

Case study

Information system for flight disruption management

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Abstract

Airlines operate in a macro-economic environment characterised by stiff competition and stringent regulatory constraints. Disruption management can play a key role to assist the industry towards a minimum unit cost. This paper investigates communication process business drivers required for flight operations and disruption management. The disruption management in the company under study (Emirates airlines) is studied in order to derive an operational strategy in which input resources and transformation process are reconsidered to deliver effective output services to passengers. Effects of different types of flight disruptions are studied and the role of Network Control Centre (NCC) is identified through subsequent stages. A Management Information System (MIS) approach is proposed to offer solutions to disruption management. The flight disruption at the company are analysed along with their impacts on airport, aircraft and passengers through a case study.

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1. Introduction

The airline industry, scarred from terrorist attacks, is undergoing a looming phase of poor profits. Companies are laying-off staff and trimming their services in order to overcome the drop in the number of passengers and rising cost for securities. Emirates Airlines continues to grow and perform exceptionally well in the recent years when some airlines have been struggling to survive. The company is not targeting the price sensitive passengers and hence it has no plans to enter low-cost services. In contrast, the strategy is to set long-haul flights with some regional routes (to feed long-haul flights and maintain the presence in the region).

Flight operations include the aircraft schedule and rotations, manipulation and altering of the schedules, crew scheduling and management and flight statistical analysis. The unit cost of flights is mostly affected by flight operations as the other costs such as aircraft maintenance cost, crew salaries, fuel consumption cost, etc. are relatively rigid to change. Flight operations management for an airline provides an integrated solution to plan, monitor and

respond to real-time events, analyse traffic statistics and improve operational performance (Airline Software, 2001).

Airline service quality depends on their ability to meet the requirements of their planned schedules. However, various events ranging from severe weather to the failure of a crewmember to report for duty inhibit their ability to always satisfy their schedules. In some instances, as in the case of thunderstorms, only a single airport may be affected for a few hours. In others, a large weather system can disrupt airline schedules over thousands of square miles for several days.

Disruption can be defined as *an act of delaying or interrupting the continuity* (Hyper Dictionary, 2003). However in operational terminology, Clausen, Hansen, Larsen, and Larsen (2001) defines disruptions as a situation during the operation's execution in which the deviation from plan is sufficiently large that the plan has to be changed substantially. A disruption in flight operations takes place when the observed situation deviates from the planned situation and the deviation on operation is substantial. Disruptions may have minimal effect in some cases on the airline. In other cases, it can become severe, causing the airlines to delay, cancel or divert substantial number of flights and imposing substantial cost to them.

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Due to increase of air traffic in the future, the airline industries are obliged to provide high-quality services even in the case of disruptions and abnormality. This requires a fresh look and redefining the existing operational activities performed in flight operations. Very few attempts have been carried out to handle disruptions in flight operations. Operations Research (OR) techniques has been used for disruption management to be applied on the day of the disruption that can produce alternative plans well ahead of potential problems (Clausen et al., 2001).

The paper is intended to develop the authors' previous work (Abdi & Sharma, 2007) that investigated the influencing factors on the strategic flight operations/disruption management using PEST analysis. This paper is to examine the current processes to handle disruptions in flight operations and discover proactive measures in order to avoid disruptions while running operational activities. In particular, an Information Technology (IT) framework is developed to manage the operations disruptions as well as flight operations. The proposed IT strategy can assist managers to explore existing disruptions and build a knowledge-based approach on the basis of historical data for handling the upcoming disruptions. The IT-based analysis can facilitate managing the disruptions and might result an alternative solution, which can eventually reduce the disruptions and the cost incurred. The data used in the research has mainly been gathered from interviews and discussions with different stakeholders and from the existing documentation such as Emirates Flight Operations Manual (2003).

2. Flight operations strategic management

Flight operations of an airline needs an Integrated Operations Control (IOC) to plan, monitor and respond to real-time events, analyse traffic statistics and improve operational performance (Airline Software, 2001). Fig. 1 illustrates the overview of IOC conversion process where the inputs are transformed to the customers delight. The input resources consist of transformed and transforming resources which are treated, transformed or acted upon. The transformation or the conversion process consists of material processing, information processing and customer processing (Slack, Chambers, & Johnston, 2001). Material processing focuses on the baggage, freight in order to change their location from the origin of the journey to the destination. Information processing changes the possession of the data (for example the flight map is delivered to the flight crew) and processes the information in order to generate the reports. Customer processing transports the passengers to the destination. IOC plays the role of the transformer and takes care of all the processes within the conversion process to deliver the output.

The fundamentals of airline operations are not different from those of any other firms operating in an open market (Shavell, 2000). However, the airline operations are very different from other operations in terms of disruptive

events. Manufacturing firms and some service providers when confronted with disruptive events are able to react to preserve the uninterrupted flow of product and services to their customers. On the other hand, the customers of an airline are either trying to board or are already on the airplanes when flights are cancelled, delayed or diverted. There is nothing an airline can do to avoid inconveniencing their customers.

The flight operations might have high/low *visibility* aspect within the same macro-operations. Some of its activities are totally visible to its customer, e.g. catering, crew service, on time departure, baggage handling, etc. Other parts of flight operations have relatively little visibility. For example aircraft planning or flight dispatch has very little customer visibility. The high visibility operations require staff with good customer contact skills. In other area, IT can provide user-friendly, real-time solutions for the customers which can lower the cost of operations and enhance the airline productivity.

Emirates flight operations are high on *volume* dimension because of the high number of passengers transiting through the Dubai Airport. As per department of Civil Aviation, Dubai, a total of 18.06 million passed through the airport in 2003 (DIA—Statistics, 2004). There is the repeatability of the tasks which the staffs perform in the flight operations. For example a flight dispatcher repeats the same task for every flight which is dispatched from the Dubai airport. The staff follows the standard procedures set down in a manual, with instruction on how each part of the job should be carried out. IT can help in such a scenario by providing a business solution to achieve the standardisation of the tasks.

Flight operations are relatively low in *variety* dimension because it operates according to a set schedule, published well in advance (e.g. the crew roster, aircraft plans are published 3 months in advance) and adhered to in a routine manner. Unless there is any disruption in the day-to-day running of the operation, the cost of operation is also low. The standardisation and the regularity in the daily business of flight operations again highlights the scope of IT solutions in managing the operations.

As Dubai International airport is emerging as a transit hub for all the air travellers across the globe, it is relatively low in the *variation* dimension as well. The demands of Emirates flight operations are therefore relatively level. The crew, catering, flight plans and other activities of flight operations can be carried out in a routine and predictable manner which results in a high utilisation of the resources. Fig. 2 summaries the typology of the flight operations.

Emirates IOC is characterised by high repeatability, well defined, routine and predictable operations which have relatively low unit cost. However, the disruptions in such operations escalate the unit cost tremendously. Thus, one of the critical factors to the success of Emirates flight operations is to contain the cost of disruption handling.

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