have a high standard of OTP . Therefore, public known the airlines committed professionally. if the OTP is on the lowest standard, this could be the threat for the airline, means the possibility of losing the passengers will be affecting in losses or even the bankruptcy. In the characteristics of an airline, the scheduled flight could not be replaced by the any replacement date, due to the situational human needs.

So, every airlines need to improve their passenger services, both on ground and on board an aircraft, and operational services, like great scheduling, and reduce the time of delay and the time that
aircraft is on the ground. In addition, On Time Performance (OTP) is the major thing in aviation industry. Timing schedules of the flight must be in accordance to the actual of departure times. The on time schedule will be affecting the loyalty of passenger and increasing the competitive advantage of the company. Stated that the higher standard of the On Time Performance (OTP), the higher level of the professionalism and the responsibility of the company will be [1].

2. Literature Study

OTP (On Time Performance)

The second matters in the aviation industry is the timing. Public uses the timing to choose their airlines as the transportation, therefore the On Time Performance (OTP) becomes one of the indicator airline’s performance. On Time Performance (OTP) is the ability of airline to depart or arrives on schedule. Based on OAG (Official Airline Guide) “On-Time Performance (OTP) is a flight that arrives or departs within 14 minutes and 59 seconds (under 15 minutes) of its scheduled arrival/departure time” (OAG, 2016). Based on the definition, the flight that departing later than 15 minutes than its scheduled consider as a delayed. On Time Performance (OTP) and delays are indeed inseparable, as on time performance (OTP) is the reverse of delay. The timeliness of a flight is On Time Performance (OTP).

The schedule flight of an airline must be in accordance with the actual departure time. the accuracy of the On Time Performance will be satisfying the passengers and increase the competitive advantages of the aviation industry. The higher accuracy of the on time performance (OTP), the highest professionalism and responsibility of the aviation company will be. Duari (2018:7) Smither and London (2009:70) in the book named “Performance Management: Putting research to action” stated that the matter of The On Time Performance (OTP) is the “Target performance for on-time performance represented success for the airline. The impact of potential improvements in boarding speed on important outcomes such as customer satisfaction and retention and operational cost” the difference time between the set target and actual times of boarding or flight delays could affecting the satisfaction of customer and operational cost of the aviation company.

The aviation company should be paying attention to the accuracy times. The accuracy times is the major thing in the service area. The airline operated in Indonesia should be evaluated by Directorate General of Civil Aviation for the increases of the On Time Performance (OTP). In matters of the delay airlines, Directorate General of Civil Aviation governed the regulation of the customer’s compensation. Governed in the Ministry of Transportation Regulation 25/2008 concerned in the implementation of Aviation Act and Ministry of Transportation Regulation 77/2011 concerned in the responsibility of Transport carriers, the passengers shall be receive the compensation from the airline if it delays or later than the schedule.

Based on the Official Airline Guide (AOG) data, the On Time Performance (OTP) of Citilink in the 2018-2019 has been fluctuating. The Highest level of On Time Performance (OTP) is on May 2018 which in 90,9%, while the lowest level is on February 2018 which in 76,5%. But in the 2019, On Time Performance (OTP) of Citilink hit the instability of the OTP. The highest level is on May 2019 which in 89,1%, while in the lowest level is on January 2019 which in 77,1%. Based on the data, the OTP fluctuating is affected of several conditions. Out of the capability of the airlines such as the weather and the density of the traffic airlines that can behalf on their amounts of the flight numbers. In that matter affecting the highest demand of air transportations while in order the traffic of airlines is in the highest level of numbers of flights and increased the highest amount of tourist in several destination.

According to Soemohadiwidjoyo (2017;82) On Time Performance (OTP) is the measure that determine the capability of flight facility to arrive on schedule at its destination. OTP can not be separated from flight delay. The definition of delay according to the Aviation Law No. 1 concerned in Aviation is the difference about time flight between departure or arrival on schedule and actual time of the flight. Delay can be interpreted as a condition when a proper mismatch of schedule occurred in a flight.
Table 1. OTP CITILINK HALIM 2018

| No | Month    | Total Flight Frequency | On-Time | Delay | OTP (%) |
|----|----------|------------------------|---------|-------|---------|
| 1  | January  | 953                    | 627     | 326   | 66      |
| 2  | February | 814                    | 554     | 260   | 68      |
| 3  | March    | 913                    | 667     | 246   | 73      |
| 4  | April    | 906                    | 535     | 371   | 59      |
| 5  | Mei      | 916                    | 610     | 306   | 67      |
| 6  | June     | 971                    | 713     | 258   | 73      |
| 7  | July     | 962                    | 620     | 342   | 64      |
| 8  | August   | 957                    | 642     | 315   | 67      |
| 9  | September| 911                    | 606     | 305   | 67      |
| 10 | October  | 899                    | 661     | 238   | 74      |
| 11 | November | 794                    | 592     | 202   | 74      |
| 12 | December | 919                    | 696     | 223   | 76      |
|    | TOTAL    | 10915                  | 7523    | 3392  | 68      |

Table 2. OTP CITILINK HALIM 2019

| No | Month    | Total Flight Frequency | On-Time | Delay | OTP (%) |
|----|----------|------------------------|---------|-------|---------|
| 1  | January  | 807                    | 632     | 175   | 78      |
| 2  | February | 676                    | 566     | 110   | 84      |
| 3  | March    | 790                    | 622     | 168   | 79      |
| 4  | April    | 725                    | 563     | 162   | 75      |
| 5  | Mei      | 740                    | 620     | 120   | 84      |
| 6  | June     | 932                    | 778     | 154   | 83      |
|    | TOTAL    | 4670                   | 3781    | 889   | 81      |

Based on the table above obtained by the Citilink airlines in 2018, the total amount of frequency of the flights is 10915 numbers, which is the 10915 flights had been delayed about 3392 times or 31% and about 138 times or 1.3 % of the schedule changes. so the result for OTP in 2018 is 66%.

Delay

Flight schedules that is delay, the on Time Performance shall not be achieving and affecting the causes of another delay flights. Delay stated in Indonesia Law No. 1 concern in Aviation. Delay defined as a differences time between the departs or arrivals rather than the actual schedule times. Whereas according to the Eurocontrol (2016)[2] delay is the time lapse which occurs when a planned event does not happen at the planned time. The delays is the separation times between the actual times and the lacks of timing itself.

The delay itself is a straightforward meaning. Delay is generally applied when an event is occur not on the scheduled time or late that it was arranged, planned or anticipated that would happen. Delay is a term that been used in many industry to make a statement that they are late from the schedule.
Delay in aviation is happen like a chain, one of the flight is delayed it will affect the following flight. In addition, the delay in aviation can describe as an ongoing postpone occasion. This occasion giving a very impact to many stakeholders, such as passenger, airport and the airline itself.

3. Research Method
The method used in this study is the Fishbone Diagram Analysis method. Watson (2004) in Illie G. And Ciocoiu C.N. (2010)[3] define Fishbone diagrams as tools that describe a systematic way of looking at various impacts or consequences and causes that make or contribute to these impacts. In its application, this diagram is used to identify the factors that cause the problem. Fishbone diagrams are classified as practical and guide each team to think about finding the main cause of a problem. The basic concept of fishbone diagrams is the name of the problem that gets attention listed on the right of the diagram (or on the head of the fish) and the cause of the problem that might be described as the bones of the main bone. Because of its function, this diagram is usually called a causal diagram.

Possible causes are described as the branches of the main bone are grouped with:
1. Machine (machine or technology),
2. Method (method or process),
3. Material (include raw material, consumption, and information),
4. Man Power (labor or physical work) / Mind Power (labor: suggestion, etc.)
5. Measurement/ Management (measurement or inspection)
6. Milieu / Mother Nature (environment).

![Figure 1. Fishbone](image)

In this research, authors did not use material because aviation focuses on services that are not manufactured, the material is not used in this case.

There are two components of the causal diagram, namely:
1. Fish Head (Consequence)
The segment on the fish head will be on the right. This chapter includes an issue (disability or job outcome), which is a result.
2. Fishbone (Cause)
Depending on the amount of causes discovered, these spines would branch. Each end of the fish bone will form an arrow leading to the fish's head where this will prove the causal factors connected with consequence.

Fishbone diagram or cause and effect is a structured method that enables a more thorough assessment of the causes of an issue, discrepancies and gaps. (Gasversz (1997: 112)[4]. The steps to make fishbone diagrams:
1. Agree on the primary problem (problem statement)
2. Identify possible causes of problems
3. Identify categories of causes (using 6M)
4. Finding of potential categories
5. Finding the root cause of the problem
6. Determining the theme and subject matter
7. Achieving agreement after the interpretation by looking at the causes that appear repeatedly

4. Result and Discussion

The technique used in this research is a 5M-factor fishbone diagram, particularly regarding Manpower, Method, Mother Nature, Machine and Management, Using “Why” questions. The interviewees there are ramp dispatcher and station manager. And subfactors affecting OTP are obtained as follows after conducting interviews:

1. Man Power
   Human Resources Limited, Reliability of crew, licence, availability and capability technician, and crew performance
2. Management
   Security issues, VVIP priority/military exercise, delay, maintenance scheduling, cancellation, and late arrival.
3. Machine
   Reliability machine, fuelling and towing process, and limited Ground Support Equipment, Airline/Computer Glitches
4. Method
   Loading/ unloading baggage, spare part availability, and unscheduled maintenance.
5. Mother Nature
   Bad weather, BASH, FOD

The results of the disclosure of opinions are arranged in a table based on the categorization of problems, as follows:

1. Man Power

| No  | As Why                                                                 | Answer                                                                 | Root Cause |
|-----|----------------------------------------------------------------------|-----------------------------------------------------------------------|------------|
| 1   | Why does crew cabin reliability affect otp?                          | Because OTP is not achieved if the cabin crew does not serve optimally and improve during flight. Like the occurrence of miscom between the cabin crew and the ground officer that the incompatibility of information can cause the aircraft to hold at the destination. Reliability depends on the personnel but still maximizes the ability and performance possessed. | Y          |
| 2   | Why can't improvise?                                                 | Because the cabin crew thought there must be a delay due to the notam, but from the ground officer they wanted to leave before the clock on the notam so that otp is achieved | N          |
| 3   | Why does the license factor affect otp?                              | Because the ground officer who has the license to do the loading and unloading process can only be manual, while those who have the license cbl can use cbl (loader conveyor belt) and also the manual process. However, if in a condition of the lack of human resources, they can be assisted by officers who do not have the license cbl as long as he/she is competent. | Y          |
| 4   | Why do ground officers who do not have cbl licenses still be allowed to load and unload the baggage using cbl? | Because to speed up the process of loading and unloading luggage | N          |
| 5   | Why do technicians affect OTP?                                       | Because the technician has the stages or procedures, depending on the part or division, for example, the technician performs maintenance on the cabin plane, aircraft avionics, aircraft engine, must be competent because it can affect otp | Y          |

Table 3. Describe the causes of problems in the man power category
2. Management

**Table 4. Asking "Why?" For Causes in the Management Category**

| No | Ask Why | Answer | Root Cause |
|----|---------|--------|------------|
| 1  | Why can good management handling affect OTP? | Because if management is bad and maintenance scheduling is not done well then when the plane is high demand and doing maintenance can cause delay because it has not been briefed and prepared | Y |
| 2  | Why does maintenance scheduling affect OTP? | Because heavy maintenance requires a long time process and it is situational | Y |
| 3  | Why doesn't heavy maintenance affect OTP? | Because Citilink has a spare plane that can be used when there is an unscheduled maintenance | N |
| 4  | Why security issues can affect OTP? | Because if an issue such as terrorism arises, flight activities at the airport will be delayed. | Y |
| 5  | Why can there be a late arrival even though management has been good and has an impact on OTP? | Because the plane should be able to continue the route, but at the departure airport there are troubles such as damage to the runway, etc. so the flight must be canceled (cancellation) | Y |
| 6  | Why does cancellation have an impact on OTP? | Because cancellation causes scheduling changes | Y |

3. Machine

**Table 5. Asking "Why?" For Causes in the Machine Category**

| No | Ask Why | Answer | Root Cause |
|----|---------|--------|------------|
| 1  | Why machine has an important role in achieving OTP? | Because the machine being sought is agile and economical, machine is a company investment because it can be economical in using fuel and reducing cost for maintenance. | Y |
| 2  | Why is the use of fuel and maintenance costs more efficient? | Because advanced technology has the use of fuel that is more economical when compared to the previous machine. With the use of more fuel, there is certainly little cost for fuel will also be reduced | N |
| 3  | Why does GSE affect OTP? | Because there are limitations to tools, such as towing trucks, refueling de-refueling trucks, etc., this can affect the OTP | Y |
| 4  | Why does the process of fueling and towing the aircraft take a long time? | Because the limited GSE and Angkasa Pura does not only serve Citilink but other airlines | Y |

4. Method

**Table 6. Asking "Why?" For Causes in the Method Category**

| No | Ask Why | Answer | Root Cause |
|----|---------|--------|------------|
| 1  | Why does the loading / unloading process take a long time to affect the OTP? | Because the luggage capacity carried by passengers is not limited by the airline thus the loading / unloading process takes a long time | Y |
| 2  | Why is luggage capacity unrestricted? | Because passengers have prerogative rights but are charged the cost of excess baggage | N |
| 3  | Why does the maintenance process affect OTP? | Because the maintenance process is not fast and the availability of spare parts is not available and depending on aircraft damage. | Y |
| 4  | Why aren't spare parts available at Halim Airport? | Because Halim is a branch while the center is in Cengkareng, so if it is brought to Halim it takes time and the damage cannot be predicted. Sometimes it can do unscheduled maintenance | Y |
| 5  | Why does unscheduled maintenance affect OTP? | Because of the limited number of skilled (technicians). | N |
5. Mother Nature

Table 7. Ask "Why?" For Causes in the Mother Nature Category

| No | Ask Why                          | Answer                                                                 | Root Cause |
|----|----------------------------------|------------------------------------------------------------------------|------------|
| 1  | Why does bird strike affect OTP? | Bird strike does not interfere with OTP because the aircraft has taken off in accordance with the schedule | N          |
| 2  | Why does the weather affect otp? | Because if there is bad weather it can disrupt visibility, the minimum visibility of a pilot is 1.2 km. | Y          |
| 3  | Why is the weather bad?          | Because of natural factors                                             | N          |
| 4  | Why can FOD interfere with OTP?  | Because when the aircraft turns on the engine and there is wind thus gravel then enters the engine, the aircraft will suffer damage therefore it needs maintenance and can affect the OTP. | Y          |
| 5  | Why does FOD often occur at Halim? | Because the frequency of landing often causes damage to the asphalt in the runaway area, as well as the apron area. | N          |

Analysis of Problems by Fishbone Diagram

Based on the identification of the root causes with the categorization above, where the root causes of the problem are found through several questions of "why?" Several times are then included in the causal diagram, which shows the relationship between causes and problems as shown in this Figure.

Figure 2. Fishbone Diagram

Each root cause of the problem is included in the causal diagram categorized by category (Management, Method, Man Power, Machine, Mother Nature). The use of cause-and-effect diagrams in this problem is a continuation of the results of the opinions of ramp dispatcher and station manager, collected individually involving 4 people, especially Citilink at Halim Perdana Kusuma Airport, Jakarta as on the object of current research.

Finding for the dominant cause

Determination of Late Arrival and Aircraft Departure Dominant Causes. The Nominal Group Technique (NGT) technique is used to determine the dominant cause of delays in flight departures and arrivals. Method of Nominal Group Technique (NGT) Provides a point or value of the variables influencing the arrival and departure of aircraft in order to obtain the greatest value, which is the cause of the most dominant impact.
Table 8. Score from Airlines

| NO  | Cause factor      | Score from airline parties | Score | %     | Rank |
|-----|-------------------|----------------------------|-------|-------|------|
|     |                   |                            |       |       |      |
| 1   | Man Power         | 3                          | 3     | 3     | 5    | 14   | 22.58% | I     |
| 2   | Method            | 3                          | 1     | 3     | 3    | 10   | 16.12% | IV    |
| 3   | Machine           | 3                          | 4     | 3     | 3    | 13   | 20.96% | II    |
| 4   | Management        | 5                          | 3     | 4     | 2    | 14   | 22.58% | I     |
| 5   | Mother Nature     | 2                          | 3     | 4     | 3    | 11   | 17.74% | III   |
|     |                   | 62                         |       |       |      | 62   |        |       |

The method factor does not dominate the causes of OTP with a score of 10 or 16.12% percent on flight departure, so the root cause is not in the method category such as Human Resources Limited, Reliability of crew, licence, availability and capability technician, and crew performance, etc. What really dominates the cause of OTP on aircraft departure, however, is man power and management with the same score of 14 or 22.58%. Man power is refer to Human Resources Limited, Reliability of crew, licence, availability and capability technician, and crew performance, and management refer to security issues, VIP priority/military exercise, delay, maintenance scheduling, cancellation, and late arrival.

5. Conclusion

Airline used the on time performance as one of the key performance indicators (KPI). This OTP reflected the reliability and the productivity of an airline. On the other side, public claimed the airlines to have a high standard of OTP and OTP can be called as a product from airline, because in general airline sells schedule to the passengers. Based on the research there are many factors that can affect achievement of OTP on an airline, and it can be seen in the 5 segments. There are management, method, man power, machine, mother nature. From 5 segments, management and man power give the highest contribution to achieved OTP. These two things are very related and cannot be separated. Because in management activities, there will be definitely a way to manage people who are suitable and also place them in the right place or known as "The right man in the right place". So that management inputs such as human resources and natural resources and also other functions can be going smoothly without any significant obstacles and the output will be turned well. This certainly will facilitate the achievement of an airline OTP. If reviewed from the point of the man power, surely this man power greatly contributes to the achievement of OTP because man power serves as the executor of the entire sequence in flight, so that reliable man power, will be very helpful in achieving OTP. On the other hand the method, machine, and mother nature can also influence the achievement of OTP.

6. Recommendation

Based on the research that has been undertaken, it can be seen that manpower and management are the biggest contribution to OTP's success. The thing to do is to do better management activities, to ensure that all resources such as individuals and instruments can be managed as efficiently and efficiently as possible. Because if the input is good, it can be determined that the output will be good as well. Sometimes as regards the necessary management team to guarantee that all operations undertaken are monitored and supervised in accordance with the goal, And if there is a deviation, it can be assessed and fixed instantly. When it comes to human power, might be able to do some training in order to
improve the reliability of any such personnel. So in the end, management and man power to carry out their duties smoothly without a hitch.

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