

EVALUATION OF AIR CARGO LOGISTICS: SUARNABHUMI AIRPORT, BANGKOK

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ABSTRACT

Air shipment has become a growing solution for international shipments. It is traditionally used for high-value merchandises such as electronics parts, orchids, tropical fruits. There are many factors that influence a customer's decision to move cargo by air. These factors include high value, urgency of need or use, product sensitivity, being lightweight but important in the production process (i.e. spare parts).

However, due to lack of visibility, sometimes cargo can disappear or get damaged before reaching the destination. Problems in the cargo logistics system range from damaged cargo, miss-routing, missing cargo, or even missing documents. Performance measurements are required to analyze the effectiveness and efficiency of the cargo logistics system. Performance measures can be distinguished by many aspects, such as Relational Performance, Operational Performance and Cost Performance (Stank et al., 2003). In the case of the new Suvarnabhumi Airport, the operational performance of air cargo is difficult to control by the air cargo service providers. This is because the operations at the cargo terminal are centrally operated by Thai Airways International (Thai Cargo Terminal) and Bangkok Flight Service (BFS Terminal).

The purpose of this study is to identify and analyze the hidden factors and elements that affect the performance of air cargo service providers. This study reviews the flow of cargo from booking and receiving to the end. It also examines the operation process starting from the Cargo Terminal, to customs formality and inspection, unloading, to being put on standby before exporting. The flow of cargo and operation process will be described and examined after being investigated and analyzed at the International Cargo Terminal. A Root Cause Analysis (RCA) will be applied to identify the hidden factors and elements which affect the performance of the operation process.

The result of this analysis shows the sensitive points in the cargo system. This analysis and resulting suggestion will increase the air cargo service providers' ability to manage

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their performance. This study will serve as a basis for the improvement of performance of airport cargo logistics systems.

INTRODUCTION

Manufacturers and exporters are continually upgrading to international standards and are evolving into multinational corporations with global networks, an important factor in international business. The increasing importance of efficiency and a focus on core competencies open up many business opportunities for manufacturers and companies to sell or offer the products beyond their domestic customers to customers in other countries. These products can be materials, electronic items, equipments, spare parts, machinery, fresh foods & daily foods, flowers, animals, services.

To sell these products to other countries, there are three basic components: seller, buyer, and logistics. Transportation becomes an extremely important factor for its logistics part, as it is a movement service. It is the creation of place and time utility. When goods are moved to places where they have higher value than they had at the places from where they originated, they have place utility. Time utility means that this service occurs when it is needed. Time and place utility are provided to cargoes when they are moved from where they are produced to places where they are needed at the demanded time. Sellers are largely providing the same product to their end customers as they always have. The big difference is there is growing demand for “build to order” products, driven mainly from their clients’ need to keep fewer inventories on the shelf. This shift in requirements is straining the supply chain. Sellers are no longer “pushing products”, because end customers are now “pulling” products through the supply chain.

Thus, customers increasingly expect shorter cycle times through the Just-in-Time technique (JIT). The speed, delivery time or transit time between manufacturer’s and customer’s warehouse at destination countries, and more accurate services, are factors that are being focused on for the transportation part.

The concept of JIT is increasingly applied in many industries. It is important that the seller adjust its business strategies and operation practices to respond to the changing requirements of its customers and to maintain competitiveness. By applying JIT, buyers will place their orders more frequently while the lot size is smaller. With JIT, sellers might suffer when they want to satisfy customers, and so one choice is to keep more stocks so as to have product availability to meet demand.

However, many companies who also adapt their business strategies, respond to JIT by producing smaller lot size, keeping stock as low as possible. As a result, there may be product unavailability when there is demand, and thus customers are lost. To operate the business with

JIT, total cycle time has had to reduce, therefore good logistics management in planning, organizing, scheduling, information, and cooperation between seller and buyer is required both upstream and downstream. Besides production lead time, delivery time and transit time should also be considered and be more strict so that there is less inventory within the chain.

However, there are many factors that influence companies to consider how to distribute or transport their products to customers in different places around the world. Transportation modes can be distinguished based on characteristics of product types and some limiting conditions of the consignment. Transportation modes can be airfreight, ocean freight, railway, and trucking. The consignment can be sent through a single mode, or through inter-modal transport such as Air-Sea, or Railway-Sea. Generally, if the product is urgently required because of a hurry to use it, a fixed schedule, no inventory availability etc., then Airfreight transportation can be one of the best options in order to meet the demand and satisfy the customer's needs on time.

Air transportation cost seems to be the most expensive when compared with other transportation modes but it provides the shortest transit time, which enables a response to the concept JIT. Most companies therefore need a reliable carrier, a reliable service, within restricted time, mistake-free, and visibility, while cargoes are being transported.

This study will mainly focus on a single mode: airfreight transportation. There are several factors why companies choose the airfreight mode to transport their products to customers at various destinations, such as valuable cargo, urgent requirement, lightweight consignment, temperature control, fast transit time is required, sensitive cargo, flexibility and frequency of the services. There is a prediction of TIACA (The International Air Cargo Association), that the volume of global airfreight shipment will grow 6.5% annually, and within Asia by 9%.

Reliability, accessibility, times restriction and mistake-free are high expectations of customers when they accept to pay such high transportation costs. It is therefore easy for an air carrier to disappoint its customers who find that their consignments are lost or missing. Poor accessibility is one disadvantage of air carriers. Generally, it is unpredictable when the missing cargo will be found. It might be at some other place instead of the consigned destination, or it might be lost or disappear from the loop due to poor operation either at the loading port or the destination port. Times of tracking are unpredictable, as this varies from days, weeks or even months. Making a claim on an air carrier for the full cargo's value is difficult and time-wasting.

The Airport Authority of Thailand moved their operations from Don Muang to the new Suvarnabhumi International Airport, on the southern fringe of Bangkok in October 2006. The records base of Thai Airways International from October 2006 to January 2007 shows that the total import shipments from airports worldwide was 624,174 shipments, of which a total of 2,206 shipments (or 0.35%) were missing.

This paper studies the loading processes at two international cargo terminals at Suvarnabhumi Airport, to gain a better understanding, visibility and accessibility of the process. The possible causes that lead to poor operational practices will be analyzed by investigating the current practices at the airport. The loading process was observed, and interviews conducted with air cargo carriers and with the two ground service handling companies which operate at the airport.

LITERATURE REVIEW

Many authors identify the linkage and effect of one variable with another, such as how operational performance has an effect on a company's service quality level, and how service quality affects customer satisfaction and loyalty. Relevant topics in the literature are the growth in airfreight, performance and service quality, customer satisfaction and loyalty, and implementation of information technology to improve the trace and track system, provide more accuracy, and increase visibility of the consignment when it ships from origin to destination.

Performance of Logistics Service Providers

The literature examines a variety of measures of the general or specific performance of logistics service providers regarding transport activities, timeliness and accuracy (Bromley, 2001; Johnson, 2001); delivery performance (Stewart, 1995); and personnel scheduling and safety measures (Crum and Morrow, 2002; Mejza et al., 2003). These providers can also be distinguished by the characteristics of their customer relationships (Knemeyer et al., 2003), customer satisfaction and loyalty (Stank et al., 2003).

As greater distances separate markets, suppliers and manufacturers, logistics plays a more critical role in the success of the supply chains. As a result, total logistics cost has become one of the most important economic indicators of supply chain efficiency. This concept is supported by Gilmore (2002): there is a growing recognition of the role that transportation and logistics excellence plays in achieving a world-class supply chain. A large body of literature relates to the strategic role logistics plays in creating value and its relationship to a company's financial performance. As reported by Richardson (1995) and later stressed by Gilmore (2002), logistics controls a significant amount of assets and has direct impact on cash flow and the bottom line, adds value through continuous productivity and service improvements, and possesses a strong relationship with a firm's customer service level and revenues.

Since there is uncertainty about how much of a product will be sold, manufactured and shipped, even with improved forecasting methods it is not possible know precisely how much demand there will be for a firm's products in the future. This means that it is difficult to know how much logistics capacity the firm will require, or the timing and location of the needed capacity. Be-

cause forecasting does not provide exact results as to the amount of product to be sold, logistics flexibility is necessary (Ronald et al., 2006).

Growth of Airfreight

Many of the above issues have led to increasing use of airfreight in supply chains. The Chairman of the Research and Development Committee for The International Air Cargo Association (TIACA), predicts that the world airfreight industry is expected to more than triple in the next 20 years, growing at an average of 6.7% per year and significantly outpacing passenger growth in all major markets. Airfreight shipping is increasing, primarily because:

- Fluctuating currency has increased the demand for goods from overseas.
- Labor costs and interest rates remain low, as fuel prices tend to vary.
- Businesses worldwide have seen the need for express cargo shipping.
- Shorter lifecycle of products
- General trend towards global markets, spurred by the Internet.

The prediction is that the greatest growth will occur in the intra-Asian freight markets, followed by North America-Asia, Europe-Asia and Australia-Asia, and North America-Europe. Intra-Asia growth will be 9% while the world average is expected to be 6.7% per year.

In changing markets (Zairi and Lobo, 1999) the airfreight customers have seen dramatic changes in the recent past. The life cycles of their products have become shorter and shorter. At the same time the buyers' market has become more global and - thanks to Internet - more transparent, leading to tougher competition.

According to Zairi and Lobo (1999), globalization of sourcing, production and sales has revolutionized the requirements for transport providers. Customers are reducing batch sizes and demanding ever-shorter transport times. Global logistics systems with low and reliable transport times are needed for accelerated product cycles and for competition in global markets. Due to these factors, the airfreight mode has become the focus of more firms, due to fastest transit time, most reliable, safety, response to JIT and reduction of total cycle time.

Performance and Service Quality

To keep current customers and develop relationships with new ones is a key business strategy (Piercy, 1995). According to Zemke and Bell (1989) nothing is as common as organizations committed more to lip service than customer service, more interested in advertising than action. Zeithaml (2000) highlights three major problems in measuring relationships:

1. The time-lag between measuring customer satisfaction and measuring profit improvements;

2. The number of other variables influencing company profits such as price, distribution;
3. That other variables (such as behavioral issues) should be included in the relationship as they explain causality between satisfaction and results.

However, a number of studies have demonstrated a clearly positive relationship between organization performance and customer satisfaction/service excellence. Wirtz and Johnston (2003) highlight the positive correlation between the profits and service excellence of airlines. Perceived quality is related to organizational performance indicators in the same year and/or in the next year (Van der Wiele et al., 2002). Service failure and the subsequent complaints from customers are a likely occurrence over a product/service lifetime, and the rapid, effective handling of these has proven to be vital in maintaining customer satisfaction and loyalty.

Research by the Office of Fair Trading (OFT, 1990) illustrated that when people make a complaint about goods and services and the complaint is satisfactorily resolved, three quarters of them will buy the same brand again. Where the complaint is not resolved, less than half will buy the same brand again. Clearly there is a profit to be made by retaining the customer loyalty of those whose complaints the company resolves (Citizen's Charter Complaints Task Force, 1995). The ability to deal effectively with customer problems is closely related to employee satisfaction and loyalty. Additionally, Guenzi and Pelloni (2004) provide further support for the evidence that customer satisfaction is a fundamental driver of customer loyalty in service markets.

A widely reported model is the one proposed by Parasuraman et al. (1985) who condensed ten original factors into five categories: tangibles, responsiveness, reliability, assurance and empathy, and a sixth was added later, called recovery (Gronroos, 1988a, b).

1. **Tangibles:** includes the company's or service provider's physical facilities, equipment, dress of their employees, and communications material.
2. **Reliability:** refers to the ability of the service provider to perform the service accurately and dependably as promised.
3. **Responsiveness:** refers to the willingness of the firm's staff to help customers and to provide the requested service promptly.
4. **Assurance:** refers to the knowledge and courtesy of the company's employees and their ability to inspire trust and confidence in the customer towards the service company.
5. **Empathy:** refers to the ability of the service provider to provide a caring and personalized attention to each customer.

Dale (2003) summarizes three major changes in the service sector due to the present emphasis on service, in particular the contribution made by service providers in enhancing and maintaining service quality. These arise from environmental trends relating to: Consumers' awareness and expectations; Technological developments and sophistication; and Competitive elements.

Zairi and Lobo (1999) list the improvements in service quality by carriers:

- Fewer mistakes;
- Better space utilization;
- Improved reliability;
- Greater control over shipments;
- Improved inventory control;
- Much improved management information; and
- Revolutionized communications in the air cargo handling community.

The following four criteria for examining air cargo carrier performance are from URL: <http://www.aircargoworld.com>:

- Customer Service: Claims handled expeditiously, problems solved in a prompt and courteous manner, a professional and knowledgeable sales force.
- Performance: Fulfills promises and contractual agreements, dependable, accomplishes scheduled transit times.
- Value: Competitive rates commensurate with service levels, value-added programs.
- Information Technology: Tracking and tracing, Internet/electronic commerce capabilities.

Air France Airlines regularly measure their performance. Their main criteria are:

- Flown as Booked (tons): this indicator represents the ratio between the AWBs with firm reservations, which have been loaded onto the booked flight and the total number of AWBs with reservations.
- On-Time Performance of Freighters: this indicator measures the on time departure of freighters.
- Missing Documents / Missing Cargoes: this indicator measures the rate of missing documents or missing cargoes on arrival in all stations on the network.
- Handling Calls - Reservations Paris: this indicator measures the percentage of calls handled by the Paris Sales team. This figure covers all calls, as well as the average of waiting time before someone answers
- Handling Calls - Import Paris: this indicator measures the percentage of calls handled by the Paris Imports Department, and the average waiting time before someone answers.

Customer Satisfaction and Loyalty

Heskett et al (1994) identify a number of factors that are considered important for employee satisfaction. These include: satisfaction with the job itself; training; pay; advancement fairness; treatment with respect and dignity; teamwork; the company's interest in employees' well-being; and the service worker's perceptions of their abilities to meet customer needs. One study mentions that the greatest barrier to effective service recovery and organizational learning is that only 5%-10% of dissatisfied customers choose to complain following a service failure (Tax and Brown, 1998; Dube and Maute, 1996). Instead, some dissatisfied customers

choose to silently switch providers or attempt to get even by making negative comments to others (Singh, 1990).

The suggestions by Hart et al. (1990), Mason (1993), and Bowen and Lawler (1995) are that there are specific practices that improve service-recovery effectiveness: hiring, training and empowerment; establishing service-recovery guidelines and standards; providing easy access and effective responses through call centers and maintaining customer and product databases.

Furthermore, as service quality is influenced by customer satisfaction (Bitner, Hubbert, 1994) much more convergence evolves upon satisfaction representation. Satisfaction is defined as an emotional post-consumption response that may occur as the result of comparing expected and actual performance (disconfirmation), or it can be an outcome that occurs without comparing expectations (Oliver, 1996). Moreover, satisfaction is based on the extent to which customers perceive the service episode to have met, fallen short, or exceeded their expectations. When performance is less than expected, the organization experiences detrimental effects. When customers are satisfied, the organization may be performing well. When customers are delighted, they come back, and frequently become an organization's best advertising/marketing tool (Nicholls, Gilbert and Roslow, 1998)

Many previous researchers talk about customer satisfaction. Bennett and Rundle-Thiele (2004) demonstrated in their research that satisfaction and loyalty are not the same, and in some cases satisfaction does not predict loyalty (consider banks where customers are highly dissatisfied yet remain loyal). This suggests that marketing managers need to test both customer satisfaction and loyalty levels because high levels of satisfaction do not always translate into high levels of attitudinal loyalty.

Moreover, Eggert and Ulaga (2002) showed that customer perceived value and customer satisfaction could be conceptualized and measured as two distinct yet complementary constructs. Strong interactions between the two concepts do exist. Both theoretical reasoning and empirical research provide evidence, however, that value and satisfaction tap different dimensions. Critical customer information includes on the one hand data about how satisfied customers are with the company's products and services. On the other hand, the assessment of how value is perceived by customers in market offerings complements the information needed for marketing decision-making. Besides, Levesque and McDougall (2000) indicated that the very strong relationship between loyalty and satisfaction will raise the importance of perceived value to loyalty and, in turn, lead to profitability. Perceived value was a significant determinant of customer satisfaction. Its consistent effect on satisfaction, which dominated the contribution of relational quality intentions, highlights the improvement in understanding customer satisfaction and future intentions. The three factors, core service quality, relational service quality and perceived value, impacted on customer satisfaction, which, in turn, impacted on loyalty (Leversque and McDougall, 2000).

Information management, which is needed in order to control and track products, can be significantly improved in accuracy, detail and sheer speed of availability. Electronic Data Information (EDI) is extremely useful because partnership has become a major theme of freight forwarding, needing to be underpinned with very fast, reliable methods of information technology to enable business partners to function more effectively. The advantages of EDI are recognized globally, and more and more cargo professionals are switching to EDI. In theory, EDI means that any piece of cargo can now be sent from its site of origin to its destination, using as many modes of transport as required - with a single set of EDI messages to control, document and monitor its progress to any part of the world (Zairi and Lobo, 1999). There is also 'Barcoding'. Lufthansa Cargo, introduced barcoding as a standard system in 1997. The bar code label describes a worldwide standard in air cargo and serves as the basis for an integrated logistics chain.

METHODOLOGY

The research problem can be summarized as follows:

What are the major factors that are the cause of missing cargo, miss-routing, or damage occurrence?

What would be the variables that are driving the factors to be the cause of the problem which occur?

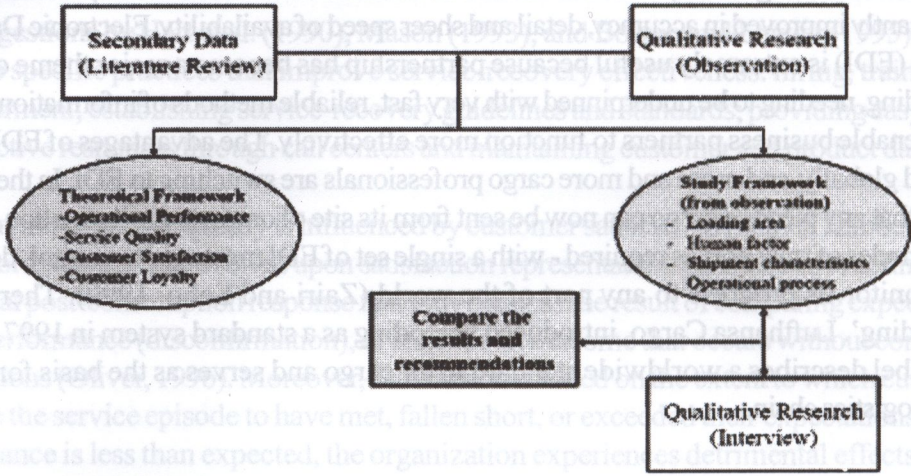
The following objectives were identified:

- To identify the current operating process of air cargo transport service providers at the loading terminal, International Cargo Terminal, Suvarnabhumi Airport.
- To identify and evaluate the potential variables that could create the risk of problems at the loading terminal.
- To prevent the potential causes that lead to missing cargo, miss-routing, and damaged cargo at the loading terminal.

The scope of the study focuses on the major risk factors that lead to the problem of missing cargo, mis-routing, and damage. These factors could be environment, human, and loading process.

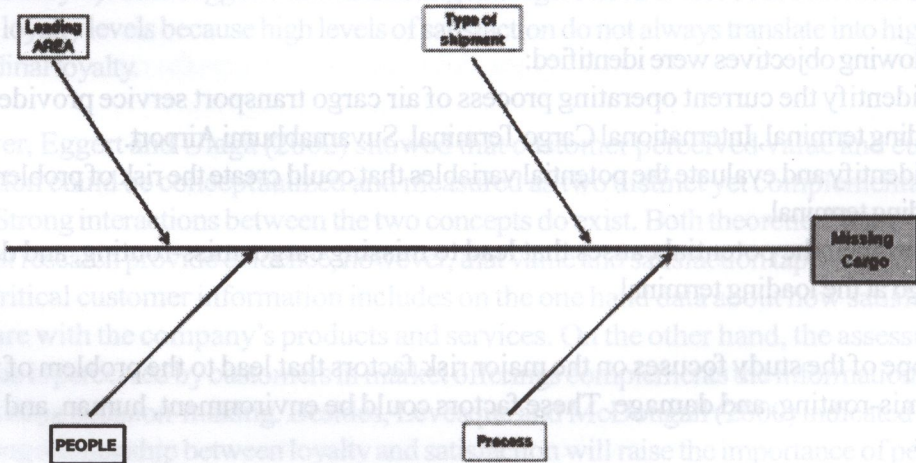
A research design is a logical plan in which there are a number of major steps, including the collection and analysis of relevant data. The following Figure models this.

Figure 3.1: Process of the Study



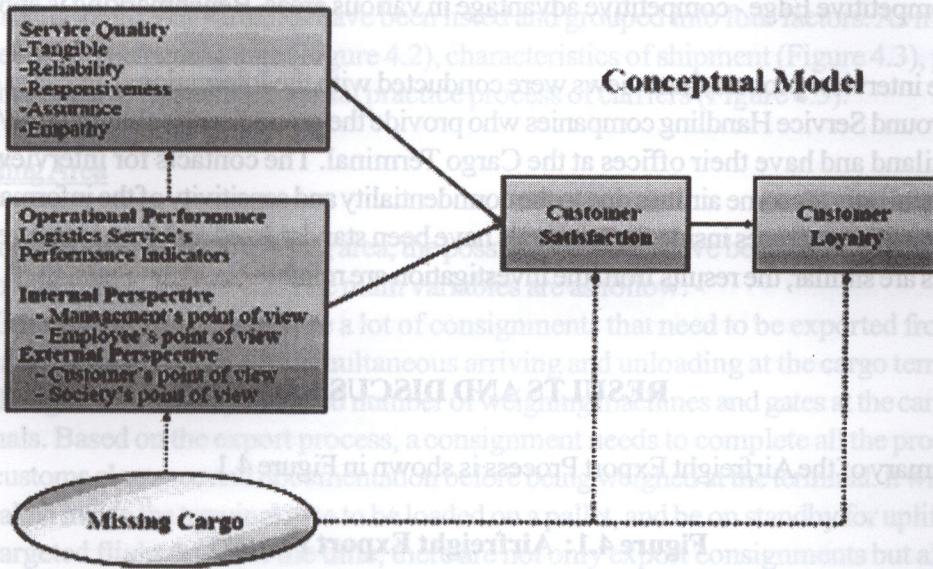
The observation at International Cargo Terminal, Suvarnabhumi Airport, resulted in many factors that could lead to problems of missing cargo. All possible variables will be listed under 4 factors, which are in Figure 3.2 below.

Figure 3.2: Root Cause Analysis of Missing Cargo



The following is a model of partially lost (missing cargo), and its effects on the framework of operational performance and service quality, which influence customers in their satisfaction and loyalty.

Figure 3.3: A Conceptual Model of Customer Satisfaction and Loyalty



However, this research will be based on the concept of service quality measurement which is proposed by Parasuraman et al. (1985) who condensed ten original factors into five categories: tangibles, responsiveness, reliability, assurance and empathy. Missing cargo has been listed under 'reliability' service of the air carrier. Based on www.worldaircargo.com, there are four criteria for examining air cargo carrier performance: customer service, performance, value and information technology.

This research used as its main sources of data, observations at the International Cargo Terminal and interviews with air cargo carriers.

- Observation - the operation process of exporting and loading cargo is the same for all airfreight shipments, and there is only one loading area at the airport.
- Interview - the target population is international airlines. Interviews with either the Air Cargo Manager or the Claims Department discussed possible factors that may occur during operating at the loading terminal, resulting in missing cargo, and the effects on the company. Interviews were also conducted with the two ground service handling companies:

In selecting airlines to interview, the following criteria were used:

- Area of Operation - passenger-cargo or freighter carrier only.
- Network and Size - worldwide destination services, whose major hubs are in Europe and Asia.
- Market Reputation - recognised and well known in the Europe-Asia market.
- Evidence of Quality Systems - top ten carriers as ranked by World Air Transport Statistics

(WATS), ISO 9001 standard and Cargo 2000 membership.

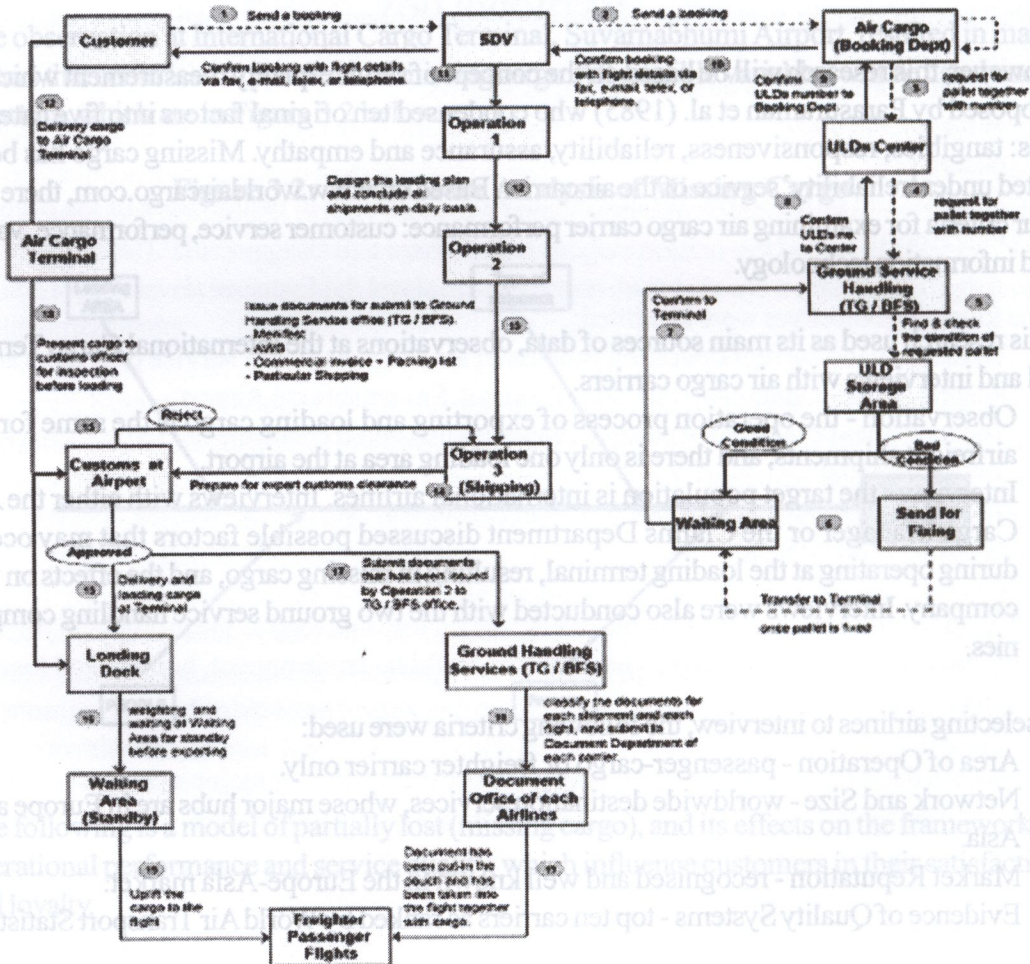
- Competitive Edge - competitive advantage in various areas. Benchmarking is applied.

For the interview process, interviews were conducted with the International air cargo carriers and Ground Service Handling companies who provide the ground service handling at Airports in Thailand and have their offices at the Cargo Terminal. The contacts for interviews were successful only for some airlines due to the confidentiality and sensitivity of the information. As the operating processes inside the terminals have been standardized and the procedures for all carriers are similar, the results from the investigation are reliable.

RESULTS AND DISCUSSION

A summary of the Airfreight Export Process is shown in Figure 4.1.

Figure 4.1: Airfreight Export Process



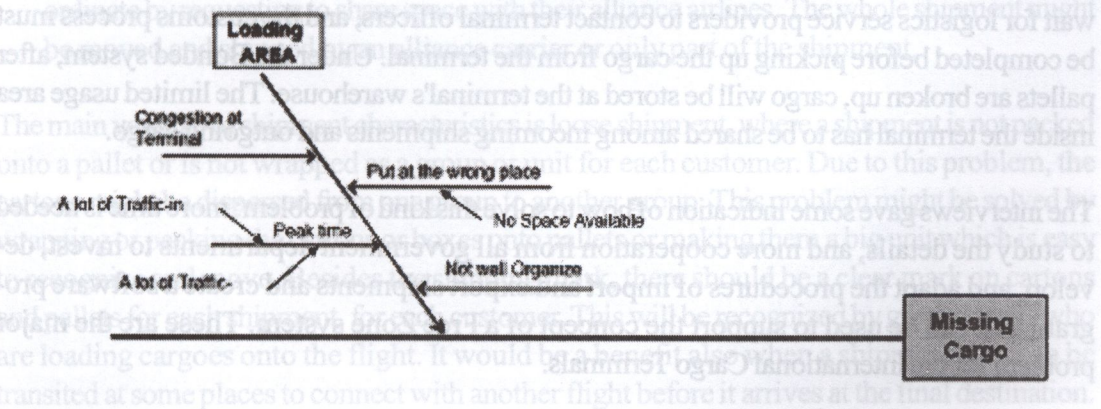
This study found many variables in the current export process, which are causing the problem of missing cargo. All variables have been listed and grouped into four factors. As mentioned earlier they are: loading area (Figure 4.2), characteristics of shipment (Figure 4.3), people or labor (Figure 4.4), and the internal practice process of carriers (Figure 4.5).

Loading Area

After observations of the loading area, the possible variables have been listed under the factor of Loading Area, Figure 4.2. The main variables are as follow: -

1. Congestion - when there are a lot of consignments that need to be exported from Thailand, there is continuous simultaneous arriving and unloading at the cargo terminal, although there are only a limited number of weighing machines and gates at the cargo terminals. Based on the export process, a consignment needs to complete all the processes of customs clearance and documentation before being weighed at the terminal. It will then be taken inside the terminal gate to be loaded on a pallet, and be on standby for uplift into the targeted flight. Most of the time, there are not only export consignments but also many import consignments waiting to be checked. If there is no damage (package condition), nothing missing, no short-shipment, then the consignment needs to be taken out of the terminal gate to wait for trucking at the loading/unloading area. A truck is allowed inside the terminal to pick up cargo only when the shipping company completes import customs clearance. Waiting time for both export and import consignments can generate congestion at the loading/unloading area.

Figure 4.2: Root Cause Analysis of Missing Cargo - Loading Area



2. Peak Time - during the day, there are a lot of flights coming and going, both passenger flights and freighters. Every flight contains many consignments, and the area for both storage and loading/unloading is shared among imports and exports. Because of lack of space to support this number of consignments, a consignment might be mixed up if loosely packed.

3. Put at the wrong place - due to not enough space or no available space at peak times. generated by staffs at the terminal.

Sometimes the staff of a Ground Service Handling Company put the cargo at the wrong place or close to the area of other carriers.

4. Not well organized - due to the area being limited although there are many carriers and consignments. Each carrier has quotas in the area for loading and unloading the pallets inside the terminal. When there is congestion of traffic and at peak times, the quota system cannot be well organized.

From the interview with an officer at terminal, we learned that the international cargo terminal was built to support a Free Zone system, not a Bonded Warehouse system. A Free Zone system has been planned and designed to eliminate the problem of congestion, peak time, and inefficient area usage (problems experienced at the old airport). However, the Free Zone system did not succeed due to factors such as the system and process of customs clearance, and the software program, which did not support the Free Zone system and needs more time and investment to develop.

The differences between a Free Zone system and a Bonded Warehouse system is that in a Free Zone, all import consignments move freely from cargo terminals to freight forwarders' warehouses without having to complete import customs clearance. Warehouses have been built in the Free Zone area and are for rental by freight forwarders or logistics service providers. When shipments arrive and are unloaded from a flight, all ULDs (pallets and containers) will be pushed out of the terminal, and freight forwarders or logistics service providers have to go to pick up their own pallets and containers to send to their warehouses, break the console, prepare for customs clearance and distribute cargo to customers.

For a Bonded Warehouse system, the consoled shipments will 'break' inside the terminal and wait for logistics service providers to contact terminal officers, and the customs process must be completed before picking up the cargo from the terminal. Under the Bonded system, after pallets are broken up, cargo will be stored at the terminal's warehouse. The limited usage area inside the terminal has to be shared among incoming shipments and outgoing cargo.

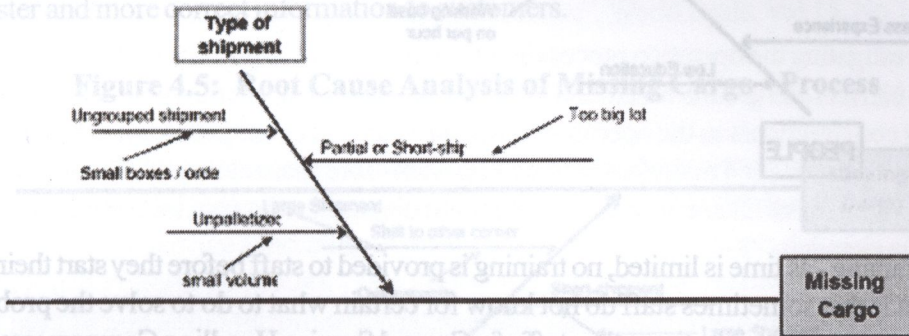
The interviews gave some indication of how to solve this kind of problem: more time is needed to study the details, and more cooperation from all government departments to invest, develop, and adapt the procedures of import and export shipments and create a software program that can be used to support the concept of a Free Zone system. These are the major problem for the International Cargo Terminals.

Characteristics of Shipment

In a lot of missing cargoes it is sometimes found that characteristics of shipment are also important and lead to the problem. Figure 4.3 shows the characteristics of shipment that could lead to missing cargo.

1. Ungrouped shipment - sometimes the shipment is not packed or wrapped as a big unit or put together in the same area or put in the cart while waiting for weighing or loading onto a pallet. It is easy to become mixed up with other loose shipments.

Figure 4.3: the Root Cause Analysis of Missing Cargo - Type of Shipment



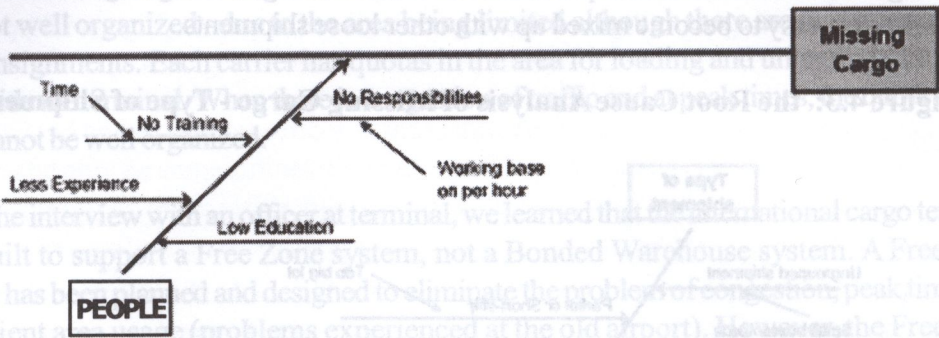
2. Unpalletized - sometimes the volume of shipments is not great, some customers having only a few boxes while others have greater volumes and pack or wrap these as a big unit before loading them onto the pallet. It is not easy for staffs to recognize the shipment and not be confused as to whether a carton belongs to which pallet or to which customer. A loose shipment is easily mixed up with other shipments during loading or unloading and this may occur both inside and outside the terminal.
3. Partial or Short-shipment - sometimes too big a shipment also creates the missing problem. In some cases, a shipment is too big for the carrier's limited capacity. Therefore the carrier will break or split the shipment into partial shipments. Sometimes carriers will coordinate by requesting to share space with their alliance airlines. The whole shipment might be moved and shipped by an alliance carrier or only part of the shipment.

The main variable of shipment characteristics is loose shipment, where a shipment is not packed onto a pallet or is not wrapped as a group or unit for each customer. Due to this problem, the cartons might be dispersed from one group to another group. This problem might be solved by wrapping or packing the cartons or boxes onto pallets or making them a big unit which is easy to recognize and move. Besides the shipping mark, there should be a clear mark on cartons and pallets for each shipment, for each customer. This will be recognized by ground staffs who are loading cargoes onto the flight. It would be a benefit also when a shipment needs to be transited at some places to connect with another flight before it arrives at the final destination.

People (Staff of Ground Service Handling Company and Shipping Company).

The loading/unloading area, and inside the terminal, are mostly operated by people, and it is people who generate the most errors. Figure 4.4 shows the variables that cause missing cargo generated by staffs at the terminal.

Figure 4.4: Root Cause Analysis of Missing Cargo - People



1. No training - as time is limited, no training is provided to staff before they start their job. Its effect is that sometimes staff do not know for certain what to do to solve the problem.
2. Less experience - sometimes the staff of a Ground Service Handling Company are new or have less experience of the operating process.
3. Low education
4. No Responsibilities - some staff at a terminal or staff from shipping companies are hired on a daily wage basis. Staff may not feel much responsibility and this variable could lead to the problem of missing cargo.

As people generate the most errors, staff from freight forwarders and ground service handling companies should be well trained in the process and the importance of each process, their effects, and what to do when mistakes occur. When staff realize the effects of mistakes, they may become more careful and more responsible.

Internal Practice Process of Air Carriers

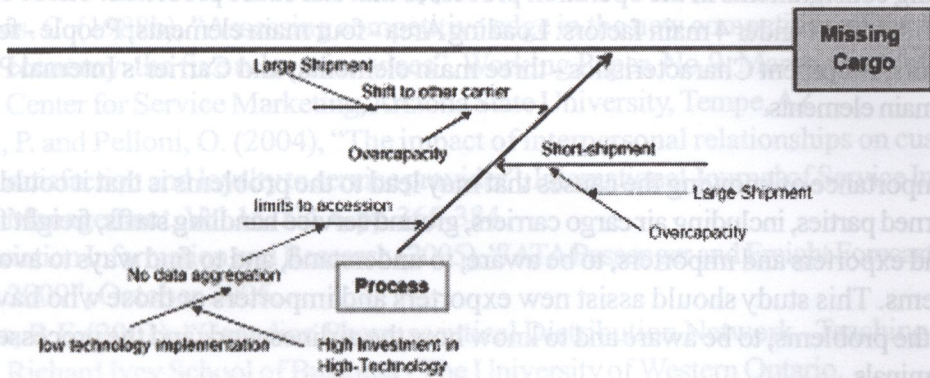
The problem of missing cargo also occurs due to the internal procedure of each air cargo carrier, as shown below in Figure 4.5.

1. Short shipment - as mentioned earlier in characteristics of shipment, if the shipment is too big, it is possible that an air cargo carrier will decide to split or break it up into partial shipments. All these might be shipped with the same carrier but some may be shipped with an alliance carrier. To ship as partial or change the carrier, sometimes the number on the air waybill is changed but the carrier does not inform the customer about the split shipment or of the new air waybill number, so misunderstandings might occur between origin and destination stations.
2. Shift to other carrier - as mentioned in the previous variables, when a shipment is too large and cannot be carried from origin to destination on one flight, the shipment will be moved and shipped by the alliance carriers who have space available and have a similar time

schedule, and if not, the first available flight and schedule will be used. With this practice, an air carrier sometimes does not inform the destination office or the customer.

3. Limits to accessing information - as the airfreight mode provides customer with the fastest transit time. It normally takes only a few days to get to the destination. So the proper shipment information or shipment status is sometimes not keyed-in on time. Moreover, it is very costly for airlines to invest and implement new information technology to support faster and more correct information to customers.

Figure 4.5: Root Cause Analysis of Missing Cargo - Process



Another factor that limits accession is data aggregation. Different information technology is used by carriers, terminals, and ground service handling, even though there is a need to communicate with various parties for each shipment. Possibly one of those parties did not update the shipment information or status into the system, such as shifting a big shipment from one carrier to another carrier. It is an unplanned action and the decision has to be made at loading time. Sometimes it is recorded and communicated only between origin offices and the origin terminal but not to the destination. When the shipment arrives at its destination, nobody is aware the shipment is due as the number of the air waybill has been changed. The customer will try to trace the shipment using the old number.

The main factor in the internal process of the carrier is communication. From interviews with air cargo carriers it was learned that any change for a shipment is sometimes not well communicated between the parties of origin as well as between the origin office and the destination office. To track and trace the shipment, it will take time to make contact between the destination and origin offices due to time differences from country to country. The current system used to communicate between each party, both of origin and destination, is telex. To solve this problem, they should develop an IT system which can link the data to all concerned parties. Although RFID is already implemented by some airlines, they are few because of the high investment cost.

CONCLUSION

This study attempts to identify the factors that cause the problem of missing cargo by identifying elements that may lead to the missing problem during the loading process. It is important for all concerned parties to find a way to solve and avoid the problem. This study has also extended our understanding of the international air cargo process at Suvarnabhumi Airport.

After investigating the operation process at International Air Cargo Terminal and interviewing air cargo carriers and ground service handling companies, there are many elements and factors affecting consignments in the operation processes that can cause problems. Those elements can be identified under 4 main factors: Loading Area - four main elements; People - four main elements; Shipment Characteristics - three main elements; and Carrier's Internal Process - three main elements.

The importance of knowing the causes that may lead to the problems is that it could help all concerned parties, including air cargo carriers, ground service handling staffs, freight forwarders, and exporters and importers, to be aware, to understand, and to find ways to avoid these problems. This study should assist new exporters and importers or those who have never faced the problems, to be aware and to know how the airlines work and the processes inside the terminals.

After observation and interviews, it seems that the main problem of the Air Cargo Terminal at Suvarnabhumi airport is the problem of total area usage, which has been designed to support the Free Zone System, not the Bonded Warehouse System. Moreover, the process of customs clearance regulations and processes are not supported.

All research has limitations. In this study, as the Airport had only recently moved to a newly built one, data in this study is based on the records of Thai Airways International and recorded only from October 2006. There is therefore no previous data for comparison or to elicit trends. Also, although observation was made at the loading/unloading dock, we were not allowed inside. However, the process inside was explained during the interviews.

The finding of this study focused on variables which can be classified into four factors that could lead to the problem of missing cargo, misrouting, and damage. This study was conducted in one service industry and replication is needed in other industries such as the Sea freight Industry. Moreover, all missing cargo, misrouting, and damage, affect the company's operational performance and service quality. Therefore, further study should be conducted on the effects on customers' perceptions.

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