A CASE STUDY OF FUEL SAVING INITIATIVES ADOPTED BY AIRASIA
(KAJIAN KES TERHADAP INISIATIF PENJIMATAN BAHAN API YANG DIAMALKAN OLEH AIRASIA)

CHAI SHUE LIANG¹, TEY LIAN SENG*² AND SHARAN KAUR GARIB SINGH²

¹Graduate School of Business, ²Department of Business and Policy, Faculty of Business and Accountancy, University of Malaya, Kuala Lumpur.

*Corresponding author: teyls@um.edu.my

Abstract: Fuel price fluctuation is a nightmare to airlines. To reduce the impact of fuel price fluctuation, many fuel saving initiatives have been adopted by airlines throughout the world. Extant studies have addressed the impact of different fuel saving initiatives on different airline. However, few studies have examined how an airline operator adopts different fuel saving initiatives to reduce the impact of fuel price fluctuation. To fill the gap, this paper analyzed how Malaysian low cost airline - AirAsia responds to fuel price fluctuation. It not only reveals the fuel initiatives adopted by AirAsia, but also addresses the issues faced by the company in implementing those fuel saving initiatives.

Keywords: Fuel saving initiatives, airline, AirAsia.

Introduction
A low cost airline, emphasizes on simplicity, is famous for its no frills services that allows passengers to save their travelling cost in exchange for many traditional passenger services which are provided by full service airlines (Jafari & Vasili 2006; Gillen & Lall 2004). It was popular in the western countries with the legendary low cost airline like Southwest Airlines, Ryanair, Jetstar Airways, Virgin America, Indigo, Easyjet and many more before AirAsia was setup in January 2002 in Malaysia. The development of low cost airlines in Asia was triggered by the deregulation of the aviation industry and the open sky policy in asia pacific (Lim et al., 2011).

Unfortunately, fuel price fluctuation is one of the most challenging tasks that need to be responded to. The tension in Middle East and high demand from China since 2004 did not help to relief fuel prices (Abdelghany et al., 2005) and this was not seen possible until recent drop in last quarter of 2014. According to Boeing market watch, the airline industry is projected to achieve a continue average growth of about 5% every year and this has outgrown the production of required fuel for the industry (Hendricks, 2007). Rocketing fuel price had forced airlines to take drastic measures to sustain the difficult times (Akbar & Abdullah, 2010). In countries like United States, the increased in jet fuel price had forced US carriers to increase their ticket price. Some of the Asian airlines also imposed fuel surcharge to ensure their profit were not be greatly affected. Due to the crisis in middle east which resulted in fuel price escalated, AirAsia had no choice but to increase the fuel surcharges to all its...
destination to cope with the situation in 2011 (Lim et al., 2011).

Jet fuel cost is the largest expenses by an airline operator (Carter et al., 2006). When fuel price increases, the common initiatives adopted by airlines are to increase fuel efficiency in their operation, direct the fuel increase margin to their customers and hedge fuel requirement for future using derivative market forecast (Morrell & Swan, 2006). Like many other low cost airlines, maintaining low cost has always been the core issue of AirAsia. The main challenge that AirAsia needs to tackle now is to maintain low cost at all time so that they can continuously provide lower fares to customers. Thus, it is necessary to study the fuel saving initiatives that airlines adopted.

Extant studies have conducted in fuel saving initiatives. E.g. fuel hedging practices and firm’s financial performance (Carter et al., 2006); Role of operating, passenger and infrastructure cost and fleet planning and fleet planning (Megan & Mark, 2003); Energy efficiency in aircraft systems and aviation energy consumption and emission (Lee, 2010); Excessive fuel loading for operations due to lower fuel price and fuel burn cost saving (Abdelghany et al., 2005); Technology and fuel efficiency (Babikian et al., 2002); Social, political and economic factor on airline fuel optimization (Drake, 1974). However, these studies only look at one or two aspect of the fuel saving initiatives. To fill the gaps, this study was carried out with the following objectives:

1. To identify the fuel saving initiatives adopted by airlines in general.
2. To identify the fuel saving initiatives adopted by AirAsia.
3. To identify factors that affect AirAsia’s fuel saving initiative decision making.
4. To describe the assessment method used by AirAsia to measure their fuel efficiency.
5. To examine the challenges that AirAsia experience when implementing the initiatives.

Based on a literature review, the fuel saving initiatives by airlines were identified in next section. To achieve the above mentioned objectives, a case study approach was employed. Several interviews were conducted with the managers, engineers and consultant of the company. Data collected was coded and analyzed. Finally, the findings were discussed and conclusion were made. The findings of the study might help other airlines to enhance their operation efficiency and achieve sustainable development.

Fuel Saving Initiatives Employed by Airlines

Prior studies have shown that there are 12 fuel saving initiatives:

**Fuel Hedging**

Fuel hedging is one of the practices that airlines protect themselves from fuel price fluctuation. It is defined as the act of securing the fuel prices for future purchase (Morrell & Swan, 2006). Fuel hedging has been adopted since 1989 where airlines use derivatives based on heating oil, crude oil or jet fuel to hedge their fuel cost. Most airlines use vanilla option to hedge fuel cost which includes swaps, futures, call options (including average price options which are a type of call options), and collars (including zero cost collars) (Carter et al., 2006). Reasons that airlines hedge are mainly to avoid financial burden cost, to avoid underinvestment problem, tax benefits (tax incentives given to company with lower and steady earning) and managerial interest to reduce external noises on its earnings (Ribeiro & Moreira, 2014).

**Fuel Burn Efficiency**

Aircraft fuel burn rate is 70% more efficient than what the industry had 40 years ago (Airbus, 2012). Aircraft manufacturers have improved the aircraft design and fuel efficiency at a rate of 1% every year for the last three decades. This is translated to a further 20% improvement in fuel efficiency which projected by year 2015 and a
40-50% improvement by middle of the century (Sharif et al., 2009). To counter growing fuel price, airlines and aircraft manufacturers have continuously looking ways to improve aircraft efficiency through technology advancement and operating procedures.

**Optimize Flight Profile**

The usage of advance air traffic management technologies for aviation communications, navigation, surveillance systems (CNS) allows airlines to choose the most proficient altitudes and routes, and minimize the takeoff distance and waiting time (Pahlevan et al., 2009). According to claim from IATA, airlines can reduce their fuel consumption by 18% when airlines use these sophisticated tools to optimize their air traffic control. With an efficient Air Traffic Management (ATM), it can avoid unnecessary fuel burn through waiting in line for take-off, in-flight “holding”, or waiting for a parking stand on arrival. The most optimal way is to allow aircraft to take off and climb to its optimal cruise altitude and descend continuously for optimum altitude to its destination runway (Blakey et al., 2011).

**Fuel Tankering**

Fuel tankering is another common practice that applied by commercial airline to reduce the operation costs. Fuel tankering basically means topping off fuel at the cheaper station to complete both flight cycles (forth and back) to save fuel cost (Walter & Lesinski, 2011). However there are drawbacks in this practice where fuel burn goes higher due to heavier fuel weight carried and higher maintenance cost (e.g. engine thrust, landing gear, breaks and tires) (Abdelghany et al., 2005).

**Continuous Descent Arrival**

An energy saving arrivals or commonly known as continuous descent arrival (CDA) (Itoh et al., 2009) is an alternation to operation procedure to reduce fuel burn. The design of CDA is a new type of approach that reduces noise, emissions and fuel burn by having the aircraft descends rapidly rather than through a series of phases which is in practice today (Johnson et al., 2010). When an aircraft descends from it optimal cruising altitude in a continuous manner, it can contribute to fuel saving up to 40% (Sarkar, 2012).

**Fixed Electrical Power Units**

A fixed electrical power unit supplies electrical power to an aircraft at bay during aircraft transit or night stop for maintenance check. Airports equipped with fixed electrical power units allow aircrafts to plug in the power source while waiting at gate instead of burning its engine fuel for electrical power. According to Sarkar (2012), Zurich Airport has reported a yearly saving of 30000 tonnes of CO\(_2\) through the usage of electrical power units at its 50 gates.

**Alternate Fuel**

Some of the airlines try to use a cheaper alternate fuel to replace traditional fuel. In early 2008, a demonstration flight was done by Virgin Airway using bio fuel on its Boeing 747 jets which marked the first test on renewable fuel (Lee, 2010). Airbus has confirmed that usage of alternate fuel is currently available to operators in mixture with traditional fuel up to 50% ratio without any constraint and operation requirements (Blakey, 2011). However, the concerns are the bio fuel might experience thermal instability when it is exposed to high temperature and it might freeze at aircraft normal cruise altitude.

**Reduce Usage of APU**

Auxiliary Power Unit (APU) has been the secondary main fuel consumer after aircraft engines. It requires to burn fuel in order to generate electrical power and pneumatic pressure for aircraft on ground when engines are not turn on. And it is usually turned on during aircraft maintenance at line where there is no ground power unit (GPU) available to supply
the necessary electrical power for maintenance purposes. Thus, it is recommended to use GPU on ground during aircraft servicing to reduce both fuel and APU life usage (Speyer, 2009).

**Single Engine Taxi**

Many airlines encourage their pilots to perform single engine taxi on ground when it is possible. It is usually performed after aircraft landed or on its way to runway for takeoff. This is done to reduce fuel burn by engine when aircraft are capable to travel with single engine to facilitate necessary power. However, due to safety issue and airport regulations, pilots are not always allowed to perform the procedure in all airports (Ryerson et al., 2010).

**Reduce Aerodynamic Drag**

Aircraft aerodynamic drag is one of the factor that increases the fuel consumption. It increases when aircraft age. Aircraft drag increases when there are damaged seal on airframe, improper rigging of control surface, paint roughness, chipped paint, structure damages from lightning strike, bird strike or even ground vehicles due to poor maintenance job. Restoring aircraft structure and engine to as good as new conditions allows airline operators to maintain aircraft aerodynamic efficiency without causing more drag. (IATA, 2009).

**Weight Reductions**

Carrying extra weight on an aircraft cause more fuel burn during operation (IATA, 2009). Airlines have the options to reduce aircraft weight by maintaining minimum weight carried on aircraft to burn less fuel. This can be done by reducing meal cart size, carrying less water onboard, less fuel required if sectors is short, digitalized aircraft manual onboard and etc.

**Education**

Education is important for the employees to be in the same thoughts as management when comes to initiating fuel saving initiatives in the company. Employees of an airline who are equipped with fuel saving knowledge is crucial to make fuel saving plans success. When the employees are aware of cause and effect of different type of fuel saving initiatives, it will ease the process of implementing fuel saving initiatives in the company (IATA, 2009).

**Methodology**

Single case study was applied for this research. AirAsia had been selected for the study. To enhance corroboration, convergence and correspondence of the findings, a two-phase semi-structured interviews were carried out with the regional fuel manager (F01) of AirAsia, continuous improvement programme manager (F02) and technical services engineer (F03) of AirAsia who are directly involve in formulation and implementation of fuel saving initiatives. The interviews were conducted in AirAsia office meeting room and it took around 2 hours per interview in September 2014. First phase of the interview were conducted with F01. His experience in managing and implementing fuel saving initiatives for AirAsia provided us with the necessary information regarding the fuel saving initiatives formulation and implementation. Second phase interview were conducted with F02 and F03 who assist fuel manager in carrying out the fuel saving initiatives to get in depth understanding on the issues arises in fuel saving initiatives implementation. This gave us an insight of how the departments support fuel saving initiatives implementation and identify problems faced by AirAsia. The interview questions are shown in Appendix 1. To ensure the face validity, all the interview questions were verified by experts in the area which include General Electric (GE) black belt instructor, GE aviation fuel manager and AirAsia technical services manager, before the interview process. All the interviews were recorded by using voice recorder. In data analysis, data collected was classified and simplified according to the data source. It was then coded by using open coding, axial coding and selective coding to get the findings.
Findings and Discussion

Comparison of general fuel saving initiatives implemented by airlines and AirAsia

Literature review revealed that there are twelve fuel saving initiatives which are commonly practiced by airlines. The findings of interview showed AirAsia has performed most of the existing initiatives except fixed electrical power unit, alternate fuel and reduce aerodynamic drag.

The reasons that AirAsia does not implement these fuel saving initiatives are 1) the aircrafts used by AirAsia are relatively new, these aircrafts do not suffer from aerodynamic drag. 2) Alternate fuel is still not a perfect substitute product of traditional fuel. 3) Not all the airports provide fixed electrical power unit. The common practice of AirAsia is it will conduct cost and benefit analysis before deciding to implement a new fuel saving initiative. However, AirAsia may consider to implement these fuel saving initiatives once they have become industrial practices to reduce its risk. The managers who involved in fuel saving initiatives have vast experience and awareness about existing fuel saving initiatives in market. They continuously seek ways to improve AirAsia fuel saving performance. The success of integrating different fuel saving initiatives to reduce its fuel cost is one of distinctive competencies of AirAsia to compete in Asia. When this distinctive competency blends with other distinctive competencies (e.g., marketing activities, financial management, and etc.), it will become the AirAsia’s competitive advantage that is not easily imitated by other airline (Coff, 1999).

Factors affect decision making on adoption of fuel saving initiative

The findings revealed that the factors affect decision making on adoption of new fuel saving initiative include man power, the saving level, the cost in implementation, support from suppliers and original equipment manufacturers (OEMs). For adoption of fuel saving initiative, respondent F01 focuses more on the man power to execute the initiative in decision making. Whereas respondent F02 and F03 will consider the saving level of the new initiative, the implementation cost, and supports from OEMs before they decide which initiative to be adopted. Respondent F01 are more to a macro level of managing the fuel saving initiatives whereas respondents F02 and F03 are more to execution and monitoring of fuel initiatives at micro level in related to their department. Respondents F02 and F03

<table>
<thead>
<tr>
<th>Item</th>
<th>Fuel saving operational approach</th>
<th>General Practices by Airlines (Yes/No)</th>
<th>AirAsia Practices (Yes/No)</th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td>Fuel Burn Efficiency</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>2</td>
<td>Optimize Flight Profile</td>
<td>Yes</td>
<td>Yes</td>
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<tr>
<td>3</td>
<td>Fuel Tankering</td>
<td>Yes</td>
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<td>4</td>
<td>Continuous Descent Arrival</td>
<td>Yes</td>
<td>Yes</td>
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<td>5</td>
<td>Fixed Electrical Power Units</td>
<td>Yes</td>
<td>No</td>
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<td>6</td>
<td>Alternate Fuel</td>
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<td>No</td>
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<td>Weight Reductions</td>
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<td>Education</td>
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<td>12</td>
<td>Hedging</td>
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Table 1: Comparison of fuel saving initiatives between general practices vs AirAsia practices

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tend to look at OEMs as support or influence to their fuel saving initiatives because they work hand in hand with the OEMs in implementing and tackling any technical issues arising in the process. However, at the very initial stage when the initiative is merely just an idea, the decision making lays in the hand of AirAsia higher management. At this stage, their decision making will not be influenced by neither suppliers nor OEMs.

AirAsia Fuel Burn Efficiency Measurement

Findings showed that there are two methods measuring the initiatives. Fuels saving initiatives are measured at both macro and micro level depends on the measurement values that respondents are studying. In a Macro level, respondent F01 are measuring it at a fixed quarterly interval for all initiatives where reports will be presented to higher management and shared with all stakeholders. The fuel burn efficiency will be measured through the cost per distance and the cost to run an aircraft per hour. However, at a micro level, respondent F02 and F03 are doing it according to their initiatives requirement. They measure it on monthly basis through aircraft performance degradation since aircraft degrades according to time factor. Therefore, it is necessary to be monitoring the degradation factors on monthly basis in order to get a better idea of the aircraft performances.

Challenges in Fuel Saving Initiatives Implementation

The most challenging task to implement the new fuel saving initiatives is to get stakeholders to buy in the idea. When a new initiative is introduced, stakeholders may have doubt with regards to the outcome of the initiative and it is common to have the tendency to reject new initiative. However, once the stakeholders are comfortable with the initiatives through operation under defined limitations and data justifications, they will slowly accept it.

Discussion and Conclusion

Although fuel is an external factor that AirAsia might have less bargaining power to response to, AirAsia has done a fantastic job in keeping its fuel consumption to the lowest possible which is inimitable to its competitors. It has become one of the organization competitive advantages to compete in market (Priem & Butler, 2001). In a nutshell, AirAsia is strong in continuously searching for fuel saving initiatives and improvement in its existing practices to save fuel consumption.

This study have made several contribution. Prior studies showed that not many studies have been done on AirAsia fuel cost efficiency managements. Most of the studies performed on AirAsia are about the low cost carrier model (O’Connell & Williams, 2005), sustainability of AirAsia business model (Lim et al., 2011), AirAsia service strategy on customer satisfactions (Munusamy, 2011), AirAsia business plans (Taylor, 2013) and Managerial comparison between AirAsia and Malaysia Airlines (Kamisan & King, 2013). This study has explored the different fuel saving initiatives implemented by AirAsia.

Second, plenty of fuel saving initiative studies were done in the developed countries, e.g. fuel hedging of Southwest Airlines (Carter et al., 2004), fuel hedging of American Airlines (Ribeiro & Moreira, 2014) and assessing role of operation, customer and infrastructure cost under fuel price uncertainty on USA carriers (Smirti & Hansen, 2009). This study was conducted based on data collected from a developing country.

Third, numerous studies focused on one specific fuel saving initiatives at a time. E.g. the fuel hedging practices under Southwest Airline (Carter et al., 2006), energy efficiency in aircraft systems to reduce aviation energy consumptions and emission (Lee, 2010), fuel management program to reduce fuel emission (Transat, 2014), fleet planning under fuel price influence to rationalize the adoption of fuel efficiency (Ryerson et al., 2010), fuel burn
cost saving to analyze stages of fuel ferry flight (Abdelghany et al., 2005), technology, operation and cost in comparison between large and narrow aircraft (Babikian et al., 2002) and airline fuel optimization to address constraints in realistic way (Drake, 1974). This study has addressed all the fuel saving initiatives based on data collected from AirAsia.

Fourth, previous studies were looking at the beneficial and practices of fuel saving initiatives of airlines, e.g., improving efficiency of aircraft systems (Lee, 2010), political and economic on fuel optimization (Drake, 1974) and fuel prices effect on airline operators (Jacobs, 2012). This paper has investigated the problems that prevent airline operators from implementing new fuel saving initiative. It provides an insight of general problem faced when implementing fuel initiatives and how AirAsia resolved the problems arise.

Fifth, a two-phase interview process had been employed in this study. Data was collected from multiple informants. It enable compatibility between the interview responds to enhance the validity of research findings (Morren et al., 2012). At the first phase, interview is done with regional fuel manager of AirAsia to get an understanding of how fuel saving initiatives was performing in AirAsia. Whereas at the second phase, interview were conducted with the personnel form technical service performance department and continuous improvement department to obtain an in-depth information of the initiatives (Gabilondo et al., 2010) one of the biggest southern European countries, is scarce and heterogeneous. The objective of this study was to assess the epidemiology of the disorder in the Spanish sample of the ESEMeD project.

METHODS: The ESEMED-Spain project is a cross-sectional, general population, household survey conducted with a representative sample of Spanish non-institutionalized adult population. The survey instrument was the CIDI 3.0, a structured diagnostic interview to assess disorders and treatment.

RESULTS: Lifetime prevalence was 10.6% while 12-month prevalence was 4.0%. A monotonic increase in lifetime overall prevalence was found from the youngest to the 50-64 cohort, declining then in the oldest group. Median age of onset was 30.0. Being a woman (OR=2.7). This allows us to see the different perspective of initiating fuel saving initiatives from a macro and micro level.

Sixth, the findings showed that when airline has an intention to implement a new initiative, they should always start by creating awareness to the stakeholders involved in the project and trying to let the stakeholders buy in the ideas before starting at full capacity. Only after all stakeholders agreed with the new initiative, it can only be implemented smoothly. In initial stage of implementation, airline should start it with small scale to reduce its impact on the operation of airline. For examples, if there are stakeholders that are not comfortable with the new initiative due to concerns over side effect on aircraft component reliability, implementation can always start in a smaller scale such as only selected aircraft is involved to collect the data. Once stakeholders are convinced with the initiative outcomes, only then the new fuel saving initiative be implemented throughout the organization. The findings also revealed that airlines should continue to improve its fuel saving. They not only need to improve their existing initiatives, but also seek new initiative to be adopted to further reduce their fuel consumption.

Seventh, the findings showed that Air Traffic Management (ATM) in Malaysia plays an important role in aircraft fuel burn. Collaboration between ATC and airlines is important to make sure that efficient communications exist. With the current increase of air traffic in Malaysia, ATC has to upgrade their technology to better control air traffic. For example, ATC can consider to use the Communication Pilot Data Link Communication (CPDLC) system which is used in USA. The communication system acts like a short messaging system (SMS) between aircraft and ATC which allows pilot
using SMS to communicate with ATC. It can reduce the risk of overheard because of high traffic and radio congestion. In addition, policy makers should work with airlines to come out with shorter route for airline to travel from one destination to another destination to reduce its fuel consumption which causes less carbon dioxide emission. This is important for achieving sustainable development. Airline can reduce its operation cost and transfer part of the cost savings to its clients while create less pollution to the natural environment.

Lastly, aircraft OEMs like Airbus or Boeing and engine OEM like GE and Pratt and Whitney are also play a role in encouraging airlines in executing fuel saving initiatives. They should continuously update the manuals to reflect new initiatives and operation procedures that can help airlines in building interest and initiatives to start new fuel saving initiatives. Support and guidance from OEMs can be very influential to airlines if the materials are well supported with data analysis. This can cut down a lot of time in convincing stakeholders in implementation of a new fuel saving initiative.

Regardless of the contributions mentioned above, this study has several limitations. First, this study is performed in the Malaysian context where only one low cost airline in Malaysia was selected for the study. The findings cannot be generalizable to other airlines. Future study needs to examine the issue from larger sample data to increase the generalization of the findings. Second, due to information accessibility problem, this study did not examine the fuel hedging practice. Hence we are not able to get input from the fuel hedging party for this airlines. Therefore, future research might focus on fuel hedging initiative on other airlines in Malaysia.

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### Appendix 1 Interview Questions

<table>
<thead>
<tr>
<th>Question</th>
<th>Through the following general interview questions:</th>
</tr>
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</table>
| 1. What fuel saving initiatives measurements did AirAsia adopt in respond to fuel price fluctuation? | 1. What are the types of fuel saving approaches adopted by AirAsia?  
2. How are they being launched and monitored?  
3. Does each of the fuel saving initiative produce the predicted outcome?  
4. Will there be new fuel saving initiatives in near future that company is looking to embark on? What are they? |
| 2. What are the conditions that influence AirAsia to adopt fuel saving initiatives? | 1. How decisions were made on when and what fuel saving initiatives should be employed?  
2. What are the efficiencies or factors of fuel saving initiatives considered when choosing to implement them?  
3. Do suppliers play any role in influencing airline operator to start on fuel saving initiatives?  
4. Beside fuel fluctuation cost, Is there any other factors that encourage AirAsia to adopt fuel saving? What are they?  
5. What are the threats and how airlines in Malaysia or nearby regions affect your decision in fuel saving? |
| 3. How AirAsia fuel management team assesses effectiveness of fuel saving initiatives adopted? | 1. What measurements were employed for each fuel saving initiative?  
2. How long of data will be retrieved for assessment? Why?  
3. Which personnel will be involved for fuel saving initiatives measurement and assessment?  
4. How do you decide if effectiveness of each fuel saving initiative is achieved after implementation? |
| 4. What approaches AirAsia took to solve problems raised when implementing the initiatives? | 1. What were the problems/challenges faced while introducing/implementing these initiatives?  
2. Were there restrictions from parties that involved? How were they resolved?  
3. Were there limitations for each initiative? What are they?  
4. How are the problems being handled? |