CRANFIELD UNIVERSITY

ROHAFIZ SABAR

An Evaluation of the Provision of Terminal Facilities for the Design of Low Cost Airport Terminals

SCHOOL OF ENGINEERING
Department of Air Transport

PhD THESIS

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ABSTRACT

The growth of the Low Cost Carriers (LCCs) in the world will have a significant impact on future airport development. LCCs such as Ryanair, Air Asia and EasyJet prefer only basic terminal facilities (TFs) at Low Cost Terminals (LCTs) to reduce associated costs (airport charges, capital investment, operational costs). Pressure by LCCs for reduced airport charges has led to the inclusion of only basic TFs so as to reduce capital investment and operational costs. This has raised an interest in the evaluation of TFs within LCT design. A reduction of airport charges, which is possible through LCTs, is indirectly linked to the reduction in air fares.

The debate concerning the development of the 'right' TFs has led to considerable discussion by airport operators. Airports have to retain the airlines as business partners and customers. To this end, they need to develop facilities that offer best value in order to retain their custom. In addition, airports must be flexible enough to meet the changing needs of passengers. With particular emphasis on experiences at Kuala Lumpur International Airport (KLIA), this research is an evaluation the provision of TFs for a LCT model, taking into account potentially conflicting expectations of airline and airport managements, and passengers.

A research framework was developed as the result of a literature review of LCT design and development. The research itself used multiple questionnaires in pre- and post-development surveys involving three different parties: airline management (Air Asia Berhad), airport operator (Malaysia Airports Holding Berhad) and passengers (LCT users). The headquarters of Air Asia Berhad and Malaysia Airports Berhad were visited and surveys were undertaken to ascertain the viewpoints of LCC passengers flying with Air Asia, a low-cost airline based at KLIA, Malaysia.

The main focus of this research has been to propose a possible conceptual model for LCT design with an emphasis on simplifying the provision of TFs in such a way as to reduce capital investment and operational and airport charges, while at the same time being able to generate additional airport revenues. The evidence from the surveys reveals that, in LCT design, there are conflicting expectations between airlines, airport authorities and passengers on the adequacy of TFs whose design is influenced by consideration of cost and revenue structures. The proposed conceptual model indicates the preferences for core and secondary TFs within LCT design after the cost and revenue structures, and airline management, airport operator and passenger's expectations, are considered.

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My late father

&

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GLOSSARY OF TERMS

AAB	Air Asia Berhad
AC	Airport Charges
APAC	Asia Pacific
APAN	Asia Pacific Area Network
AR	Airport revenues
ASEAN	Association of Southeast Asian Nations
ASK	Available Seat Kilometre
ATMs	Air Traffic Movements
BMI	British Midland Airways
BRS	Bristol Airport
CAA UK	Civil Aviation Authority, United Kingdom
CAAS	Civil Aviation Authorities of Singapore
CAB	Civil Aeronautic Board
CCI	Chambre de Commerce et d'Industrie (France)
CEO	Chief Executive Officer
CI	Capital Investment
CLSA	Credit Lyonnais Securities (Asia)
Co.	Company
CUSS	Common Use Self Service
CUTE	Common Use Terminal Equipment
DCS	Departures Control System
DGAC	France's Civil Aviation Authority
DOM	Domestic
EDS	Explosive Detection Systems
ERL	Express Rail Link
ESRI	The Economic and Social Research Institute
EU	European Union
EUR	Euro
F&B	Food and Beverage
FIDS	Flight Information Display System

GLC	Government Link Company
INT	International
JB	Johore Bharu
Kg	Kilogram
KKIA	Kota Kinabalu International Airport
KL	Kuala Lumpur
KLIA	Kuala Lumpur International Airport
KLIA LCT	Kuala Lumpur International Airport Low Cost Terminal
KLM	Royal Dutch Airlines, Netherlands (ICAO code)
LCCs	Low Cost Carriers
LCTs	Low Cost Terminals (Low Cost Carriers Terminals)
LGW	London Gatwick
LHR	London Heathrow
LPL	Liverpool Airport
MAB	Malaysia Airport Berhad
MAMTS	Malaysia Aviation Management and Technical Services
MAN	Manchester Airport
MPPA	Million Passengers Per Annum
MTB	Main Terminal Building
MTOW	Maximum Take-Off Weight
NBIA	New Bangkok International Airport
No	Number
NST	New Straits Times
OC	Operational Charges
OSAs	Open Skies Agreement
PBZ	Pre-boarding zone
POT	Purpose of Travel
PSA	Pacific Southwest Airlines
PSC	Passenger Service Charges
RM	Ringgit Malaysia
RTK	Revenue Tonnage Kilometre

SARS	Severe Acute Respiratory Syndrome
SPSS	Statistical Package for the Social Science
STN	London Stansted
TFs	Terminal Facilities
TGV	train à grande vitesse or high-speed train
TRP	Technical Research Planning
TV	Television
UK	United Kingdom
USA	United State of America
USD	American Dollar
UUM	University Utara Malaysia
VAT	Value Added Tax
VFR	Visiting Friends and Relatives
VIP	Very Important Person
Vol.	Volume
WFC	Warsaw Frederic Chopin Airport

CHAPTER 1

1 INTRODUCTION

"The development of low cost airlines at under-utilised airports has enabled large numbers of consumers to be able to travel at the low cost fares, allowed previously unprofitable airports to become viable and profitable entities and has also benefited regional development and the growth of tourism" Wolfgang Kurth, Chief Executive of Hapag-Lloyd Express[1]

1.1 Setting the Scene

The airport industry is facing competitive challenges as a result of the rapid growth of low cost airlines (carriers) (LCCs) worldwide. The emergence of LCCs has been greatly influenced by the economic liberalisation[2] of the United States and European markets. LCCs have already modified the traditional airline business model by re-engineering its design and controlling an increasing market share of the short haul air transport market. LCCs control 8% of the intra-Asian market, and 23% and 27% of the intra-European and US domestic markets, respectively (O'Connell, 2007). Taking the example of European market, the sustained growth of LCCs has been (up to mid-2008) about 25% per annum and has had a dramatic effect on the European Market (Francis, 2003). Route networks have grown substantially as 48 LCCs now operate out of 22 States in Europe[3] and these airlines need the provision of suitable airport terminal facilities.

Looking at some examples of LCCs: Southwest Airlines (US market); EasyJet and Ryanair[4] (European market); Air Asia, Air Decan and Virgin Blue (Asia market); and Air Arabia (Intra-Gulf market); it is clear that most of the LCCs make use of secondary airports rather than primary airports for their operations. It should be noted that the operating and infrastructure requirements of LCCs may be different for each secondary airport, but the LCCs all have a common interest i.e. to reduce operating costs. The advantages of secondary airports (i.e. geographic location, traffic mix and less congestion) have encouraged the development of route networks by LCCs as well as being offered lower airport charges when compared with primary airports. Taking Luton Airport as an example, the establishment of LCCs has in recent years increased passenger traffic by about 7.6% annually at this secondary airport.

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1 Airport for Low Cost Airlines, Macau International Airport.

2 According to Miyoshi (2007), the deregulation of the US domestic market and the Canada-US Open Skies agreement significantly eased the regulatory restrictions on the development of airline networks in North America.

3 http://www.eurocontrol.int/statfor/gallery/content/public/analysis/LowCostMarketUpdateDec06.

4 Ryanair offer low cost, no frill services and more frequent flights with an extremely low cost base at secondary airports. As a result, the number of Ryanair passengers has increased gradually from 13.26 million in 2002 (Peng, 2004) to 51 million in 2007.

The single segment concept (i.e. low cost) has been introduced by LCCs in order to benefit from cost leadership[5]. The penetration of a single segment (low cost) of the passenger market by LCCs can give an airport an advantage of economies of scale[6]. The characteristics of LCCs that have been identified include point to point operators; single class; faster turnaround times; high aircraft utilisation; short haul routes and avoidance of luxury facilities (Venegas, 2005). These factors may influence the terminal design.

The provision of low cost terminals (LCTs) facilities have attracted the interests of airports, airlines and passengers and much effort has been directed towards understanding the concept and its practicality. A significant number of low cost terminals (LCTs) have been constructed as a result of the growth of LCCs around the world. According to CAPA (2008), approximately 30 LCTs have been developed across the world. The growth of LCTs, as a result of the establishment of LCCs, has led to the concept of fewer facilities being offered to airport users in return for a reduction in aeronautical charges. The industry has seen the introduction of various types of LCT such as Warsaw, Kuala Lumpur International Airport (KLIA), and Coventry, the production of various guidelines for the development of LCT facilities, and promoting the concept of 'simple and functional' into terminal design. Many airports have established the concept of simplification into their LCT design in order to reduce the costs associated with terminal development and operation. Other airports have responded to fulfilling airlines' needs and passengers' preferences in order to attract significant numbers of LCCs and their passengers to use the airport and associated terminal facilities.

Understanding the low cost market, which is highly sensitive to changes in cost (i.e. air fares), may contribute to pressure on the airport in designing adequate terminal facilities for them. The growth of LCCs has transferred the burdens of the operation (i.e. capital investment for constructing terminal facilities) to airports while at the same time requiring flexibility on airport charges in order to reduce their operational costs. The provision of terminal facilities is also highly influenced by costs (i.e. operation, capital investment and airport charges) and revenues (i.e. aeronautical and non-aeronautical). However, airports have doubts about designing terminal facilities to be suited to the airlines' and passengers' preferences because the airport's interest is to reduce operational costs while at the same time maximising revenue. Therefore, an investigation into the influence of cost and revenue structures is important in determining the design and inclusion of specific terminal facilities for an airport serving by the LCC market.

At present, design concepts for LCTs differ around the world. Taking Europe as an example, the potential role of LCTs in the airport industry is becoming more important

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5 Cost leadership can also be known as price leadership, which is defined as a situation where one firm in an industry sets a price which others follow.

6 Economies of scale are the cost advantages that a firm obtains due to expansion and can be enjoyed by any size of firm expanding its scale of operation.

because of the higher airport charges being imposed by major airports. LCCs prefer to operate out of secondary airports because of cost advantages, as the carriers have negotiated significantly reduced aeronautical charges in return for developing the low cost travellers' market at a secondary airport.

Most LCT models have only considered the influence of cost and revenue structures on the terminal design. Considering the fact that the airlines' and passengers' expectations may have a positive influence on airport terminal design, there is a need for new design concepts to meet their expectations by investigating alternative models that will incorporate cost and revenue structures in the design models. Noting some examples of LCT development at Warsaw (Poland), Marseille (France), Kuala Lumpur International Airport (Malaysia) and Changi International Airport (Singapore), there appears to be a need to explore and investigate the relationship between cost and revenue structures, and airlines' and passengers' expectations for basic terminals, the design of which may vary from one region to another.

Recent examples have revealed a vast range of expenditure spent (or planned) for low-cost terminals. At the top end of the financial range is the development of a new pier (i.e. Amsterdam) or new terminal (i.e. Singapore and Kuala Lumpur). At the lower end of the financial range there are examples of cargo terminals (i.e. Marseille), and supermarkets (i.e. Warsaw), being converted to serve the LCC market. Although the low-cost market phenomenon commenced in the United States and then moved into Europe over the last ten years, the same market is now moving into other parts for the world, for example, South East Asia where Tiger Airways and Air Asia are examples of airlines currently serving the low-cost market.

Many authors have debated the reduction of cost structures (mostly airport charges) for LCCs and also made suggestions for further improvements. IATA (2004) argued that the lower charges have discriminated against network carriers and that there is the possibility to have cross-subsidisation from the main terminals to LCTs at the same airport. The charging mechanisms associated with developments in terminal design (i.e. provision of terminal facilities) could emphasise the burden of financing costs at some airports resulting in an increase in market price. The reduction of departure taxes for KLIA LCT, for instance, is discriminatory as it does not apply to passengers using the main terminals (main terminal building and satellite). In this case, network carriers are facing cost disadvantages of up to 50% as the discounted LCT departure charge for international and domestic passengers does not apply,. This practice is against the charging policies recommended by IATA[7].

In respect of the impact of operational costs, O'Connell (2007) and Malaysia Airport Holding Berhad (MAHB)[8] state that the establishment of LCTs are able to reduce airport costs by around 40%. Operational costs (i.e. maintenance, repairing,

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7 IATA complains to Malaysian Prime Ministry over LCC Terminal Fee Cuts, Air Transport News.

8 Malaysia Airport Holding Berhad (MAHB) Internal Report.

administration and overheads) can be reduced after the introduction of LCT. Taking MAHB as an example, the cost-reduction of LCT terminal size is estimated to be around 30% compared with normal terminals. As another example, the adoption of advanced technologies (i.e. self-service kiosks) is recommended to be included as part of the terminal design, in order to reduce delays, waiting time and queues.

Most of the current design concepts for LCTs aim for a reduction in airport charges as a trade-off for the provision of fewer terminal facilities to be included in the LCT design. The requirements by LCCs for a reduction in aeronautical charges and simplification of terminal facilities are also important as they may influence the service levels of the LCT. The need for flexibility of cost and revenue structures to ensure greater efficiencies as well as having competitive advantages for the parties involved (both airlines and airports) is necessary. However, the issue of cost and revenue structures (mostly related to charging policies for terminal facilities) should not be avoided. Therefore, the need to examine the relationship between cost and revenue structures and provision of terminal facilities is important when examining the possible options for setting the guidelines for an ideal LCT design.

From the literature search on cost and revenue structures, it was realised that these elements regularly appeared in airport studies as a benchmark for measuring industry performance (Graham, 2003). More interestingly, the lessons learnt from the literature search were quite surprising and the need to fill a knowledge gap (examining the relationship between the cost and revenue structures and LCT facilities) appeared to be necessary. The literature merely discusses the relationship of cost and revenue structures but with little detail on the provision of terminal facilities and parties' expectations (i.e. airports, airlines and passengers). The absence of research gives the perception that both academia and industry have not paid much attention to the investigation of the relationship between cost and revenue structures against the provision of terminal facilities. Perhaps they were simply unaware of the association of cost and revenue structures with the provision of terminal facilities and parties' expectations for the terminal design.

This lack of attention has possibly created some inflexibility in cost and revenue structures that in turn may influence the provision of facilities as part of LCT design. As a remedy to counter this problem, efforts to investigate the relationship between cost and revenue structures, provision of terminal facilities and parties' expectations are critical. This thesis proposes to articulate the potential of cost and revenue structures in terminal design as well as fulfilling the needs of airlines, airports and LCT passengers. By reviewing the current model of LCTs, the elements of cost and revenue structures, provision of terminal facilities and parties' expectations could be included as part of terminal design.

The cost and revenue structures of LCT development have been reviewed to understand the issues and problems that have been raised in traditional terminal designs. The availability of data related to the cost and revenue structures is sufficient in order to investigate their relationship with the LCT design. A number of empirical studies have been sourced that have examined the relationships of cost and revenue structures with the provision of terminal facilities as part of terminal design:

- An analytical tool has been designed to understand the demands of air travelers. The tool is useful to investigate the willingness of passengers to accept the trade-off between the amount to pay for fare class, provision of terminal services and travel restrictions (Proussaloglou, 1999).
- The impact of cost and revenue structures has influenced the needs of LCCs towards the provision of terminal facilities for secondary airports. A study by Barrett (2004) indicates that the provision of terminal facilities (i.e. check-in facilities) is important and is reflected in airline costs. The availability of luxury facilities (i.e. airport lounge or showroom) can be eliminated to reduce capital investment costs. Taking the airport lounge as an example, the non-provision of a business lounge can reduce the cost by around $1million of capital investment.
- A comparison of terminal facility costs between LCTs and 'normal' terminals has been revealed by Macquaire and Bristol Airports who estimate that the provision of low cost facilities is around £1500 per square metre while the full service terminal cost is around £3000 or more per square metre. Short term low cost facilities have been constructed at Sydney Airport (Australia) and Hahn Airport (Frankfurt) for under £1000 per square metre while the development of facilities for Philadelphia Airport (USA) have been constructed at a far higher cost of £4500 per square metre[9].
- The balanced score card[10] was a useful way to estimate cost levels as part of the feasibility study for the establishment of Senai Airport (Malaysia) to be made available for low cost operators. The score was developed with discrete increments from 1 to 10 in order to evaluate the significant costs associated with the development of Senai Airport as a low cost hub for Malaysia. The score of finance and administration costs were scored as 10 and 9 respectively as they are highly important to the development of the low cost hub. In contrast, manpower, building and land costs were identified as being less important and shown as 2 from the total score of the balanced score card[11].

One approach might be PESTLE analysis which is an analysis of the external macro environment in, for example, the air transport industry. The PESTLE analysis is simply a framework that categorises out of control influences such as political (P), economic (E), social (S), technological (T), legal (L) and environmental (E). Kotler (1998) states that PESTLE analysis is a useful strategic tool for understanding market growth, business position, potential and direction for operation. PESTLE analysis examines the impact of each of these factors on airport development. The results can then be used to take note of opportunities and to be aware of threats when preparing the airport master plan. The use of PESTLE analysis can be seen to be effective for airport business and

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9 The impact of low fare airlines on private sector airport, Presentation by Kerrie Mather, CEO of Macquarie Airports, 2004.

10 The balanced scorecard was initially described as a simple, 'four box' approach to performance measurement [Kaplan and Norton (1996)] which indicates financial performance, customer knowledge, internal business processes, and learning and growth.

11 Ideal hub for low cost airlines, Presentation by Senai Airport, Malaysia, 2004.

strategic planning. The PESTLE ensures that airport performance is aligned positively with the powerful forces of change that are affecting the business environment.

Noting Malaysia as an example, the demands for fast delivery, reliable and just in time logistics are highly dependent on the efficiency of the air transport system. Surface transportation is quite problematic to encounter the requirements of the high-tech, tourism and aviation industries in Malaysia. Because of the economic status and demographic characteristic of local residents in Malaysia, air transport is considered as a high-value industry and only affordable for high level income passengers.

Economic conditions affect Kuala Lumpur International Airport (KLIA) profitability at any time because of capital availability, costs and level of demand. There are high demands on LCTs facilities by Air Asia, for example, and the aeronautical charges are low. Therefore, this will increase the volume of passengers and traffic will grow with expectation of being profitable. The timing and relative success of low cost strategies can be influenced by economic conditions. When the Malaysian economy is growing, demand may exist for a low cost service which would not be in demand in more depressed circumstances. Similarly, the opportunity to exploit a particular strategy (i.e. low cost) may depend on demand which exists under growth conditions.

Economic conditions are influenced by political and government policy, being a major influence affecting air transport development in Malaysia. While economic conditions and government policy are closely related, they both influence a number of other environmental forces that can affect airport development. Capital markets determine the conditions for alternative ways of funding LCT development. They tend to be a subject to government controls and they will be guided by the prevailing economic conditions. The rate of interest charged for loan will be affected by inflation and by international economics as the interest may be fixed by a central bank. Noting Malaysia Airport Holding Berhad (MAHB) as an example, the development of LCTs has been fully subsidised by the Malaysian Government as the government is one of the major stakeholders of the MAHB. Therefore, government ownership and interest will influence airport planning and development both directly and indirectly, as they provide both opportunities and threats.

The labour market reflects the availability of particular skills at national and regional level; this is affected by training, which is influenced by government and other regional levels. Labour costs will be influenced by inflation and by general trends in other industries, and by the additional power of trade unions. Noteworthy, new advanced technologies that have been introduced into LCT design (i.e. self-service check-in kiosks) will reduce the amount of labour cost, therefore, it is a potentially significant reduced LCT cost.

The development of LCT facilitates enables easier migration and long-distance migration to become viable. In recent years, around 2 million of Indonesian and Bangladesh workers have joined the Malaysia labour market. LCT developers will most likely use foreign workers as local labour costs are higher. Therefore, this would reduce the capital investment in LCTs. In a similar situation in European countries, the admission of Poland to the European Union has allowed more than 1 million Polish workers to enter the external European Union labour market where Polish labour is more viable, competitive and low cost than local labour. This allows airport developers to have an option to reduce what is a significant cost.

Competition has been acknowledged as a major issue of concern and a serious threat to airports in Malaysia. Taking Singapore, Malaysia and Thailand as examples, the governments of these countries have decided that the development of LCTs is of importance in order to cater for the needs and requirements of airport users. As a result, LCCs have seen rapid growth and created a new paradigm of aviation industry within these counties. This has led to an increase in air travellers from / to Malaysia- Thailand and Singapore adequate to cater the amount of traffic that has been generated.

The cultural system refers to one of the major components of the macro environment which determines a set of beliefs, values, expectations and norms based on personal experiences towards particular issues. Culture is the combination of values, beliefs and attitudes possessed by a national group or subgroup (Jober, 2004), More interestingly, culture is often divided into core and secondary cultural values (Kotler, 1980). Core cultural values normally have a high degree of persistence, which means that in the airport context most of the airport passengers believe in a high level of terminal facility efficiency and a good level of service standards as part of their airport terminal experience. In the aviation environment, the core beliefs and values are passed from one person to another by the majority of airline passengers.

Secondary beliefs and values are susceptible to change by new environmental or social forces. Secondary beliefs always consider that KLIA LCTs will introduce lower service standards and a lack of provision of adequate terminal facilities when space restrictions and cost limitations are taken into account. The influence of culture which is represented by passengers' lifestyle can make a better understanding of the core and secondary values of airline and passenger expectations so as to be included into the terminal design. Therefore, it is important for airport planners to design a 'custom made terminal' which, in developing a green field site, should also concentrate on reducing the significant costs of terminal construction and operation.

More interestingly, the changing patterns of passenger behaviour also encourage commercial efforts to increase airport revenues. Therefore, the airport planner needs to pay attention to the possible impact of culture on the development of commercial activities. For example, the retail and catering facilities at the KLIA LCT has been tailored to meet the needs of low-fare passengers. Here, with meals usually an optional extra on low-cost flights, the airport introduced a wide range of 'take-away' style products to meet passenger demands. Often, the pressure for innovation comes from the passengers, who are becoming more experienced travellers as well as more demanding airport customers (Graham, 2006). Therefore, the need for commercial areas as part of LCT facilities is necessary.

1.2 Research Scope

Detailed research to investigate the relationship between cost and revenue structures, the provision of terminal facilities, and the parties' expectations (airline, airport and passengers) is needed. This is especially relevant because the cost and revenue structures have a significant influence on terminal design. Cost and revenue structures are important as a means to select adequate terminal facilities for LCT as well as to indicate how to have better design guidelines to fulfil the needs of customers (airlines and passengers). The results of the research will give possible guidelines to airport management (particularly at KLIA) to select the appropriate facilities to be included in the terminal design after taking into consideration the cost structures of airlines (airport charges), the airport (capital investment, operational costs and airport charges) and passengers (air fares).

The scope of this research is therefore to propose a conceptual model of terminal facilities (core and secondary) that contribute to the design of a LCT, taking into account the impact of cost and revenue structures and the potentially conflicting expectations of passengers, airlines and airport operators. The conceptual model will be based on the specific experience of LCT development at KLIA, Malaysia and more general experiences of LCT development worldwide. It is expected that the conceptual model will be sufficiently robust to provide a guide for designers of similar airport facilities, and for selecting the provision of facilities for LCT development, taking into account cultural differences and the current global development of LCT facilities. Although a number of papers have been written on LCT development in general, a detailed examination of LCT development at KLIA as original research is regarded as adequate for the purpose of this thesis.

1.3 Research Questions

The research concentrates on the significant influences of cost and revenue structures on basic LCT design (which includes the core and secondary facilities). The cost and revenue structures enhance the applicability of the KLIA LCT model to be used as guidelines for LCTs developers. Considering the fact that the cost and revenue structures may be difference from one country to another, the element on cost and revenue structures is more relevance and controllable than others (i.e. culture and political). However, cost and revenue structures may be influenced by the economic conditions (i.e. rate of inflation) of Malaysia. However, the research outcomes are relevant as cost and revenue structures will affect the LCT development.

With respect to fulfilling the main aims of the research, the researcher has had the advantage of being able to use the KLIA (Malaysia) LCT model for analysis. The KLIA LCT was used to validate the conceptual model developed in this research for the following reasons:

1. It is recognised as a main serving base for Air Asia who have been successfully operating their service in this terminal with the advantage of the lowest operating cost in the world ($0.04 per seat mile). However, Air Asia's

management argues that it strictly adheres to the budget model pioneered by Southwest Airlines and admits that low labour costs are available in Malaysia (Lawton and Solomko, 2005).
2. The development of the LCT at KLIA as a low cost hub has been copied for the construction of Kota Kinabalu International Airport (KKIA) which is to be the second LCC hub for Malaysia.
3. The current design of LCT has been identified as a dedicated terminal which, although the terminal design is different from other models around the world, has also successfully increased airport revenue over the past couple of years.

From the literature search, it has been noted that there are significant influences of cost and revenue structures on basic LCT design (which includes the core and secondary facilities). The basic terminal design concept should fulfil the needs of customers (airlines and passengers). Because of the influence of the cost and revenue structures on the basic LCT design, this research will associate the cost and revenue structure elements in the selection of specific facilities for LCT design. The focus of this research is to evaluate the development of the LCT with an emphasis on measuring the significant impact of cost and revenue structures in the terminal design after taking into consideration inputs from airlines, airports and passengers while focusing on setting guidelines for possible solutions to develop the ideal conceptual model of basic LCT design.

Therefore, taking into account of Malaysia and KLIA as a case study, the proposed conceptual design of LCT model gives options open to airport management to other airport as follows:

1. An ability to identify the main characteristic of LCTs facilities, which allows airport management to considers the option of simplifying terminal facilities in order to reduce airport charges.
2. The influence of cost and revenue structures in KLIA LCT design that have been discussed would be useful to give an indication of cost and revenue estimates for airport management interested in developing their own LCTs.
3. The generalisation of appropriate LCT facilities into LCT design based on expectations of passengers, airline and airport management. However, the allocation of LCT facilities should be tailor-made to take into account culture (i.e. lifestyle) of the local residents and expected customers (i.e. passengers and airlines)

Noting cost and revenue structures at KLIA LCT as an example, the basic terminal design concept should fulfil the needs of customers (airlines and passengers) in order to reduce a significant amount of charges. The research associates the cost and revenue structure elements in the selection of specific facilities for LCT design. An evaluation of LCT development concentrates on measuring the significant impact of cost and revenue structures in the terminal design after taking into consideration inputs from airlines, airports and passengers while focusing on setting guidelines for possible solutions to develop the ideal model of basic LCT design.

Based on the above reasons, the following research questions, as shown in Table 1.1, are raised and answered in this study.

Table 1.1 Research Questions

No.	Research Question
1	What are the features and characteristics of an LCT?
2	How has LCT development evolved and how have the cost and revenue structures influenced passenger terminal designs?
3	What are the differences in design, and cost and revenue structures of KLIA LCT compared with other models around the world?
4	What is the research methodology for evaluating the provision of terminal facilities and what are the key inputs of a model for evaluating the inclusion of terminal facilities?
5	Is there any significant relationship between passenger expectations, provision of terminal facilities and the range of fares charged by LCCs, and what are the basic and secondary facilities that are preferred by passengers?
6	Is there any significant relationship between LCC expectations, provision of terminal facilities and range of airport charges, and what are the preferences of LCCs for the provision of facilities in a passenger terminal?
7	Does the requirement for LCT facilities design have any significant influence on airport investment, airport charges, operational costs and revenues, and which core and secondary facilities should be included in LCT terminal design?

1.4 Research Aims, Objectives and Methodology

The aims of this research are:

- To examine the growth and characteristics of LCTs, and to assess the influence of cost (capital investment, operations, airport charges) and revenues (aeronautical and non-aeronautical) on terminal design.
- To evaluate the relationships between cost and revenue structures with the provision of terminal facilities and the conflicting expectations of airlines, airport operators and passengers.
- To develop a conceptual model that will include the selection of core and secondary facilities for LCTs after taking into consideration the expectations of passengers, airlines and airport operators.

The hypothesis tested here is that the conflicting interest on the provision of terminal facilities within an LCT can be simplified but this is dependent on their cost and revenue structures and ability to meet the different requirements of airlines, airport and passengers. The aims of the research are encapsulated into four different specific objectives which lead to the development of the research methodology. The objectives are outlined as follows:

1. **To examine the elements of cost (capital investment, operations, airport charges and air fares) and revenue (airport revenue) structures that have influenced the development of LCTs and identify the appropriate LCT facilities that have been included within various LCT models.**

A detailed study of global LCT development (including economic analysis and design review) was conducted by a literature search from various sources including refereed journals, dissertations, books, conference proceedings, annual reports and airport and organisation publications. High-level databases have been extensively used such as Ecopus, Emerald and Science Direct.

2. **To assess the proportion of passengers who are willing to trade-off between the provision of a specific LCT facilities, compared with 'normal' terminals as a result of fare reduction (in discrete decrements of 10%, 20% and 30% and those who would not trade-off) and identify the core and secondary facilities that would be retained when the passengers trade-off as a result of a fare reduction.**

Two surveys testing the importance of the provision of specific LCT facilities were conducted with Air Asia passengers and 710 responses were received. These surveys were undertaken in order to have feedback from passengers before and after the development of the KLIA LCT. The pre-LCT development survey was conducted in the early stages of the LCT research and aimed to explore the provision of specific terminal facilities by passengers from their experiences of airport use (main terminal facilities). The survey included specific questions in order to establish the relationship between the provision of terminal facilities and cost structures. The objective was to understand the decisions made by passengers who will use future LCT facilities. For example, responses were sought to the following questions: '*What do you consider to be the five most important terminal facilities during the check-in process and rate them in order of importance'* and '*What do you consider to be an appropriate fare discount as a trade-off against the omission of specific terminal facilities within terminal*'.

The post-LCT development survey aimed to understand the facility preferences of experienced passengers that have been using the KLIA LCT facilities. This survey was a supporting study for validating the decision towards the adequate provision of specific terminal facilities. For example, responses were sought to the following questions: '*Did you do any of the following in the check-in hall, before going through immigration or security to the departure area….*'. The results of this survey were presented to the Air Transport Research Society Conference, Athens, 2008[12].

3. **To investigate the level of importance for the provision of terminal facilities in addition to basic facilities, while determining the level of cost structure as a trade-off with the provision of specific terminal facilities against airport charges (in discrete reductions of 10%, 20%, 30% or no change in charges) and identify the core and secondary terminal facilities that would need to be retained as the result of trading-off airport charges.**

The pre-development questionnaires gave an indication of the opinions of airline management (from senior managers to senior executives), while the KLIA LCT was still under construction. The important points of the survey were to examine the

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[12] The journal paper: 'Preferences of business and leisure class passengers and their influence on Low Cost Airport Terminal (LCT) Development' indicates the pre-development results. The paper was accepted but as yet unpublished for the Journal of Airport Management.

decision on the ideal provision of terminal facilities by airlines as future LCT users. Questions included '*What is your expectation towards the provision terminal facilities and airport charges in LCT developments*'. In contrast, the post-development questionnaire also included the opinions of airlines management after the LCT was completed. The aim of the post development survey was to explore the views of the airlines on the provision of terminal facilities based on the change in airport charges. Questions included '*What would be an appropriate charges discount as a trade-off between the provisions of specific LCT facilities*'.

4. **To measure the level of importance for the provision of specific facilities as part of LCT development from an airport's point of view, while considering the effect of airport charges of terminal design (in general) and identify the core and secondary facilities that would be retained when the airport considers the balance (trade-off) between airport charges, operations, and capital investment costs and revenue sources.**

A detailed questionnaire was designed concerning the development of KLIA LCT. The post development questionnaire solicited the opinions of senior managers and executives of KLIA airport after the LCT was completed. The aim of the questionnaire was to explore the decision made by the airport on the provision of terminal facilities based on the importance of LCT facilities. The questionnaire also sought to determine the importance of terminal facilities to be traded-off after taking into consideration cost structures and airport perceptions towards LCT development. The questionnaires were distributed in order to explore the relationship between the airport charges and provision of terminal facilities. Sixteen participants from various airport management positions provided feedback on their interests in terminal development. Support from the airport was essential for the proposed provision of terminal facilities to be validated.

1.5 Thesis Structure

The thesis is presented in 9 chapters. Chapter 2 explains about the characteristics of the basic LCT concept. Chapter 3 briefly discusses Low Cost Airports (LCAs). Chapter 4 reviews recent LCT designs and developments. The research methodology is justified in Chapter 5 with the inclusion of a selection of research techniques by which TFs provision was evaluated. The theoretical framework is also explained in Chapter 5, detailing the link between cost and revenue structures and provision of terminal facilities. As there were three different parties involved, the survey data analysis and interpretation of the results are presented for passengers (Chapter 6), airline management (Chapter 7) and airport management (Chapter 8). Finally, Chapter 9 presents the conclusions, summarising the new knowledge contributed by this research as well as offering recommendations for future research. Figure 1.1 shows the research structure that indicates the linkage between the chapters, research questions and research methodology. The contents of each chapter are now outlined in more detail.

Chapter 2 examines the core components of LCT facilities. The LCT design has been categorised and encapsulated into four different groups of terminal facilities: overall layout, check-in, departure lounge, and arrival[13] facilities. The discussion also includes the importance of commercial revenues in order to generate extra income for airports that in turn will influence the capacity of, and space requirements for, terminal buildings.

Chapter 3 looks at the overall airport industry starting from the introduction of secondary airports as low cost airports, air traffic growth, airport characteristics, and the transition of secondary airports to low cost airports. The chapter then examines the impact of airline industry developments on airports with regard to market share when considering external factors such as liberalisation and the emergence of low cost carriers. The chapter identifies important factors that influence the profitability of low cost airports, for example, the demands of LCCs, the need for basic terminal facilities and the changing pattern of demand. The chapter then moves into a discussion on the importance of the cost structures that will influence the provision of terminal facilities including airports (capital investment, operational cost, commercial charges, and aeronautical charges), airlines (airport charges) and passengers (air fares). The chapter concludes by examining the characteristics of the various airport types: full service airports, small airport terminals and low cost terminals.

Chapter 4 discusses the issues of development costs and construction of terminal buildings. Through the desktop study, a better understanding of the cost structure associated with terminal construction has been noted: acquisition cost, running costs and recovery costs. The chapter also discusses the characteristics of design concepts that are important for basic terminal buildings and facilities, and the cost structures. The chapter provides a detailed discussion on the labour, material, equipment, building areas and cost per square metre of LCTs.

Chapter 5 discusses the principle of the research methodology and research design as the viewpoints of airlines, airports and passengers' expectations on their preferences for facilities included within LCT design are taken into consideration. The proposed methodology can be used to determine the most suitable terminal facilities while measuring the relationship between cost and revenue structures for LCT design. Furthermore, the chapter explains the theoretical framework that has been established in view of the relationship of cost and revenue structures and provision of terminal facilities. It represents the process within the development of the methodology and the concept of basic terminal facilities provision.

The advantages of adequate terminal facilities and the relationship of cost and revenue structures have been linked and are also supportive of the flexibility of cost and revenue structures potentially bringing benefits to terminal facilities. The development of the conceptual framework has also considered the roles of participants, parties' expectations, time, strategic processes and adaptation of the cost and revenue structures

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13 Baggage reclamation and arrival halls.

into a research context. The discussion about the success factors of the proposed methodology is necessary in order to achieve the aims and objectives of the research.

Chapter 6 presents the analysis and results for the influence of cost and revenue structures on the provision of terminal facilities provision at KLIA. The chapter consists of two parts. The first is based on the passengers' expectations about their ideal terminal facilities as a result of the importance of air fares that were revealed from the pre-development survey. Interestingly, the pre-development survey explores the exact needs of passengers was undertaken while the LCT was still under construction. The second part aimed to evaluate the provision of terminal facilities of KLIA that can meet the needs of passengers after taking into consideration cost and revenue structures.

The chapter then includes a discussion on the viewpoints of passengers regarding their experiences of using the terminal facilities at KLIA, Malaysia. This chapter also tries to assess the proportion of passengers who would trade-off between the provision of terminal facilities [as a function of demographic profiles (level of income, purpose of travel and age)] against fare changes [in discrete reduced decrements of 10%, 20%, and 30% and those who would not trade-off (no-change)]. The chapter continues with an analysis of cross-price elasticity which measures the sensitivity of passengers to a change in fares, and the measurement of this relationship. The chapter concludes with an evaluation of core and secondary LCT facilities with reference to passengers' expectations and experiences.

Chapter 7 discusses, from the LCC point of view, the implications of cost and revenue structures towards the provision of terminal facilities. The discussion in this chapter was subjected to two evaluation phases, pre-and post-development. The results of these phases have been discussed within this chapter. The first part of this chapter evaluated the understanding of airline respondents regarding terminal facility development and their expectation of cost and revenue structures as well as the associated factors that may be influenced from the inclusion of specific terminal facilities. Emphasis was given to the cost and revenue structures that can be influenced from the inclusion of specific facilities within the terminal design.

The second part of this chapter evaluated the relationship of cost and revenue structures on the decision making process for LCT design. The highlights of this chapter were to assess the perception of airlines towards the provision of terminal facilities as a result of a reduction in airport charges (in discrete decrements of 10%, 20%, 30% and no change). The importance of terminal facilities was also evaluated by using the Comparative Scale in order to determine the airlines' viewpoints on the adequacy of LCT facilities. The chapter concludes with the suggestion for an adequate level of LCT facilities of LCT with reference to airlines' expectations and experiences.

Chapter 8 discusses from the view point of airport management the impact of cost and revenue structures on the provision of terminal facilities. This chapter reviews the terminal facilities that have been made available as part of the current KLIA LCT design. The evaluation of these terminal facilities also considers the pre-and post-development surveys that have been discussed in Chapters 6 and 7. Lessons learnt from these two phases of evaluation (i.e. pre-and-post development) enable recommendations to be made about prior decision making for designing adequate terminal facilities. The essence of this chapter is to have a better understanding of the decision for the provision of specific terminal facilities after taking into account the influence of cost and revenue structures (airport charges, capital investment, operational costs and airport revenues). The determination of the adequacy of terminal facilities also relates to the flexibility of cost and revenue structures in general. The importance of cost and revenue structures has been evaluated by Likert scale[14]. The Chapter concludes with a discussion on a conceptual model for LCT facilities (core and secondary facilities) to be included in the terminal design after taking into account the expectations and experiences of both passengers and airlines.

Chapter 9 discusses and summarises the conclusions (including proposals for a conceptual LCT design model) from the research. The thesis findings are used to support the recommendations on terminal facilities that should be provided for future LCT design. The Chapter also evaluates the original aims and objectives and answers the research questions. In addition, the research limitations are discussed and recommendations made for future research.

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14 Likert scale measures generally the level of agreement or disagreement and is measured by normally using five or nine response levels. For example, a typical five-level Likert scale is (i.e. 1: Strongly disagree and 5: Strongly disagree).

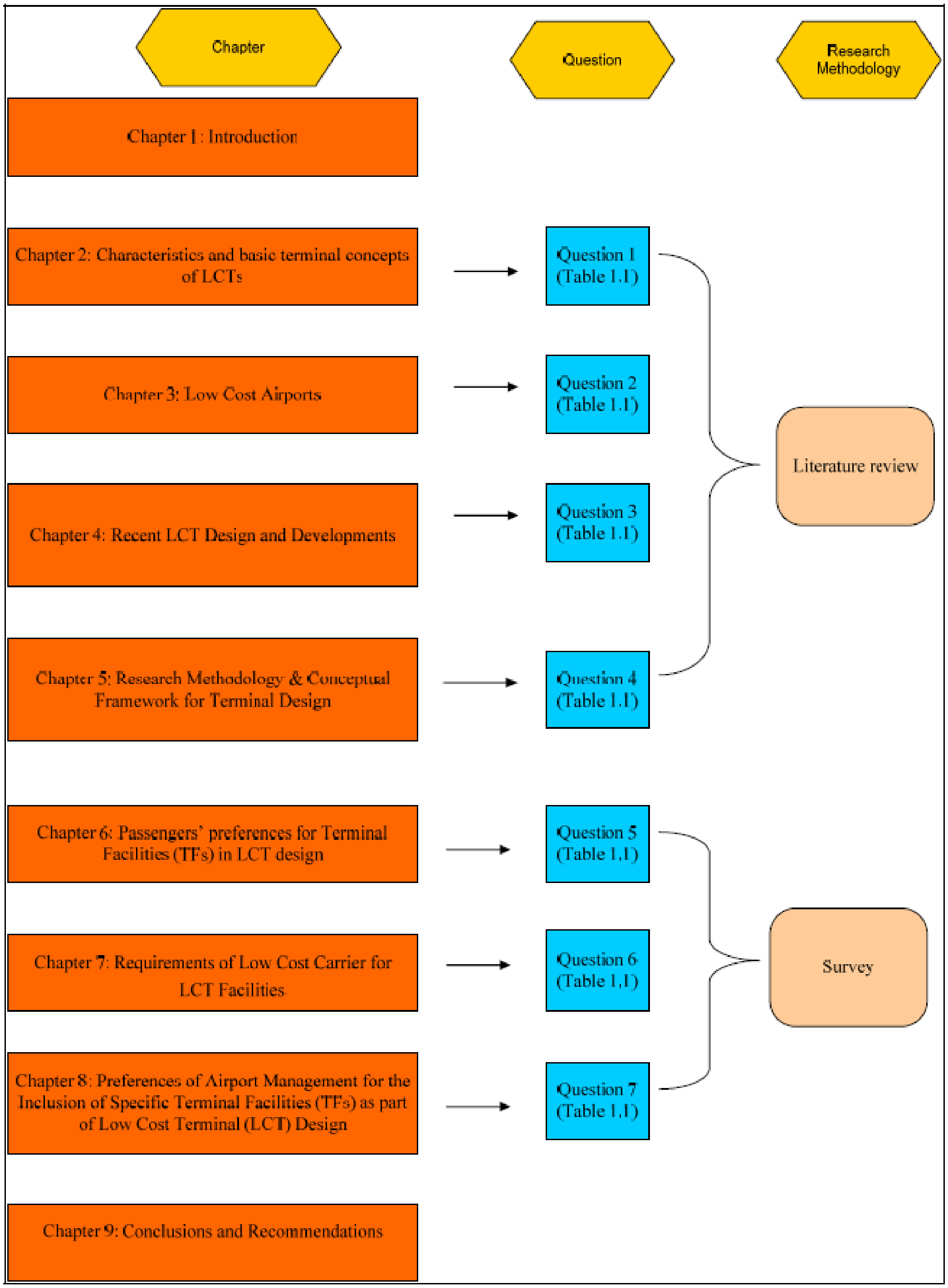

Figure 1.1 Research structure

CHAPTER 2

2 CHARACTERISTICS AND BASIC CONCEPT OF LOW COST TERMINALS (LCTs)

2.1 Introduction

The purpose of this chapter is to discuss the provision of terminal facilities in Low Cost Terminals (LCTs) after reviewing the various models of LCTs at US, European and Asia Pacific airports. The decision for the provision of terminal facilities is not only dependent on budget restrictions, available land (size and space) and capital investment but may also take into account LCC preferences. The chapter is divided into 4 parts. Firstly (Section 2.2) discusses different airport terminal types in general (i.e. traditional, small and low cost). Secondly, Section 2.3 justifies the basic concept of low cost terminals (LCTs). Thirdly, Section 2.4 discusses the characteristics of low cost terminals (LCTs) in detail and, finally, Section 2.5 identifies the three most critically important parts of the terminal area (check-in hall, departure lounge area and arrival hall) in ensuring that adequate terminal facilities are provided within the LCT. The discussion in this chapter also discusses the requirements for 'mandatory' facilities (i.e. immigration and customs).

2.2 Characteristics of different terminal types

An airport passenger terminal is a building which functionally divides landside from airside, while in terms of organisation, it is the key element within the airport where a complex interaction exists between airline companies, airport operator and the traveller takes place (Ballis et.al., 2002). A passenger terminal has three principal functions (Horonjeff and McKelvey, 1994):

- Attending to passenger needs and processing baggage;
- Providing for change of passenger movement types (i.e. international - domestic, domestic-international, international-international, domestic-domestic), and
- Facilitating change of mode of transport (origin to destination or point to point service) (Kadza and Caves, 2000).

The terminal also represents that part of the overall airport system which allows passengers to move from their ground access modes to the apron, and vice versa, and alternatively between flights (IATA, 2004), and the part of the airport involved with the flows of passengers and baggage (Jim and Chang, 1998). The terminal is also a place for transferring people from one airline destination to another and may be used as an administration base for airline operations.

Many of the modern airport terminal developments include some of the country's most emblematic buildings, as they are usually the first and last image which passengers retain of the place when they travel by air (Venegas, 2005). Airports usually apply high standards or expensive materials for constructing modern terminals, which would perhaps deliver a prestigious image to represent the culture of the country. The reputation of an airport is determined by architectural imagery, efficiency of terminal processing activities and the capability to meet service levels. The development of a modern terminal is always associated with higher costs which include capital investment, operations and maintenance. Recent examples of such modern terminals can be found in the Main Terminal Building at Singapore Changi Airport, Singapore, Terminal 5, Heathrow Airport, UK and Terminal 4, Madrid Barajas, Spain.

An airport terminal is therefore a key point of the air transport system which allows connectivity between aircraft and landside access. The efficiency of this interface is the result of various activities carried out by different parties, each having different objectives and processes. Basically, there are four main terminal types, which are (1) 'traditional' terminals, (2) secondary (regional) terminals, (3) small 'airport' terminals and (4) low cost terminals (LCTs). Each of the terminal types has different characteristics which may determine the uniqueness of the model. For example, there may be similarities in certain layouts due to the runway configuration. However, each terminal may possess several unique characteristics (IATA, 2004). Airports as a whole are unique and they have individual characteristics. These characteristics have been identified as airport type, passenger traffic, aircraft operations, infrastructure (airside or terminals), cargo or maintenance facilities, airport access, ownership, sources of revenue (aeronautical or non-aeronautical), management structures, air traffic control, security and environment. Each airport operator has unique problems in facing the challenging tasks of co-ordinating all of the services in order to enable the airport system to work efficiently (Graham, 2006). Table 2.1 outlines the airport infrastructure and facilities which may vary from one airport to another.

2.2.1 'Traditional' terminals

The definition of a 'traditional' terminal includes the capability to process the flights and passengers associated with the operations of 'network' carriers with full service facilities in the terminal building. Currently, most 'traditional' terminals are able to cope with up to 20 million passengers, or more, per annum. For example, Heathrow Terminal 5, UK, has a design capacity of about 30 million passengers per annum. Table 2.2 summarises the characteristics of 'traditional' terminals. Taking into account the target market of the 'network' airlines (i.e. first, business, full economy, high income passengers) as examples, it has been observed that the culture (i.e. lifestyle) and demographic profiles (i.e. level of income and purpose of travel) have had a significant influence on the planning of airport facilities. In addition, the budgeting costs (i.e. capital investment) for a 'traditional' terminal often allow the introduction of architectural values to represent the national culture of the country, the development of luxury facilities (i.e. airline lounges) and commercial areas.

Secondary 'regional' terminal

Occupying the middle ground between the larger 'traditional' terminals and 'small' terminals, a secondary 'regional' airport terminal is typically remote from the city centre, with sufficient capacity but a relatively low level of scheduled air services.

Advantages in terms of lack of congestion are set against disadvantages in terms of surface access and other facilities associated with 'traditional' terminals. Secondary airports have become an integral part of the cost strategy of LCCs in Europe as they offer 50%, or less, discounted charges for airline operators.

Table 2.1 Airport Infrastructure and Facilities [Adapted from Ashford and Wright, (1992), updated by author]

Infrastructure / Facilities	Variables
Runway and taxiways	Dimensions, strength, aircraft characteristics / performance, runway length and configuration, taxiway layout.
Apron	Layout of apron, size and type of stands, parking, service cargo, hangar, apron, holding bays.
Air and ground navigation and traffic, control aids	Visual aids, radio navigation aids and their buildings, air traffic services, search and rescue services, apron control communications and control towers.
Passenger terminal	Connection of passenger terminal to surface access system, passenger and baggage processing, waiting areas, government controls, airside linkages, apron passenger vehicles, transit and transfer passengers, passenger amenities.
Ground transport and internal airport vehicle circulation and parking	Private and public transport modes, traffic data, internal roadway circulation, kerb side and vehicle parking.
Airport operations and support facilities	Administration and maintenance, medical centre, ground vehicle fuel station, generating stations, water supply and sanitation, flight catering, kitchens, meteorological services, aircrew briefing and reporting, aircraft maintenance, rescue and fire-fighting, general aviation facilities and aircraft fuel facilities.
Security	Airside security: roads, fencing, isolated parking position, security parking areas, emergency explosive holding area and employee access. Landside security: passenger buildings, public storage lockers, baggage system, employee access.

The suitability of airport facilities is crucial to the success of airport planning strategies in developing the airport as a competitor to other regional airports. From the experience of Senai Airport (Johor Bahru), Malaysia, being a close cross-border competitor with Singapore, a purpose-built regional airport terminal has resulted from an upgrade of the existing terminal. The upgrade included separation of passenger flows with enhancement of customs, immigration and security procedures. Secondary terminals have proved attractive for LCCs FireFly and Air Asia, as secondary terminal facilities cater more for regional point to point services, simpler baggage handling systems, fewer transfer passengers, reasonable surface access, and appropriate security and safety systems.

2.2.2 'Small' airport terminal

As stated by IATA, (2004), a small airport terminal refers to one with the capability to process up to 3 million passengers per annum (MPPA). Small airports have been established to cater for specific market needs by fulfilling specific demands (i.e. high level income social or leisure) and to operate both commercial and privately owned aircraft. Small airports offer short to mid-range flights including both domestic and international. Small airport terminals have facilities such as the following:

1. Better provision of parking spaces and passengers normally manage to park nearer to the terminal but the security restrictions are needed, and
2. The walking distances are relatively short. Service processes (i.e. check-in and boarding) are often managed by the same individual (multi-tasking).

Table 2.2 Summary of 'traditional' terminal characteristics (IATA, 2004)

Characteristic	**Description**
Overall	Complex and high charges.
Passenger type	First, business, full economy, short/long haul international, domestic medium/high income levels, origin/destination/transfer.
Terminal design	Part of main airport complex; pier or finger, linear, open apron, satellite, compact module unit terminal and multiple levels.
Airline	Short/medium/long-haul, aircraft size may vary from turboprops to wide-bodied aircraft, point-to-point and transfer passengers.
Apron	May include air bridge, contact and remote stands. Up to 90%-95% of passengers (on an annual basis) will be served by a passenger air-bridge.
Baggage handling facilities	Sufficient numbers of carousals per multiple wide-bodied aircraft baggage. Separate device(s) for handling over size baggage. Automatic baggage sorting system.
Ground transportation	Road, rail, bus and metro access. Major airports may have high-speed rails and TGV services.
Way finding	Signposting systems should use a concise and comprehensive system of directional, regulatory and identification messages. They should adhere to basic standards of copy styles and sizes, consistent terminology, recognisable, universally acceptable symbols and uniform colours.
Commercial revenue sources	Retail, food and beverage, kiosks and advertising, 70%-80% of retail concessions should be located airside. Retail and concession facilities should not interfere with passenger flows between check-in and the departure gate lounges.
Check-in hall	For passengers waiting up to 30 minutes. 1.8m^2 per international passengers, 1.3m^2 for domestic passengers, including inter-queue space, baggage trolleys, seating for 5% of passengers. Check-in facilities should include self-service kiosks, check-in desks and baggage drop-off points, security, immigration and customs.
Terminal building cost	Medium/high capital investment between £1500 and £4000/sq.m.

Moreover, airport charges of small airports are relatively flexible depending on the location of the airports. Noting London City Airport as an example, the landing fees are relatively higher compared with other secondary airports (i.e. London Luton) after considering the location of the airport and serving the business passenger market. The airport also imposes a 75% surcharge for all movements during weekends and public holidays. Table 2.3 outlines the characteristics of small airport:

Table 2.3 Summary of small airport terminals characteristics (IATA, 2004)

Characteristic	Description
Type of aircraft	Commercial and privately owned aircraft
Apron	'Contact[15] or remote stand[16]', passengers will take a bus or walk between the gate and aircraft or vice versa.
Information display	Less frequent and located in critical areas only, as passenger way finding should theoretically be less arduous given the smaller infrastructure.
Commercial revenue	Limited retail facilities and restaurants.

2.2.3 Low cost terminals (LCTs)

Low Cost Terminals (LCTs) are defined as an airport terminal that has been developed with low capital investment cost. LCTs tend to focus on LCCs and chartered carriers with the aim of minimising aircraft turnaround time. To achieve low operating costs, LCT design should be simplified and efficient in service quality. A competitive advantage may be derived from the simplified design and reduction of airport charges that, in turn, stimulates traffic levels. Airports with LCTs tend to charge airlines less for using their facilities. LCTs offer limited facilities because of design space restrictions.

LCTs have their own capability to process flights and passengers using a simplified terminal building design. The planning of LCT facilities includes both airside and landside facilities which are able to cater for up to 10 million passengers traffic per annum (MPPA). In terms of terminal design, LCTs are classified into two different kinds, converted and dedicated (new-build).

A converted terminal is a rebuilt structure or a modification of an existing building into an airport terminal building which includes the processing activities for the airline and passengers. There is usually no provision for transfer passengers. Most simplified designs of LCT in European Countries have followed the converted terminal design concept in order to reduce capital investment cost. The construction of a specific area of terminal building for processing activities (i.e. check-in, baggage reclaim) can be classified as the converted area (i.e. Frankfurt Hahn Airport). The development of a converted terminal should be considered after taking into account restricted land availability and the high capital investment to construct a separate terminal building. The converted terminal size is small compared with dedicated terminals.

[15] Aircraft contact stands are those that are in contact with the passenger building. Passengers normally board aircraft at contact stands without use of air-bridges [De Neufville and Odoni (2003)].

[16] Remote stand is normally located away from the terminal building. Therefore, in the situation of aircraft parked remotely, the passengers are bussed to or from the aircraft.

Table 2.4 Summary of LCT characteristics (Author)

Characteristic	Description
Overall	Simple design, low charges imposed on airlines as Passenger Service Charges (PSC) indirectly imposed through ticket price to passengers.
Passenger type	Short-haul leisure (including VFR and holiday makers) and business.
Type of terminal	Converted and dedicated buildings.
Types of facilities	Aim for high efficiency, basic terminal facilities, maximise aircraft turnaround to 25 minutes
Type of aircraft	Typical for LCCs (i.e. A320, B737).
Airlines	Charter, regional short haul, origin-destination, no transfer.
Apron	'Remote stand' – passengers will take bus or walk between departure gate and aircraft or vice versa, avoidance of air bridges.
Commercial revenue	Limited retail and catering.
Terminal facilities	Usually, single storey airport terminals, reduced costs (reduced capital investment and depreciation charges for airport), quick check-in (i.e. e-tickets, no transfers, minimum hold baggage), no executive or business lounges (reduced costs for airports or airlines). Usually (but not always) only road access, coach services to service nearest cities or towns.
Airside facilities	Short taxiing distances to and from terminal building, minimum runway length sometimes specified (2200 metres for B737 operation).
Terminal building	Low (conversion) to medium lifetime.
Passenger processing time	Short and highly efficient, depends on support facilities.

The planning for a dedicated terminal is aimed at a simplified design concept either as a new building or extension of an existing terminal building. The planning of an LCT is similar to the small airport terminals when considering passenger traffic volumes, aircraft mix, capital investment, availability of resources and future expansion. A dedicated LCT may also include a multiple range of commercial initiatives (i.e. kiosks and self-vending machines) to be included in the terminal design. Recent examples of new dedicated terminals can be found in KLIA LCT and Kota Kinabalu, Malaysia, and the Budget Terminal, Changi International Airport, Singapore. Table 2.4 indicates the characteristics of LCT design to be compared with 'traditional' terminals and small airport terminals.

2.3 Basic concept of low cost terminals (LCTs)

The differences in service standards offered by 'normal' and LCCs have a significant impact on terminal facilities' ability to meet airline preferences (McLay and Reynolds-Feighan., 2006). LCC s require simple and functional facilities to serve their passengers while offering discounted prices or a reduction in the amount to pay for travel, as well as promoting their point-to-point services (Barrett, 2004). Thus, recent examples of

LCT design try to establish a basic terminal facilities concept[17], focused on cost saving and making use of economic resources. The design also emphasises cost effectiveness, simplifying the terminal process and providing easy access to the terminal building. As suggested by Odoni and de Neufville (1992), cost-effectiveness and efficient terminal design are important, especially for the development of new facilities at terminals.

The provision of LCT terminal facilities should always be designed to suit the requirements of airlines and passengers. The increased demand of passengers creates a significant pressure on airport authorities to develop new facilities to accommodate the airline and passengers with a reasonable level of service (Jim and Chang, 1998). The requirements of terminal design should include the market segment interest (i.e. leisure, low cost, business). Growth in demand, if not met by provision of these, will result in delayed trips, deteriorating quality of service and unacceptable levels of overcrowding in the terminal building (Balis et. al., 2002).

The provision of terminal facilities (i.e. departure and arrival areas) is required to meet standard levels (i.e. check-in processes within 90 minutes) that been set in order to reduce costs of turnaround time. Therefore, airport planners should decide on the level of adequacy of the facilities to be included in terminal design. A balanced provision of terminal facilities can improve service levels during the turnaround time as well as achieving the aims of the LCCs.

2.4 Characteristics of Low Cost Terminals (LCTs)

As a result of the previous discussion on the influence of cost and revenue structures, the LCTs characteristics have been identified. The basic terminal design appears to have the following characteristics as shown in Figure 2.1 to serve as an ideal LCT model.

2.4.1 Simple design

A straightforward design has been adopted in the structure of LCT models. Simplifying terminal design will eliminate the effort in delivering an aesthetic value or a prestigious image of an airport as the aim is to reduce investment cost. Thus, the building's emphasis is on functional activities while the basic terminal concept is being established. The simplifying of the design also demonstrates the capability of the landside facilities (i.e. check-in desk, baggage belts, commercial area) and airside facilities (i.e. apron, holding areas and walkways) to be efficient and meeting LCCs preferences. In addition, the simple concept eliminates the provision of luxury facilities (i.e. business lounge, conference room and VIP facilities) at airports, but retains the 'mandatory' facilities (i.e. immigration and customs counters) in the terminal building. Figures 2.2 (a) and 2.2 (b) show examples of LCT simplified designs.

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[17] Basic concepts of building performance as may be viewed by the various groups having an interest in the airport terminal and how measures of performance might be useful to decision makers concerned with terminal building planning, design, or operations in new facilities or major alterations (Lemer, 1992).

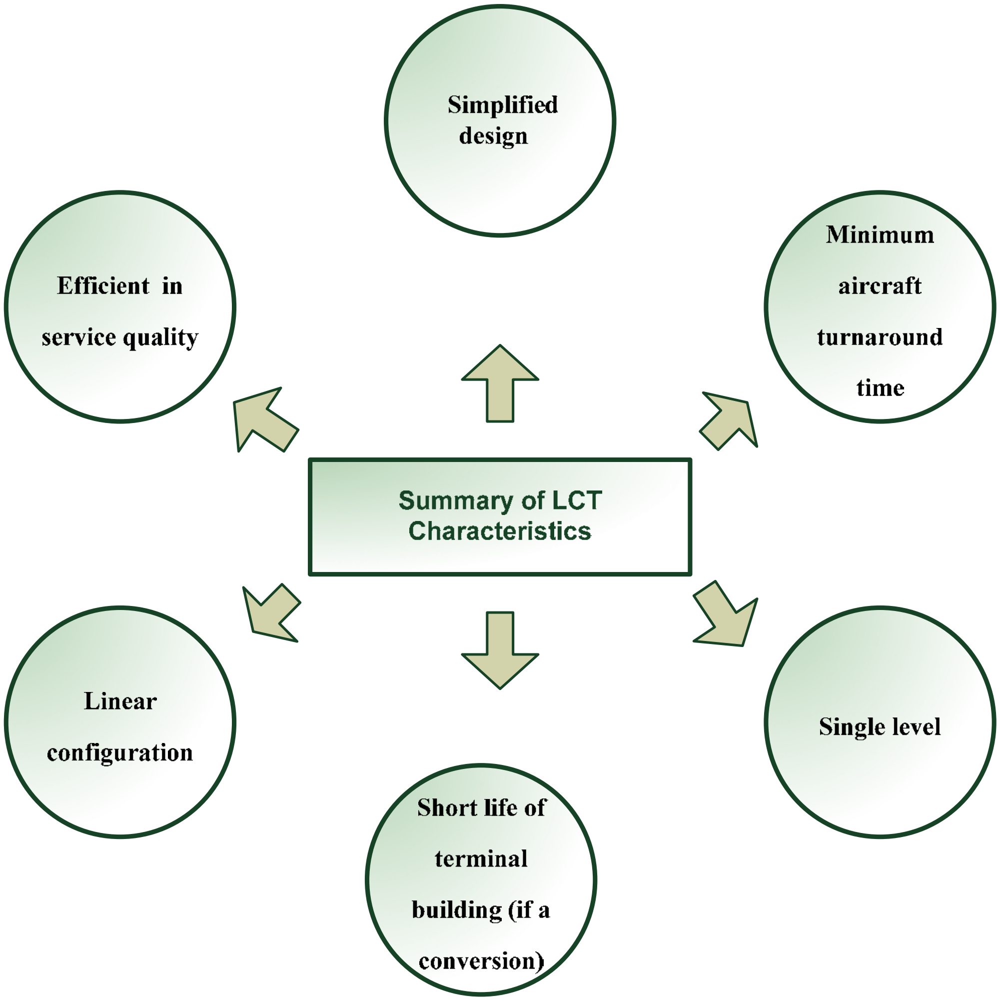

Figure 2.1 Summary of LCT Characteristics

Usually (but not always), the availability, location and dimensions of terminal facilities are negotiated and agreed between the airlines and airport. In the recent example of KLIA LCT, Malaysia and Budget LCT, Singapore, the negotiation between LCCs and airport authorities in terms of the provision of terminal facilities was mutually agreed with the aim of reducing airport charges. The airport offered these facilities to fulfil the LCCs' preferences (i.e. fewer basic facilities and a reduction in airport charges) by implementing a straightforward design concept. Through mutual agreement between airport and airline operators on the provision of facilities, the terminals were expected to deliver efficient services by minimising the associated costs in LCT development (i.e. capital investment and running costs). Thus, the adoption of straightforward or simplified terminal designs in various models of LCT is necessary.

(a) Arrival Hall, Coventry Airport, UK (Source: Coventry Airport)

(b) Design at KLIA LCT, Malaysia (Source: MAHB)

Figure 2.2 LCT simplified designs

2.4.2 Life span of LCT terminal buildings[18]

Most 'traditional' airport terminals are built to cope with an increased growth of traffic, usually, for more than 10 years. The factors determining terminal building lifetime are dependent on the growth demand (i.e. transfer, short haul, long haul). Most of the 'traditional' terminals have been built to be operated for a long period of time (i.e. 20 or 30 years) during which the building is expected to reach its maximum capacity (Venegas, 2005). The growth in passenger traffic and the long design lifetime of the terminal building may lead in due course to capacity issues, in terms of inadequate terminal facilities and an increase in maintenance and operational costs.

Taking some examples of LCT design, Warsaw (Poland), Coventry (U.K) and Marseille (France), these LCTs have been planned for use over a short to medium time frame, although designed to cope with additional capacity requirements stimulated by a growth in LCC[19] passengers. The designs are developed by focusing on minimum capital investment while, at the same time, generating additional airport commercial revenues. For example, the construction of KLIA LCT was designed and developed with the objective of coping with an increased capacity requirement of up to 10 million passengers per annum while, at the same time, being able to generate extra commercial revenues for the airport.

2.4.3 Construction time

The design of LCTs has reduced the construction time. A shorter construction time is beneficial in reducing the associated costs of capital investment. On average, LCTs have been ready to use within 12 months of start of construction.

For example, the recent development of LCTs (KLIA LCT at Malaysia, Budget Terminal at Singapore Changi and Hajj Terminal at Jakarta Airport), these terminals have been constructed in less than a year and have had the advantage of a reduction in investment costs. The length of construction time is also considered as one of the various factors influencing terminal development (i.e. space or size of terminal, availability of terminal facilities and budget limitations). Thus, these factors can be used as important elements in justifying different LCT models which are therefore identified and grouped into (1) dedicated terminal and (2) converted terminal, after taking into consideration the factors which have influenced the terminal design. Further details of these terminals can be found in Chapter 4 of this thesis.

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[18] If a conversion terminal but a new build terminal will have value working life as normal terminal (30 years).

[19] The establishment of LCCs has introduced 'low frill' services in order to fulfil the requirements of their passengers. Thus, the airport owner has no option but to design and construct LCTs to cater for the LCCs' requirement, as well as to cater for the growth of traffic volume.

2.4.4 Single level terminal

A single level LCT has been preferred after taking into consideration the aims of reducing the capital investment, running costs and other costs associated with terminal construction. The design concept of LCT discussed in Section 2.4.1 has been able to establish the single level terminal as a standard in terminal design, including the separation of arrival and departure passengers. According to IATA (2004), the separation between arrival and departure for international passengers is compulsory after exclusion of 'meeters and greeters' (i.e. family and friends), domestic passengers (arrival and departure). A single level concept is beneficial for greater access to terminal facilities and increases efficiency of passenger flows and processing activities. No level changes leads to capital and operational cost saving with the elimination of lifts and escalators. However, concentration of all facilities on a single level may result in the building having a larger footprint.

2.4.5 Basic Configuration

Single pier and linear concepts[20] are the ideal layouts for LCT design through the implementation of a straightforward design. With single piers, aircraft dock against double-sided extensions (Blow, 1998). This arrangement has the advantage of placing some aircraft gates close to the central facility, and thus more convenient for passengers than the gates at the end of the piers (de Neufville and Odoni, 2003). A recent example can be found at Marseille Airport, France with establishment of the single pier concept although with longer walking distances for passengers. Therefore, considering the restriction of space in terminal design, the aim of establishing a single pier concept is advisable.

The 'linear' configuration in terminal design refers to a building with finger piers[21]. According to Kadza and Caves (2000), the linear concept provides simple access from the terminal building to the boarding aircraft and sufficient space for technical handling equipment and staff at the apron level. The linear configuration can reduce the walking distance for passengers inside the terminal. It can also improve terminal services by easy navigation and sufficient access frontage on the aircraft side, as needed to accommodate parked aircraft. The linear concept has been used in recent developments of the LCT model [i.e. KLIA, LCT (Malaysia), and Hahn (Germany)]. However, the linear concept may be inefficient and impractical for particular reasons (De Neufville and Odoni, 2003) of being unproductive because it virtually eliminates the possibility of commercial areas.

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20 The configuration of passenger buildings has been identified as (finger) piers, satellites and link or a combination of all three [Blow (1998), Kadza and Caves. (2003)].

21 Individual stands are located along the terminal building as at Roissy-Charles de Gaulle-Aerogare 2 and 3, or around the terminal building, as at Birmingham's Terminal 2.

2.4.6 Efficiency in service quality

On average, the terminal process of an LCT normally fails to meet the higher level of service standards as the 'traditional' terminal because of the reduction in dimensions (i.e. size and space) of the terminal. In some airports, (i.e. Coventry Airport for example) restrictions on space and size of terminals create a congestion problem, mostly at peak hours. Thus, the restrictions may influence the LCT's capacity to provide efficient services, particularly for check-in, departure lounge and arrival facilities. The reduction of terminal size and space had been seen to be necessary after considering the aim of airport was to reduce investment and operation costs.

The forecasting of passenger profiles is important so that the airport can establish an adequate terminal design which may be able to cope with an acceptable level of service to the passengers while, at the same time, the terminal is able to generate sufficient commercial revenues from the LCC customers. Taking account of the LCC profiles, the airport needs to pay attention by ensuring their preferences for facilities and level of service should be included in the terminal design.

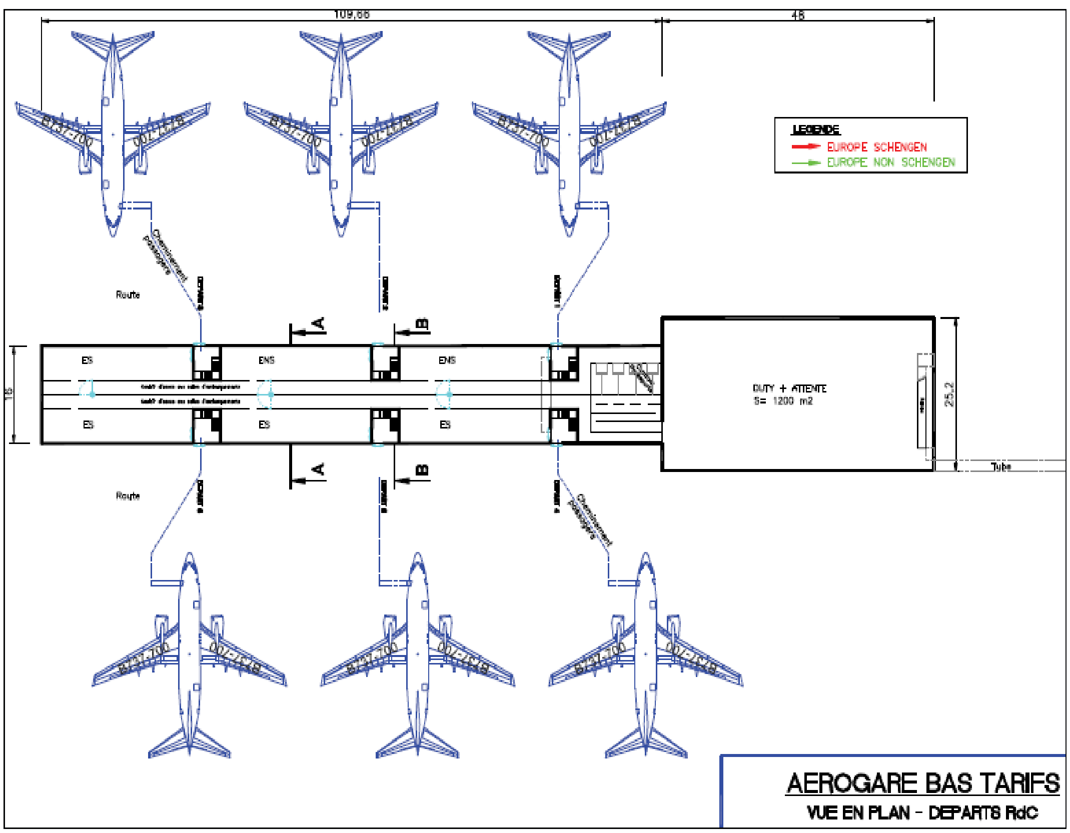

Figure 2.3 The design of main LCT building at Marseille Airport, France (Source: Marseille Airport)

2.4.7 Turnaround time

Turnaround time refers to the minimum time for an aircraft to complete unloading, loading and, where required, catering and cabin cleaning procedures (IATA, 1997). The shorter turnaround times of the no-frills carriers, however, reduce the gap that has traditionally existed. An example of flight frequency of 10 operations per day which was achieved by easyJet in 2000 (Air Transport Group, 2004) reflects the LCCs' trying to schedule a minimum turnaround time of less than 30 minutes with the consequent advantage in economic benefits. Economic pressures encourage airlines to increase aircraft daily utilisation by reducing turnaround times (Kadza and Caves, 2000). As a result, the efficiency of airport terminal facilities has to be increased, introducing a reduction in time of terminal processes (i.e. check-in, baggage sorting, handling system, loading and offloading the passengers).

2.5 The major differences between LCTs and 'traditional'[22] terminals

The major differences between LCT and normal terminal design have been identified and grouped into three major areas: (1) check-in hall[23], (2) departure area[24] (3) arrival hall[25]. The provision of LCT facilities is influenced by cost and revenue structures as well as by airline preferences. The availability of terminal facilities has been subjected to examination in order to ensure their relevance to the terminal concept. Therefore, the selection of research variables is crucial to prove the basic terminal concept that has been established. The research variables[26]include the terminal facilities associated with the terminal design. This section discusses the availability of terminal facilities that are included in recent models of LCTs.

2.5.1 Departure Hall Area

The facilities in an LCT departure hall area include processing (check-in counter), queuing area, ticket sales office and tax return office (VAT), although these are not available in all airports (Venegas, 2005). The departure hall includes important commercial facilities, retail (convenience shop, food and beverage restaurants and coffee shops) and services (bank and bureau de change) which generate additional income for the airport. Most of the departure hall facilities are dependent on space

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22 The terms 'traditional' and 'normal' may be used interchangeably. They refer to one of the types of terminal that been built with a highly structured specification for the terminal building and larger capital investment.

23 Check-in hall refers to processing facilities (i.e. ticket counters, check-in counters, security controls, passport controls, baggage carousels, customs counters, etc.) (Kadza and Caves, 2003).

24 Departure area refers to holding areas including ancillary facilities and concessions (i.e. lobbies, gate lounges, etc.) (Kadza and Caves, 2003).

25 Arrival hall refers to the processing activities for arriving passengers (i.e. immigration, customs, baggage reclamation, etc.).

26 The research variables will be discussed in Chapter 5.

availability in the terminal building. The following departure terminal facilities have been identified as terminal facilities that should be included in the LCT design.

a) Check-in desk

Specific terminal facilities[27]are included in order to cope with the requirement of network (flag) carriers (i.e. greater number of check-in desks and exclusive check-in desks for premium classes). Various passenger types (i.e. business, leisure, VIPs, etc.) use these terminal facilities, and the number of check-in desk facilities is crucial in order to provide appropriate service levels[28] for the passengers while minimising queuing time delays. Different concepts of check-in systems have been implemented to meet the problems encountered during the processing activities in the check-in hall. Centralised check-in desk[29], split check-in desk[30] and gate check-in[31] have been adopted for the 'traditional' terminal concept. However, the check-in concept adopted requires a significant amount of capital investment and space.

The single class concept[32] established by the LCCs has resulted in the need for fewer check-in desks to deal with passenger processing. In the LCT concept, the check-in counter will be for individual flights and open normally within 90 minutes of boarding time (the flights close 30 minutes before departure). The operation of an LCC with higher turnaround time needs the airport to provide a centralised check-in system to be efficient. However, the high dependency on manual check-in counters is often inadequate due to problems (i.e. long delays, queuing, and crowding) in the check-in hall. Thus, airports are looking at the alternative of using advanced technologies in order to realise efficiencies.

b) Self-service check-in kiosks

A self-service check-in kiosk is defined as a free standing unit which handles e-ticket details or processes hardcopy tickets (IATA, 2004), which permits passengers to perform automatic check-in, select seats and print their boarding cards and baggage

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27 According to IATA (2004), the commonplace check-in arrangement used within the departure concourse includes the check-in counter, desk control panel including Common Use Terminal Equipment (CUTE) display, Departures Control System (DCS) display, weighing conveyer (incorporating scales or stand-alone scales), label conveyor, dispatch conveyors and label printing facilities.

28 Service levels refer to the quality of the context in which a service takes place which justifies the amount of space available in the passenger terminal.

29 Passengers and baggage are processed at check-in counters in a common, central area, usually the departure level of the terminal. The counters are specifically designated for individual airlines or flights or alternatively passengers may be free to check in at any counter position (common user).

30 Split check-in refers to check-in function split between two or more locations within the terminal complex. The split check-in is normally in the train station, car park, commercial building at the airport or down-town.

31 Passengers proceed with their baggage directly to the gate and are processed at check-in counters immediately in front of the appropriate gate lounge.

32 LCCs do not include premium or business passengers.

labels by themselves (Venegas, 2005). Self-service check-in kiosks reduces[33] the need for a large check-in facility in the terminal area. Kiosks are claimed to also reduce the check-in processing time, thus reducing the number of check-in positions.

Figure 2.4 Self-service check-in kiosks (Source: Austrian Airlines)

According to IATA (2004), airlines and airports are introducing kiosks to speed up the check-in process, achieving a reduction in cost by reducing the number of check-in facilities. Noting examples of self-service kiosks in European and North American airports, about 33% to 50% of terminal passengers use self-service check-in at the airport. EasyJet, for example, has established self-service check-in at most UK secondary airports (i.e. Luton and East Midlands) to increase the efficiency the terminal process. In other surveys, it was also noted that 52% of all airlines have implemented dedicated self-service check-in kiosks while 20% intend to implement them within the next two to five years[34]. Figure 2.4 shows an example of self-service check-in kiosks in a passenger terminal.

According to Venegas (2005) surveys have clearly show that about 55% of passengers use self service check-in kiosks, but about 33% still do not know how to use self-service

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33 Congestion at airport refers to passengers standing in queues at the check-in counters or security check-points, therefore, the needs of self-service technologies (i.e. self-service check-in and others) is importance to improve the service of processing facilities at the terminal area. Source: Airline Business, 2008.

34 Common-use Self Service kiosks have been introduced by 27% while 54% intends to implement within the next two to five years. Remote (off airport) passenger check-in has been introduced by 28% while 42% intend to implement within the next two to five years. Source: Airline Business in 2008.

check-in and the rest made no response on their interest in using check-in kiosks. This indicates that the availability of self-service check-in kiosks is still of less importance in some markets[35]. Noting KLIA LCT as an example, the use of self-service check-in is a relatively new concept for LCC passengers but Air Asia[36] agreed to use it for their passengers. However, the introduction of this facility may reduce the check-in space on LCT area, if traditional check-in desks are still in place.

c) Queuing Area

Recent developments of LCT design have led to problems of queuing time prior to check-in. It has been observed that the average time of check-in takes longer and is inconvenient and crowded, as well as failing to deliver service standards comparable with normal terminals[37], mostly at peak times. This could be because the LCT is providing fewer facilities in order to save capital investment and associated cost related to the terminal construction.

In general, waiting lines are formed when the capacity of check-in system[38] is exceeded (Conway and Maxwell, 1961; Chow and Ng, 2007). Queues[39] are developed when passengers' average service time at the check-in desk is slower than the arrival rate. Thus, congestion problems arise, caused by the crowded and inefficient queuing, mostly in front of and around the check-in hall in the departure area. In addition, the number of meeters and greeters (family and relatives who normally stand alongside passengers) and the number of people using the trolleys for check-in increase the congestion in the check-in area (de Neufville and Odoni, 2003). The complex baggage tagging and multiple boarding cards of a manual check-in process also contribute to the congestion (Venegas, 2005). Thus, the high dependence on manual check-in service creates additional problems when the number of passengers waiting for check-in is increased, mostly, in peak hour time.

The 'Snake queue' has been introduced to deal with congestion issues by providing an improved queue strategy in the terminal building. According to de Neufville and Odoni, (2003), the snake queue is a single queue for all persons waiting for several check-in

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35 Airline IT Trends survey, 2007.

36 Air Asia is an LCC operating successfully in the Southeast Asia Region and is based in Malaysia.

37 According to de Neufville, (2003), the total queuing space in a normal terminal has been calculated at around 2.39m2 per person. It includes the length of check-in (0.12m^2), queue (0.87m^2) and circulation (1.4m^2). As a rough rule of thumb, the length of a queue is about 0.6m (2ft) per person.

38 Service time rates less than service arrival rate.

39 Two types of queue can be identified: ordered queue and bulk queue. For an ordered queue, priority of queuing is on the basis of 'first come, first served'. A bulk queue (i.e. when boarding an aircraft) is characterised by its unordered nature and deficiency of queue discipline (Fruin, 1971).

agents or other servers, and normally follows a back-and-forth channel between stanchions[40] to reduce the queue spaces needed in front of the counter.

d) Ticket and Sales Counters

Ticket and sales counters should be available in the LCT departure area to deal with unexpected situations which may cause problems for passengers (i.e. last minute cancellation or tickets, missed flights and payment for excess baggage. KLIA, for example, has included these facilities in the departure hall. The ticket and sales counters are also used to manage the response to any enquiries related to the passengers' services. Interestingly, due to reducing the cost and space to provide this facility, the KLIA has approved the use of the information counter design with seats and waiting area to be implemented at the LCT (Venegas, 2005).

e) Commercial facilities

Most of the LCT models provide a specific area for commercial activities to generate additional income for the airport. However, the area allocated to commercial activities is subject to the availability of space within the LCT. In order to deal with space restrictions, most designers have adopted kiosks in their terminal design. Consequently, the types of facilities in the commercial area have been matched to the passenger segment which prefers that these facilities are fast, simple and easy to use. Furthermore, the LCT design should be a well designed terminal building by offering various kinds of integrated services, i.e. restaurant, news-stands, shop and travel information systems[41], to generate commercial revenues. The advantage of the single level terminal design was discussed in Section 2.4.4, and has an impact on better space utilisation for commercial areas.

f) Other services

Although the size of the LCT has been reduced compared with a 'traditional' terminal, the need for safety and security processing in the terminal building is still mandatory. The terminal building still retains facilities for government-related safety and security purposes. The necessary government services (i.e. immigration and airport police) are located in the departure hall. Therefore, there is an additional cost of providing specific facilities related to such services (i.e. offices and counters).

Safety requirements are important in order to deal with any potentially unprecedented behaviour or situation which might occur in the terminal building. Unexpected events such as terrorist and bomb attacks have highlighted the need for safety procedures to ensure safety in the terminal building. The recommendations of IATA (2004) state that an appropriate authority should establish national criteria to be followed by planners

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40 Used at Dublin International Airport for Ryanair. Also used for security and immigration channels at many other airports.

41 www.bu.ac.th/knowledgecenter/epaper/jan_june2004/somruedee.pdf

and designers in the development of airport terminals in order to maintain the integrity of the nation's civil aviation industry. In addition, ICAO Annex 17 (Chicago Convention) states that appropriate aviation security facilities should be implemented in all new airport facilities and redevelopment of existing facilities.

2.5.2 Departure and gate lounges

Current LCT designs are focused on meeting the needs of airlines (i.e. minimising turnaround time). LCCs prefer to have an aircraft parking area with a short walking distance to or from the terminal in order to enhance aircraft loading and unloading. This concept ensures that without flight connectivity or transfer activities for passengers, the development costs related to the provision of transfer facilities could be eliminated. It means that the development of the boarding area could be simplified as part of the provision of terminal facilities for passengers. In addition, a number of luxury facilities (i.e. business lounges, VIP, showrooms and conference rooms) are totally avoided in the LCT design, again as means of reducing the terminal construction costs.

a) Commercial Areas

It is important that commercial activities such as retail and F&B are included in the terminal design. Commercial activities are able to bring additional revenue to airports. The sources of commercial revenues can be from the rental activities [i.e. pre-boarding zones (PBZ)[42], shops and F&B outlets] in the boarding area. Recent examples of European Airports (i.e. Coventry Airport) show that they have introduced F&B and retail kiosks in the departure lounges for passengers waiting until boarding time. Fewer commercial facilities in the LCT design would decrease the capital investment and operating costs after considering the space limitations of the terminal building. Retail activities are only justified if generated revenues are more that additional capital investment or construction costs. The inclusion of commercial areas has had a significant impact on airport revenues after an increase in passengers making use of LCT commercial terminal facilities. Therefore, airport planners need to pay attention to having a balance between operational and commercial activities in the departure lounge, noting the benefits of revenues from the non-aeronautical services sources. Figure 2.5 shows an example of retail facilities at Coventry Airport, UK.

b) Luxury facilities (i.e. VIP lounges)

In theory, the LCT design has eliminated or severally reduced the inclusion of luxury facilities (i.e. VIP lounge and showroom[43]) as part of the terminal design. Preferences established by LCCs stressed the elimination of such facilities which may influence costs and revenues. Using a simplified terminal design (Section 2.4.1), the airport may have the advantage of reducing capital investment (i.e. construction cost) after the

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[42] Gate lounge is the main facility required by LCCs in order to accommodate their passengers.

[43] Product promotional display areas (i.e. cars or credit card)

elimination of luxury facilities considering budget constraints and restrictions in departure lounge space within the LCT.

Figure 2.5 Retail facilities at Coventry Airport (Source: Coventry Airport)

In practice, with the aim of increasing airport revenues, airport planners have made use of some luxury facilities in LCT design. Taking the airline lounge as an example, the airport could charge passengers, who require a comfortable area while they are waiting for boarding, for use of such as facility. KLIA LCT, for example, has charged passengers RM15 (USD3.94)[44] to use the airline lounge. This may attract LCC passengers to use the service, mostly when a flight has been delayed.

c) Departure Area

Most LCCs require provision of a gate lounge to accommodate the passengers. To achieve minimum turnaround time, the passengers need to be ready at the boarding gate prior to boarding time. An example of the departure lounge area in LCT design is a limited seating configuration with standing space for most passengers. The departure lounge area normally includes seats, television and other entertainment for passengers.

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[44] USD1= RM3.80

d) Boarding gates

LCCs have avoided expenditure on services not strictly necessary for the provision of the core air transport product, such as the use of air-bridges (McLay and Reynolds-Feighan, 2006). Air-bridges are used for embarking or disembarking of passengers as well as generating extra revenue through these terminal facilities. Through the adoption of a simple terminal concept, most of the recent LCT models have eliminated the use of air-bridges for passengers. This will therefore reduce capital investment and the airport will offer the incentive of discounted airport charges. The cost saving by not providing air-bridges is significant and is around £400 000 per air-bridge as well as the associated maintenance and operating costs (Venegas, 2005).

As an alternative, an airport may offer the use of remote stands. Remote stands are designed so that there is sufficient space for turnaround activities to be performed independently of activities on an adjacent stand (Kadza and Caves 2000), and at a remote location away from the terminal building. However, the use of the remote stand may cause problems when the operation is highly dependent on weather conditions. If the weather is good, the remote stand can be fully utilised. However, the efficiency and attraction of a remote stand may be influenced by bad weather as the passengers will take more time to embark and disembark between the aircraft and bus (see following section).

e) Airside Bus

LCTs have minimised the provision of facilities associated with the terminal building and airside access (i.e. bus) in order to reduce operational costs and capital investment. LCT designs do not require buses to reduce an additional expense of airside operations. However, this is not always possible, Warsaw LCT requires 100% bussing and late night arrivals at Luton Airport are often bussed. Passengers are required to walk to catch the flight when the airport has constructed walkway access between airside and the terminal. Noting the example of KLIA LCT, in line with the Air Asia preferences, the airport authority has decided to install covered walkways for the transfer of passengers from the terminal to aircraft or vice-versa. Therefore, the issue of the installation of covered walkways has been debated after considering the safety concerns, for example, whether aircraft manoeuvres will create jet blast or any other danger to the passengers.

f) People movers

People movers[45] (i.e. walkway and escalator) have been eliminated in the terminal design. As stated by Kadza and Caves (2000), the design of a small airport terminal building (with a volume of up to 5 million passengers annually) generally does not

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45 This concept was put forward by architect Hans Fischer. The terminal building was to be connected to the parked aircraft, and also many parts of the airport complex, by an electronically controlled railway system running inside a glazed tube (Blow, 1998)

require people movers. Therefore, the need for people movers, after considering the small size of terminal building, is eliminated since the passengers have to walk only a short distance within the terminal building.

2.5.3 Arrivals

The arrival area includes the terminal facilities provided to handle arriving passengers (i.e. immigration control, baggage collection, customs and public health areas).

a) Immigration

To ensure government and regulatory requirements for international passengers are met, the facilities for passport control and facilities to accommodate non-accepted passengers have to be adequately allocated in terminal design. However, the allocation of these facilities requires additional capital investment and airport operational cost. The demands on immigration facilities have increased after a growth in the number of international passengers using LCTs. International passengers have to go through additional procedures, which involve government organisations (i.e. immigration, customs), to allow them to enter the country. Therefore, they need to pass through the immigration control and these passengers have to be kept separate from domestic passengers. Thus, airport planners have included immigration counters as part of terminal design with sufficient numbers to cater for the needs of international passengers.

b) Baggage reclaim

LCCs ' policies to restrict hold luggage or even encourage passengers to carry bags on board the aircraft has allowed the possibility of the airport to reduce the number of baggage reclamation belts to be included in terminal design. Thus, indirectly, the capital investment for baggage reclamation belt installation could be reduced, whereby the belts could be used for two or three flights at the same time. Baggage claim belts need to have sufficient presentation length, that is, the length along the conveyer belt, to allow passengers to identify and pick up their bags (de Neufville and Odoni, 2003). Figure 3.6 shows the example of a simple baggage handling belts.

c) Customs

Given the many similarities in recent LCT development, customs offices or counters are always allocated to the arrival area to inspect passenger baggage. Terminal building designers should liaise with the government customs representatives to establish typical or average processing times for customs inspection (IATA, 2004).

d) Security

In order to increase the security of terminal passengers and to ensure regulatory requirements are met, the state stresses the importance of passenger baggage inspection, for both international and domestic passengers, being included in terminal design.

Figure 2.6 Baggage Handling Belts at Hahn Airport (Source: Hahn Airport)

e) Baggage Reclaim Office

In the LCT design, the availability of a baggage reclaims office to be included in the arrival area is of relevance. This includes the processing facilities for missing baggage or unattended baggage of passengers.

f) Waiting Area, Arrivals

A dedicated space or zone for a waiting area to accommodate the needs of 'meeters and greeters' in terminal design is important, hence its presence could directly increase LCT commercial revenues, in which the provision of shops (i.e. newspapers and florist) or counters (i.e. hotel booking and care hire) could be included in terminal design. Noting the example of KLIA LCT, that model has implemented commercial facilities (i.e. hotel booking, car hire, taxis, shuttle, bus and other services related to surface access). The dimension of the waiting area is dependent on strategic location and passenger numbers (Venegas, 2005). Options for the arrival waiting area include:

1. Outside the terminal building, with a roof to protect those waiting from the weather;

2. Inside the terminal building, with the option of providing retail, catering and other services and,
3. Contiguous with the departure area.

g) Toilets

Toilets[46] are an important facility and are located in different places in terminal areas (i.e. check-in hall, commercial area, departure lounge and baggage reclamation). Toilets increase the investment, running and maintenance costs, therefore, as stated by Venegas (2005), the ideal solution would be to have only three toilets areas available in departure lounge, baggage reclamation area and arrival hall to decrease the running costs.

h) Offices and other facilities

Airport and airline offices do not need to be located inside the LCT, as they need only limited office space for operational activities. Facilities such as a prayer room may be provided inside the terminal building after considering the influence of culture. For example, at KLIA LCT the availability of a prayer room for Muslims in the area between departure and arrival halls has marginally increased costs.

2.5.4 Baggage System

The LCT baggage system should be simple but highly efficient to achieve the aim of reducing operational costs. The decision on the availability and sitting of the baggage system is critical, considering the restrictions of minimising terminal size and manpower since the technical and human resources contribute to the major cost of baggage systems.

By comparison, the baggage system in a ‘traditional’ terminal involves a highly complex and sophisticated system to sort the hold baggage of passengers, and to enable the system to manage the transfer of baggage from landside to airside and vice versa (and also aircraft to aircraft transfer of baggage). However, the recent development of LCT models is a simplification of ‘traditional’ terminal design and therefore requires a simpler system with the number of baggage drop-off points to be considered and the need for handling activities (labelling, tagging) for processing the baggage. To ensure passenger and airport safety, all baggage systems have installed advanced technology such as Explosive Detection Systems (EDS) to allow the screening of passengers’ hold baggage. At Marseille and Warsaw Airports, for example, passengers are required to take their own baggage to the EDS in an adjacent facility which is close to the check-in area to complete the baggage screening. However, the drop-off point requires the presence of handling agents to transport the baggage from the terminal to the aircraft.

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[46] Minimum internal stall length and width is approximately around $1525m^2$ X $1525m^2$. Only 2% of total toilet stalls should be for wheelchair users. Source: International Commission on Technology and Accessibility.

Table 2.5 Comparison of LCT and 'traditional' terminal sub-systems

Sub-systems		Low Cost Terminal (LCT)	'Normal' Terminal
Overall	Simplified design	Yes	No
	Lifetime of terminal building	Short/medium to cater anticipated growth of LCCs and passengers (less than 10 years)	Medium/Long (more than 10 years)
	Construction time	Short	Long
	Basic configuration	Linear (depending on size of terminal)	Multiple (pier / linear / satellite)
	Efficiency	High	High
	Turnaround time	Less than 30 minutes	Depends on the carriers (from 30 minutes and 4 hours, in average)
Departure Hall Area	Manual check-in desk	Yes	Yes
	Self-service check-in and fast bag	Yes	Yes
	Queuing Area	Congested (depends on traffic flows, scheduling)	Less congested (depends on traffic flows scheduling)
	Ticket and Sales Counter	Yes	Yes
	Commercial facilities	Yes but may be limited	Yes but depends on size of terminal and passenger market
Departure lounge	Commercial area	Yes (but limited)	Yes (can be varied from basic to shopping mall)
	VIP lounges	No	Yes
	Emigration (International)	Yes (depends on country)	Yes (depends on the country)
	Separate gate lounge	No	Yes (sometimes)
	Air-bridges	No	Yes
	Airside bus	Sometimes	Sometimes
	People movers	No	Yes (large terminals)
Arrivals	Immigration counter (International)	Yes	Yes
	Baggage system	Simple	Sophisticated
	Customs (International)	Yes	Yes
	Baggage reclaim office	Yes	Yes
General facilities	Waiting area arrivals	Yes	Yes
	Toilets	Yes	Yes
	Airline or airport Offices	No	Yes

In the arrivals area, the baggage handling system may be comprised of just one or two conveyer belts. The terminal facilities in the arrival area include access to baggage reclaim and space for passengers waiting to collect their baggage. The installation size of the baggage facility in the LCT arrival hall is dependent on the volume of traffic and also on LCCs policies concerning hold baggage (Venegas, 2005). The policy is imposed on restricting the weight of baggage and number of bags to be carried, or passengers may be required to carry their bags with a limited baggage allowance on board. The policy is advantageous to the airport operator in reducing the need for baggage conveyor belts in the terminal design.

To summarise, the characteristics of LCT models vary compared with the 'traditional' terminal. It would worthwhile for airport planners to pay attention to preferences for terminal facilities to be included in LCT design. Consideration of adequate terminal facilities could possibly reduce the investment costs while at the same time, the airport planner could have the problem of designing an terminal design model which could maintain airport revenues. Thus, Table 2.5 groups and encapsulates the options for LCT model each sub-system.

2.6 Summary

This chapter has discussed the basic terminal facilities which have been included in LCT design, after reviewing recent developments across the world. Although the models appear to be different (i.e. converted and dedicated), there are some similarities which are very interesting to compare.

Most LCT designs have implemented the basic terminal concept which concentrates on offering fewer terminal facilities in order to reduce the costs (i.e. capital investment, operational and maintenance), while at the same time, meeting the preferences and maintaining passengers service standards. The planning of these facilities has also been dependent on the space and size constraints, cost budgets, passenger profiles, aircraft mix etc. The emergence of LCCs has changed the emphasis on terminal design, particularly in terms of terminal facilities. The LCCs' preferences for highly efficient but low cost terminal facilities to cope with significant numbers of terminal passengers and the minimisation of turnaround time in their airport operations have been putting pressure on airports to establish alternative concepts of terminal facilities, the provision of which to be matched to airline preferences.

LCT designs have been simplified, with a shorter lifetime terminal building, shorter construction time, linear basic configuration, an efficient service quality and a minimum aircraft turnaround time suited to LCC operation. A basic concept has been established with the primary concern concentrating on the core terminal facilities to be included in LCT design.

Sections of the LCT building have been divided into three major areas: check-in hall, departures and arrivals:

a) The departure hall includes specific terminal facilities (check-in desk, self-service check-in kiosk, queuing area, ticket and sales counters, commercial and government offices).

b) In the departure lounge, specific facilities have been identified (departure lounge area, commercial area, luxury facilities, boarding gates and bussing) which should be considered to be included in the terminal design.
c) The arrival facilities (immigration counter, baggage reclamation, customs and baggage reclaim office) and general facilities (waiting hall and toilets) should also be considered as part of LCT design.

The inclusion of terminal facilities has been directly associated with the cost and revenue structures, thus airport planners should pay more attention to considering the LCT facilities which meets the aims of airlines, airports and passengers in terms of provision of terminal facilities. Chapter 3 will discuss the low cost airport and cost and revenue structures which have encouraged the development of the basic LCT design concept.

CHAPTER 3

3 LOW COST AIRPORTS

3.1 Introduction

The aim of this Chapter is to demonstrate a comprehensive understanding of low cost airport development as well as its characteristics. The Chapter is divided into four subsections. Firstly (Section 3.2), there is a discussion on the transition of secondary airports to low cost airports. Section 3.3 briefly discusses the impact of airline industry developments on UK airports. Section 3.4 gives a brief overview on the factors influencing the design of LCTs and, finally Section 3.5 discusses the influence of cost and revenue structures on LCT design. A literature review was undertaken to gather information with the following objectives, reviewing current knowledge, understanding the present scenario, exploring the research gap, and, most importantly, to develop the conceptual context to the research. The literature review has been undertaken from various sources including published resources (refereed journals, theses). Databases have been also extensively used (Ecopus, Emerald) after considering the reliability of the material.

3.2 Transition of secondary airports to low cost airports

A secondary airport may be defined as an under-utilised and reliever airport that complements the main or primary airport of a city. A secondary airport is may situated far away from a city centre (Malmo Airport serving Copenhagen) or sometimes it is close (London City Airport serving London). A secondary airport complements the primary airport in a metropolitan multi-airport system. Normally, the secondary airport is situated within an attractive catchment area in terms of traffic generation, has an important feeder function for the large hub airports, offers a reasonable number of direct scheduled connections, and has normally more than 9 network carriers operating at the airport. Secondary airports do not have a hub function and concentrate more on point to point city pair connections.

Secondary airports have been used by the low cost airlines since the introduction of European Economic Liberalisation[47] in 1995. This gave the option of free route entry and freedom of fare charging to the airlines. European Economic Liberalisation basically included three packages[48] in order to fully deregulate the European aviation

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47 Liberalisation has also been known as deregulation. As noted by O'Connell (2007), deregulation refers to domestic markets (i.e. the US market) and liberalisation to international markets (i.e. across the EU member states).

48 a) The member states allow any EU carrier holding an operating licence granted pursuant to the regulation to exercise traffic rights within the EU. (b) Access to routes between member states is unrestricted. The airlines' prerequisite is to have a valid air operator's certificate to operate on routes within the EU. The introduction of 'air freedoms' including unrestricted access to cabotage routes has been applied. (c) Fares and rates for all air services: The air fares have been

market, as agreed by the European Union. As stated by O'Connell (2007), the three packages included:

1. Licensing of air carriers (Council Regulation 2407/92),
2. Market access for community air carriers to intra-community air routes (Council Regulation 2408/92), and
3. Fares and rates for all air services (Council Regulation 2409/92).

The development of secondary airports[49] as bases for low cost airline operations has had major implications for the aviation industry, initially in the USA and Western Europe but, now, throughout the rest of the world. Many of Europe's secondary airports were first built for military purposes, but some of them were converted to serve as regional airports (Barbot, 2006). The first secondary airports promoted by Ryanair50 were London–Luton and Dublin in 1986. Slots were not then available at Heathrow. Dublin Airport is the major gateway for air traffic into the Republic of Ireland accounting for 77% of all international passengers to/from the Republic of Ireland in 2007. The Dublin–London route prior to the 1986 deregulation was virtually a Heathrow monopoly (Barrett, 1997). Of the allocation of 20 Heathrow slots to the Dublin route, 13 were held by Aer Lingus and 7 held by British Midland Airways (BMI), giving 100, 000 passengers per slot in 2006 compared to 106,000 passengers per slot used on the Cork-Heathrow route. The Heathrow-Ireland market in 2006 had 2.7 million passengers, 73% on the Dublin route, 16% on the Cork route and 12% on the Shannon route (Barrett, 2007). In 2008, Dublin Airport had an extensive short and medium haul network, including approximately 50 daily departures from Dublin to the five London Airports (Stansted, Luton, Gatwick, Heathrow and London City).

The development of secondary airports has been highly successful leading to a significant increase in passenger numbers as well as a growth in the number of point to point routes served by the airlines, particularly by Low Cost Carriers (LCCs)51. The partnership of LCCs and secondary (low cost) airports has been significant, both in terms of gaining market share, and in expanding the size of the overall aviation market (Barrett, 2004).

To attract the LCCs, the ideal attributes of a secondary airport should include competitive airport charges (i.e. lower charges) and a lack of congestion in order to allow the aircraft to have a rapid turnaround time. The secondary airport should also be under-served by network (flag) carriers and therefore currently offer a limited choice of routes for business travellers. The potential advantages of secondary airports include growth opportunities for new markets such as business and leisure travellers (students and the elderly), plus enhanced opportunities for existing markets which may, in turn,

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set for scheduled chartered and cargo services; however, they are not subjected to control under this regulation.

49 Also known as regional airports (Liverpool and East Midlands Airports in UK).

50 Ryanair’s headquarters are at Dublin, Ireland.

51 Referred to as ‘no-frills’ or ‘low fare’, these airlines introduce the concept of ‘low cost’ into their organisational culture and offer low fares in exchange for cutting out many of the traditional passenger services.

contribute to increased economic benefits for the region served by the secondary airport, such as direct and indirect employment, and inbound tourism.

There are a number of reasons why these attributes are important. Firstly, there are no problems with the availability of slots, allowing the LCCs to design schedules to make the best use of their fleet in terms of aircraft utilisation. Secondly, the lack of congestion should allow airline schedules to be maintained and therefore the costs of delays are minimised. Thirdly, the marginal costs of secondary airports are very low, or almost zero, so that aeronautical charges are also often low. Lastly, there is a reduced dependency on complex infrastructure such as air-bridges and complex baggage handling systems, making it possible to design passenger terminals simple enough to meet LCC needs for quick and cost-effective services (Barbot, 2006).

From the examples of an increasing number of passengers at secondary airports in the United Kingdom (Luton, Liverpool, Prestwick, etc.), it can be shown that LCCs have successfully attracted a significant number of additional passengers to these airports, and that many LCCs have chosen secondary airports to establish bases. Throughout Europe, many secondary airports have registered a similar increase in traffic due to LCC flights (Barbot, 2006). As a result, the major players in the LCC sector (and, indeed, the secondary airports) have generally benefited from an increase in revenues although in such a highly competitive market some airlines have ceased operations (Debonair) or have been absorbed by competitors (Buzz, Go).

Table 3.1 Passenger Growth at UK Airports [Terminal Passengers–(thousand)] (CAA, 2008)

Airport	1997	2007	Growth (%)
London Gatwick [52]	26 791	35 165	31.3
London City[53]	1 159	2 912	151.3
London Luton	3 217	9 919	208.3
London Stansted	5 364	23 759	342.9
Nottingham East Midlands	1878	5407	187.9
Prestwick	567	2 421	326.9
Bristol	1 586	5 884	270.9
Southampton	611	1 985	224.9
Aberdeen	2 533	3 411	34.7
Newcastle	2 587	5 624	117.4

An example of traffic growth is given in Table 3.1 which demonstrates the increase in passengers' numbers at secondary airports in the UK between 1997 and 2007. For example, the number of passengers at Stansted Airport increased to 23.8 million in 2007 (compared with 5.4 million in 1997) due to the growth of easyJet and Ryanair as the

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52 Note that London Gatwick (LGW) has only had recent LCC growth (easyJet).
53 Note that London City (LCY) does not have any LCC operations.

main LCCs at the airport. This has led to a 342.9% increase in passengers. Table 3.1 therefore gives an excellent indication of the traffic stimulated at UK secondary airports by the growth of the LCC market.

Table 3.2 Airports serving metropolitan regions and specific market segments [de Neufville and Odoni, (2003) updated by Author]

Metropolitan region	Secondary airport	Market segment	Major Carriers (July 2008)
London	Gatwick	African, American, and European destinations	easyJet[54], Monarch, Ryanair, Virgin Atlantic Airways, flybe, Thomsonfly, British Airways
	Stansted	European destinations	Ryanair, easyJet, GermanWings, Blue Air, Air Malta, Air Berlin, Wizz Air, Norwegian Air Shuttle
	Luton	Holiday charters and European destinations	easyJet, Monarch, SkyEurope, flybe, Ryanair, Thomsonfly, Wizz Air
	London City	Access between London financial district and European business centres	CityJet and Scot Airways (Air France), Austrian, British Airways, Lufthansa, Swiss International Airlines, Luxair, VLM
Paris	Orly	Domestic, African and Southern Europe	Air France, Atlas Blue, Transavia.com, easyJet, Jet4you, Air Malta
	Charles de Gaulle	Asia, American and European	easyJet, bmibaby, Finnair, CityJet, flybe, Singapore Airlines, Malaysian Airlines, United Airlines, KoreanAir, Lufthansa, Eurofly, Air France
	Beauvais	European destination	Blue Air, WIZZ Air, Ryanair

As stated by Allison (2004), the targeting of secondary airports by LCCs has allowed many previously under-utilised airports to gain additional revenue as well as providing additional employment opportunities to local communities and regions. It is worth mentioning that the growth of these secondary airports has now led to individual airports being identified as having a specific role or being linked to a specific segment of the airline market. For example, Table 3.2 shows the market segments served by airports serving the metropolitan areas of London and Paris.

Table 3.2 shows that Gatwick Airport serves African and American destinations and has attracted easyJet and Ryanair because of the demand for LCC services from the catchment area. Passenger traffic grew at Gatwick Airport by about 3.2% in 2007, compared with the previous year. This growth has been driven by the introduction of new routes by the airlines but has been partially offset by the transfer of long-haul USA services to Heathrow. Another example, Luton Airport has seen growth as a secondary

[54] Including GB Airways (now absorbed into easyJet operations).

airport for LCC and Charter operators. The LCCs were initially attracted to the airport by competitive airport charges. Taking Paris Orly Airport as another example, its use as a secondary airport has seen a continuing growth in airline traffic. A combination of network carriers such as Air France and LCCs such as easyJet, Hapag-Lloyd Express and Norwegian make a significant contribution to passenger traffic and therefore airport revenues.

Following the example set by Ryanair, LCCs have used a number of airports as bases, after taking into consideration the competitive aeronautical charges at these airports, despite the fact that these airports (i.e. Frankfurt-Hahn Airport, Beauvais Paris Airport and Stockholm-Skavsta Airport) are a significant distance from the cities they are serving (Barrett, 2004). However, the continuing source of new marketable secondary airports in Western Europe appears to be limited resulting in LCCs' Ryanair and easyJet having to look for new markets. Therefore, the LCCs are moving into new destinations such as Eastern Europe, North Africa (partly due to the easyJet acquisition of GB Airways) and international gateway airports (Madrid). In comparison, taking some examples of LCC establishment in the Asia Pacific region, such as Air Asia[55] (Malaysia) and Tiger Airways (Australia), the facilities offered by Kuala Lumpur International Airport (KLIA), and Singapore Changi Airport are preferred by these LCCs after taking into account the large potential population for passenger traffic in the region, enabling the generation of additional demand.

However, most of the LCCs continue to prefer to use secondary airports for their operations because of competitive airport charges. Taking Ryanair as an example, the airline has used a number of secondary airports in European countries (i.e. London Luton and Frankfurt Hahn Airports) for their operations. As a result, Ryanair destinations are 135 in total (August 2008) and they are now beginning to dominate the European low cost market. Taking easyJet as another example, the airline also bases their aircraft at secondary airports in European countries, and currently the airline serves 126 destinations with 163 narrow-bodied Airbus A319s and Boeing 737-700s[56]. Table 3.3 shows an overview of selected European LCCs.

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55 In terms of airport selection, Air Asia does not have much choice except to use the international airport at KLIA, Malaysia as a base as well as using Singapore Changi Airport for operational activities. Therefore, the airport operators at both airports have introduced separate terminals which are exclusively designed for Air Asia or other LCCs to increase aircraft turnaround time and with lower airport charges.

56 This does not include easyJet Switzerland. LCC routes / destination / fleet size are a moveable feast and the data is an indicator only for early 2008.

Table 3.3 Overview of selected European no-frills LCCs (Author)

Airline	Fleet size (type)	Destinations Served	Main Bases / Hubs
easyJet/ easyJet Switzerland	163 (B737-700 and A319s)	126	London Gatwick / Luton / Stansted, Liverpool, Amsterdam, Paris Orly/Charles de Gaulle, East Midlands, Bristol, Geneva
Ryanair	166 (B737-800)	135	London Stansted, Glasgow Prestwick, Brussels Charleroi, Frankfurt Hahn, Milan Bergamo, Dublin, Stockholm Skavsta, Liverpool, Bristol
Germanwings	29 (A319-100)	69	Cologne-Bonn, Stuttgart, Hamburg, Berlin Schonefeld
Hapag-Lloyd Express (TUIfly)	46 (B737-300/ 700/800)	69	Cologne-Bonn, Stuttgart
Bmibaby	18 (B737-300/500)	35	Birmingham, Cardiff, Manchester, East Midlands

3.3 Impact of airline industry developments on UK airports

At the beginning of the 21st Century, the airline industry was recovering from significant events such as September 11, 2001[9/11], and SARS[57]. The impact of '9/11' pushed the industry into financial crisis after air travel dropped within the USA to 20% of normal activity during the period September-December 2001 (O'Connell, 2007). In early 2003, Ryanair acquired London Stansted based low-fare operator Buzz from KLM and integrated Buzz services into its own. Until February 2008, the growth of traffic developed continuously in UK, even though there were significant events (increase in oil price and US economic downturn) which probably contributed to a decline in yields of the airlines as well as for airport operators.

The industry was recovering from the economic downturn in 1997 after which the LCCs tried to establish a new segment market (the low cost market), while at the same time, there was an increase in competition between the network carriers on specific routes (i.e. London-Dublin). However, the UK market remains one of the largest markets to Ireland accounting for nearly 9.0 million of passengers in 2007 and the London routes to Dublin carried 4.4 million of passengers in the same year[58]. The recent economic down-turn (late 2008) is expected to reduce traffic growth for the industry as a whole.

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57 Severe Acute Respiratory Syndrome (SARS) or 'bird flu' has shown that an epidemic can have a heavy influence on the airline business.

58 Dublin Tourism Trade website, http://trade.visitdublin.com.

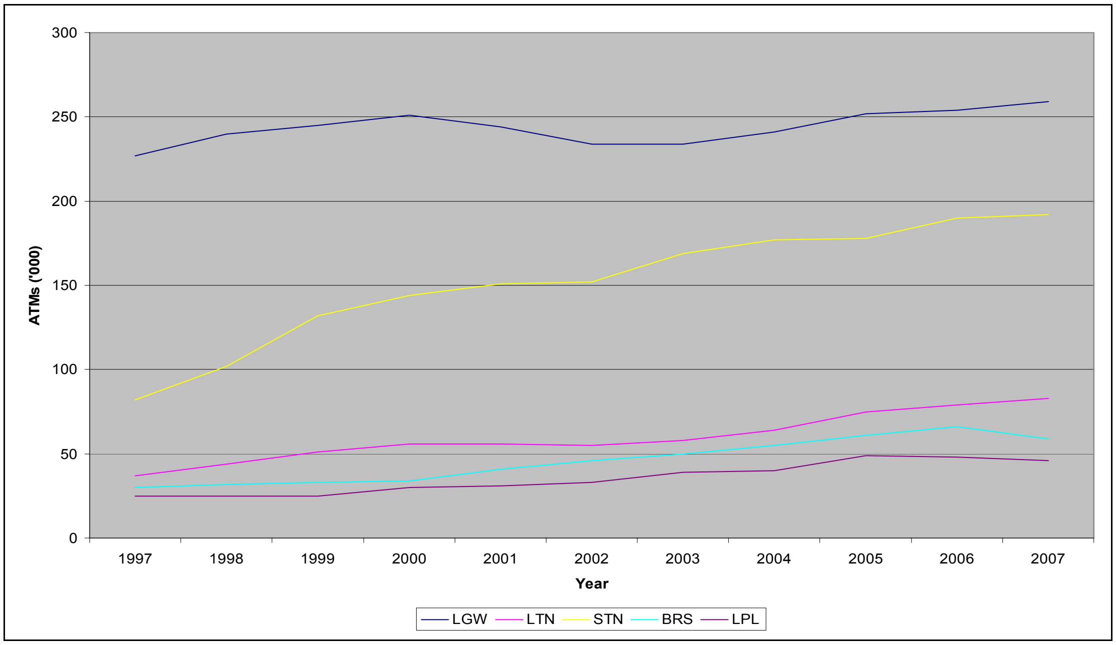

Figure 3.1 Aircraft movements (ATMs) at UK Airports 1997-2007 (CAA UK, 2008)[59]

The demand for secondary airports by LCCs seeking competitive airport charges is crucial. Many LCCs have chosen secondary airports to establish aircraft bases and the vast majority of secondary airports have seen increased traffic due to the growth of the LCC market (Barbot, 2006). Figure 3.1 shows the traffic growth at selected UK airports, London Gatwick (LGW), London Luton (LTN), London Stansted (STN), Bristol (BRS) and Liverpool (LPL), each of these airports is being used as a base for LCCs' operations. Noting the example of London Stansted (STN), the growth of traffic at this airport was influenced by Ryanair and easyJet. The emergence of LCCs has had a significant impact on the planning and development of airports, and this will be discussed later.

3.4 Factors influencing the design of Low Cost Terminals

3.4.1 Relationship with Low Cost Carriers (LCCs)

Low Cost Carriers (LCCs) refers to airlines with a lower operating cost structure than their competitors (i.e. network carrier) and which concentrate on service, operational and overhead savings. LCCs tend to focus on short haul routes of generally less than 1,500km. The carrier needs to have as many seats on board its aircraft as possible and turnaround times of less than 30 minutes. They derive a competitive advantage from a combination of using uncongested secondary airports and operating point to point

[59] London Heathrow (LHR) and London City (LCY) are the two airports not used by LCC. The data shows a comparison of passenger growths at all London Airports, UK from 1997 to 2007.

services. LCCs operate a single type fleet with low ticket prices, a simple fare structure and simplified routes. Significant cost savings can be made by selling directly to customers via the internet, call centres and by using electronic ticketing. The LCCs avoid travel agency commissions and computer reservation fees.

For a cost-effective design, the airport planner should always consider the LCCs needs for the provision of airport terminal facilities. These needs may vary from one LCC to another. However, to retain the LCCs as business partners, the airport planner has to take these needs into consideration. For example (Warsaw, KLIA, Marseille), an airport may have a dedicated terminal for LCCs with fewer terminal facilities (leading to lower capital investment and lower operating costs). Therefore, the development of LCTs has been influenced not only by the volume of traffic, terminal layout, terminal size / space, terminal configurations and capital investment, but also by airline preferences for infrastructure and competitive pricing.

The reasons behind the development of LCTs include the need to meet the LCC's requirements as well as achieving the airport planning objectives of increasing passenger numbers. Most of the LCTs that have been developed in recent years have taken into consideration competitive airport charges, minimum turnaround time and reducing costs. O'Leary has stated that the efficiency of the turnaround time factor is the main purpose of LCTs (Barrett, 2004). For example, the minimum turn-around time that is fixed by Ryanair is approximately 25 minutes. Therefore, short turnaround times will lead to higher aircraft utilisation and increase the revenue earning opportunities for each aircraft in the LCC fleet.

Ryanair has always been one of the most proactive of the LCCs in seeking higher aircraft utilisation (minimising turnaround time and therefore time on the ground) as well as supporting the development of single level terminal buildings that will also meet regulatory requirements (the airside separation of arrival and departure passengers). Included as part of the concept of an ideal LCT are faster check-in services, simple baggage-handling systems (some LCCs now actively try to reduce the amount of hold baggage), no transfer passengers, and simple surface access for passengers. As a consequence, a number of LCCs such as Ryanair and easyJet have expressed a preference for operating out of LCTs with only basic facilities, including no provision of air-bridges, in order to reduce the cost of airport charges (Graham, 2006).

A drive by LCCs towards a reduction in airport charges was the main factor which led to the establishment of LCTs for Air Asia operations. These have enabled Air Asia to achieve a critical 25-minute turnaround time for narrow-bodied aircraft and led to an improvement in on-time performance. For example, a reduction in Passenger Service Charges (PSC) has been negotiated between Air Asia, the Ministry of Transportation (Malaysia) and Malaysia Airports Holding Berhad (MAHB) at airports served by Air Asia in Malaysia.

Interestingly, as stated by Dato' Tony Fernandez, the motive for the establishment of LCTs, as seen from the Air Asia perspective, was linked to the following three principles[60]:

1. The terminal should be built with basic facilities with an emphasis on a reduction in capital investment and discounted airport charges (primarily, PSCs).
2. The terminal design should not consider the use of air-bridges as a means of passenger access to and from the aircraft, in order to reduce capital investment and eliminate air-bridge charges.
3. The charging structure for aeronautical charges, such as PSCs, landing charges and government taxes, should be revised. Table 3.4 shows a comparison between PSCs and landing charges at Kuala Lumpur International Airport (KLIA), Malaysia, for the main terminal and the newly constructed LCT at the same airport.

Table 3.4 Passenger service (PSC) and landing charges at KLIA[61]

Charges		Main Terminal (RM)[62]	LCT (RM)
PSCs	International flights[63]	45	15
	Domestic flights	30	7
Landing charges[64]	< 5000kg	RM 3 each 500kg or part thereof	
	> 5000kg but not > 45000 kg	RM30 + RM4 each 500kg or part thereof >5000kg	
	> 45000kg but not > 90000kg	RM350 + RM4.70 each 5000kg or part thereof > 45000kg	
	> 900000kg but not > 135000kg	RM773 + RM5.30 each 500kg or part thereof > 90000kg	

Table 3.4 shows that the structure of aeronautical charges for the LCT has been reduced to about 25-33% compared with those for the main terminal. International PSCs have been discounted from RM45 to RM15. The PSC for domestic passengers has been discounted from RM30 to only RM7. As mentioned previously, Fernandez stated that the main interest of Air Asia in LCT development was to have a reduction of airport charges in addition to a LCT being specifically designed and available for LCC operations.

60 Malaysia Airlines and Air Asia Agree to Work Together, New Strait Times, Malaysia.
61 Malaysia Airport Holding Berhad (MAHB) User Charges.
62 Note: USD 1= RM3.18 (08/05/08); RM= Ringgit Malaysia.
63 Airport charges exemptions includes passengers using an International flight (transiting between fights with less than 12 hours between flights), and infants on international and domestic flights. The charges do not apply to domestic transit passengers.
64 Based on aircraft weight (Maximum Take-off Weight). The landing charges are same for both main terminals and LCT.

Fernandez also stated that the capacity of the KLIA LCT should be able to deal with an increasing number of terminal passengers as a result of the rapid growth in Air Asia's traffic. Whilst the forecast is for passenger throughput to be increased, there is a need to consider the balance of terminal capacity and airport charges. Thus, Air Asia has sought to negotiate with Malaysia Airports Holding Berhad (the airport owner) to reduce the level of airport charges taking into account the additional volume of users through the passenger terminal at KLIA LCT.

Questions may be raised about the feasibility of balancing the airport cost structure, with the provision of fewer terminal facilities as well as changing the structure of airport charges. Aeronautical charges have a significant influence on total airline costs but at many airports, aeronautical charges now represent only 40% of total revenue. Thus, while the establishment of LCTs is perhaps advantageous in terms of reducing the aeronautical revenue, it ideally has to be matched by a corresponding increase in non-aeronautical revenues. In time, this might require additional capital investment rather than an anticipated decrease. This is an issue which should be resolved to ensure that revised airport charges will be adequate when considered as part of the revenue stream for the airport. Therefore, this factor establishes a link between revised aeronautical charges (passenger service, parking and landing) and capital investment in LCTs.

Table 3.5 Average revenue and cost structure at European airports, 1998-2001 (Graham, 2003)

	1998	1999	2000	2001
Revenue Shares (%)				
Aeronautical	54.1	55.9	56.6	55.6
Non-aeronautical	45.9	48.0	43.4	44.4
Total	100	100	100	100
Cost Shares (%)				
Labour	36.6	34.5	34.1	32.9
Depreciation	23.4	21.9	23.8	24.2
Other	40.0	43.6	42.1	42.9
Total	100.0	100.0	100.0	100.0

Table 3.5 shows that aeronautical revenues contribute to more than 50% of total airport revenues. In 2001, aeronautical revenues accounted for 55.6% of the total revenues within Europe. Noting London Heathrow as an example, higher aeronautical charges were imposed due to reduce congestion at the airport during peak periods. However, the pressure of airlines and regulatory bodies to keep airport charge increases to a minimum subsequently led to increased effort to generate more commercial revenues. Note that labour and depreciation costs are relatively high, as labour costs account for an average 33% of total costs with depreciation representing a further 24% in year 2001. Although the data shown in Table 3.5 is for 2002 (and before) the relative proportion of aeronautical / non-aeronautical revenues are unlikely to have changed on a global basis although individual airports will have their own characteristics in terms of revenue generation. This can be demonstrated by the data shown in Table 3.6.

Table 3.6 shows the average values of revenue and cost structures at a selection of European airports. This shows the difference between cost and revenue structures reflect policy and strategies on aeronautical and non-aeronautical charges and the individual aims of the airport operator. Note that Frankfurt, Milan and Amsterdam in 2001 were heavily involved in ground handling. Glasgow, Birmingham and Heathrow were highly dependent on non-aeronautical revenues instead of regulated commercial activities.

Table 3.6 Revenue and cost structures at a selection of European airports, 2001 (Graham, 2003)

Airport	Revenue Shares			Cost Shares			
	Aero	Non-aero	Total	Labour	Depreciation	Other	Total
Amsterdam	47	53	100	23	21	56	100
Basel- Mulhouse	45	55	100	22	38	40	100
Birmingham	64	36	100	33	21	46	100
Brussels	62	38	100	24	21	55	100
Copenhagen	56	44	100	38	29	33	100
Dusseldorf	67	33	100	41	21	38	100
Frankfurt	70	30	100	49	15	36	100
Geneva	48	52	100	38	22	40	100
Glasgow	62	38	100	35	18	47	100
Milan	72	28	100	55	11	34	100
London Gatwick	41	59	100	27	21	52	100
London Heathrow	40	60	100	22	25	53	100
Manchester	56	44	100	24	22	54	100
Marseille	44	56	100	26	29	45	100
Paris	44	56	100	33	22	45	100
Rome	62	38	100	39	22	39	100
Oslo	51	49	100	21	40	39	100
Vienna	75	25	100	57	17	36	100
Zurich	52	48	100	24	34	42	100

3.4.2 The need for basic terminal facilities

The LCT design concept is based on a reduction in costs as well as an emphasis on terminal operational efficiency. The concept also focuses on space reduction and terminal size, the basic provision of terminal services and an appropriate level of service to cater for the requirements of airlines and passengers. The provision of basic terminal facilities depends on the type of airport operations, aircraft mix and the volume of passenger traffic. The terminal design also needs to take into account airside / landside (terminal) links, walking distances, the check-in process, aeronautical and non-aeronautical services, administration space and support services (Kadza and Caves, 2000). As stated by Odoni and De Neufville (1992), the terminal design should include the following facilities:

1. Processing facilities (ticket counters, check-in counters, security controls, passport controls, baggage carousels, customs counters, etc.),
2. Holding areas (lobbies, gate lounges, etc.),
3. Passageways (corridors, escalators, moving sidewalks, etc.)

The basic terminal facilities are currently more adaptable to small airport terminal models which require fewer facilities in the LCT design. Service standards will greatly influence terminal design and capacity, as well as costs. This may lead to efforts to balance economic resources and LCT terminal efficiency. In fact, service standards have been divided into two groups: qualitative and quantitative factors. Qualitative factors are basically subjective, descriptive, difficult to quantify and highly susceptible to external influences. Quantitative factors are the ones leading to enumeration and statistical analysis, tangible and easily identifiable in the terminal environment (Mumayiz, 1990). Table 3.7 gives a detailed description of the qualitative and quantitative factors which may influence terminal design.

3.4.3 Influence of culture

The cultural system refers to one of the major components of the macro environment which determines a set of beliefs, values, expectations and norms based on personal experiences towards particular issues. Culture is the combination of values, beliefs and attitudes possessed by a national group or subgroup (Jober, 2004). Lifestyle is also included in culture and represents living patterns as expressed in terms of a person's activities, interests and opinions.

Culture has always been part of society and most of the time it is unconsciously accepted into it. The basic understanding of culture can be defined by the relationship between each individual towards some object, other people, institutions, society-at-large, nature and the cosmos (an orderly or harmonious system). More interestingly, culture is often divided into core and secondary cultural values (Kotler, 1980). Core cultural values normally have a high degree of persistence, which means that in the airport context most of the airport passengers believe in a high level of terminal facility efficiency and a good level of service standards as part of their airport terminal experience. In the aviation environment, the core beliefs and values are passed from one person to another by the majority of airline passengers.

Secondary beliefs and values are susceptible to change by new environmental or social forces. Secondary beliefs always consider that LCTs will introduce lower service standards and a lack of provision of adequate terminal facilities when space restrictions and cost limitations are taken into account. The influence of culture which is represented by passengers' lifestyle can make a better understanding of the core and secondary values of airline and passenger expectations so as to be included into the terminal design. Therefore, it is important for airport planners to design a 'custom made terminal' which, in developing a green field site, should also concentrate on reducing the significant costs of terminal construction and operation.

Table 3.7 Summary of qualitative and quantitative factors associated with the design of LCT facilities (Mumayiz, 1990)

	Qualitative Factors		**Quantitative Factors**	
1.	Environmental	Exposure, weather, terminal, internal environment, cleanliness and the sense of safety.	Personal factors	Passenger and visitors, purpose and origin/destination of trip, convenience, personality and personal behaviour.
2.	Psychological	Reaction to treatment by airport personal. Expectation of service, Reaction to overall terminal environment. Attitudes towards airport conditions, comfort, safety and privacy.	Temporal (time-related)	Processing time, delay time in waiting for service, total time spent in a facility, reporting time before flight departure, delays in flight departure and arrivals.
3.	Aesthetic	Lighting arrangement, signing, identification of the system facilities, seating provisions, catering for disabled and infants.	Spatial (Distance and area-related)	Walking distance, pedestrian density and congestion, size and dimensions of functional areas with relative location of facilities. Level of changes.
4.			Econometric	Airline ticket costs, concession pricing structure, airline and airport pricing/charging policies, frequency of air travel, frequency of flights per route, number of airlines using airport.
5.			Statistical	Frequency of air travel, frequency of flights/route and number of airlines using airport.

More interestingly, the changing patterns of passenger behaviour also encourage commercial efforts to increase airport revenues. Therefore, airport planners need to pay attention to the possible impact of culture on the development of commercial activities. For example, the retail and catering facilities at the new Brussels National Airport Low Cost Pier have been tailored to meet the needs of low-fare passengers. Here, with meals usually an optional extra on low-cost flights, the airport introduced a wide range of ‘grab-and-go’ style products to meet passenger demands. Often, the pressure for innovation comes from the passengers, who are becoming more experienced travellers as well as more demanding airport customers (Graham, 2006). Therefore, the need for commercial areas as part of LCT facilities is necessary.

The continued growth in leisure travel using charter or scheduled (low cost or network) airlines has resulted in the market becoming blurred. This is caused by the mix and clash of cultural values from the passenger viewpoints towards LCT terminal facilities.

Leisure passengers are normally interested in low air fares, whilst they also ready to trade-off between the availability of LCT facilities and air-fare. This viewpoint was supported by Greig (2005) in that leisure and some business travellers are prepared to travel at less busy times and observe other conditions in exchange for a lower air fare. The airlines' influence has also been noted in LCT development. For instance, the development of Sydney airport has included $20 million of retail redevelopment, and the design of Terminal 2 has been as suggested by Jetstar and Virgin Blue (SCAP, 2004).

3.5 Cost and Revenue Structures

According to Graham (2003), the factors influencing the cost and revenue structures of an airport are dependent on the volume and the nature of the traffic, physical service standards, accounting policies, ownership patterns, airport location, geographical situation and environmental influences. The cost (capital investment, operational, airport charges) and revenue (airport revenue) structures and interests (i.e. mutual understanding between provision of terminal facilities) between airline and airport should be carefully negotiated to avoid conflicts of both parties in the terminal design (i.e. the LCCs interest to have less turnaround time as airport operators could, in theory, increase the airport charges for parking). However, airline and passengers needs and preferences should be taken into consideration while at the same time the airport is faced with the burden of coping with passenger demands.

In terms of operational charges, the element of cost structure is significant in varying airline and airport costs but the cost does not directly relate to the passengers. Another complication is that LCCs have the advantage of joint use of shared facilities with network carriers while, at the same time, the airport can reduce the operational cost through basic terminal facilities that have been installed. Therefore, the airports could reduce the capital investment as the LCT design is implemented. As a result, it may be beneficial if the airport charges can be reduced after consideration of the reduction on investment costs during terminal construction. If the airport charges are reduced (passenger service charges), the airport users (passengers) may have an advantage on the discounted air fares while having fewer facilities in the LCT. Cost and revenue structures will be discussed in more detail in the following sections.

3.5.1 Operational costs

LCCs' operational efficiency is an advantage in the choice of an airline business model as point-to-point services provide the strategic advantages and the operational effectiveness for that model (Gillen and Lall, 2004). LCT operational costs are expected to be reduced compared with normal terminal operational costs due to the introduction of basic terminal facilities in the LCT. Operational costs include maintenance, administration, overheads, heating, lighting and human resources. Taking into consideration regulatory requirements, which are of primary importance to airport safety, the airport should also take into account the cost of safety and security which may be difficult to reduce in terms of LCT operational costs. The inclusion of x-ray machines or security manpower is important. However, recent examples of LCTs' size indicate a trend towards being smaller than normal terminal buildings. The space for safety facilities (channels and security staff) could be reduced but the function is still mandatory for airport operations. Therefore, a reduction in staff and security channels due to space limitations could also reduce the level of service.

A better initiative for LCT design would be to use advanced technologies in order to reduce operational costs. For example, the introduction of self service check-in kiosks, which may be beneficial in terms of reducing manning (labour) costs, although requiring an initial capital investment cost. Table 3.8 shows typical data for operating costs for Vienna International Airport.

Table 3.8 Overview of operating costs of Vienna International Airport[65]

Operating Costs	£ (million)
Consumables and Services	16.1
Personnel	103.1
Depreciation and amortisation	33.5
Other operating expenses	34.6
Total	187.3

Personnel are seen to be responsible for the largest proportion of airport terminal operation expenditure, and have an influence on efficiency and service standards at airports. The allocation of staff is dependent on the number of terminal facilities provided inside the terminal building.

Table 3.8 also shows that the depreciation and amortisation (interest rate, asset depreciation) contributes about € 33.5 million to the total operational costs of the airport. The debate on the scope for reduction of operational charges by introduction of the LCT concept is still ongoing. For example, this can also lead to minimisation of the operational processes as well as labour costs, and the reduction in operational cost with the LCT concept is expected to be 30% or 40% of traditional airport terminal cost (O' Connell, 2007). The LCT dimensions (size) can also be reduced in order to reduce the operational costs. Therefore, about 30% of airport operational costs could be reduced (administration and manpower costs) after reducing the number of LCT staff (MAHB, 2006).

3.5.2 Capital investment

Funding for LCTs has been obtained from local, government and private sources. Other funding can be obtained from sources such as revenue bonds, government subsidy and passenger facility charges (Gilroy, 2003). Using KLIA, Malaysia, as an example of airport development funding, most of the capital investment has been funded by the government through Malaysia Airport Holding Berhad (MAHB) which is part of the

65 Results for the first six months of 2007, Flughafen Wien Group, Vienna International Airport.

Government Link Company (GLC)[66]. Also, construction of the LCT at Singapore Airport was funded by the Civil Aviation Authority of Singapore (CAAS).

The construction of LCTs has had a major impact on airport cost structures. Because of the basic LCT terminal design concept, this has been advantageous in terms of reducing capital investment for both the terminal and equipment within. Figure 3.2 shows that terminal projects account for 31.3% of the total development needs of airport, capacity projects of 21.2%, and followed by access projects of 13.8%. Figure 3.2 shows that increases in development costs mainly come from terminal, capacity, access and reconstruction that contribute to 79.3% of the total of airport development costs. Typically, capital investment for construction accounts for about 50% of the total airport cost.

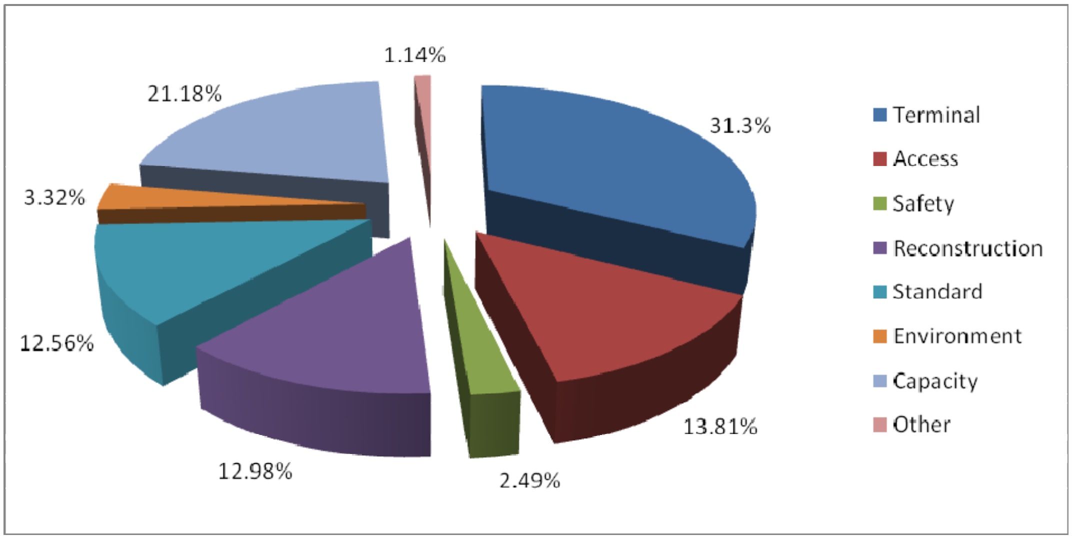

Figure 3.2 Percentages of airport development cost[67]

The design of a single level terminal will result in reducing investment costs. From the cost saving for terminal equipment, the elimination of air-bridges could reduce investment costs by 20%. However, as the airport is losing some aeronautical revenue from the air-bridges, the airport authorities should, as stated by IATA (2004), consider maintaining the total level of revenue. At the same time, LCT construction can reduce the amount of capital investment required. For example, the construction of KLIA LCT, using a basic terminal design concept, resulted in a construction cost of £18 million. LCT development has therefore led to cost savings while at the same time producing sufficient space for terminal operations. Warsaw Airport is an extreme example where a basic terminal concept has been used in order to reduce investment cost. In this case, this was achieved by converting a supermarket into a terminal building for LCCs.

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66 GLC has been introduced by the Malaysian Government which is concerned with the privatisation of government agencies to fully utilise the available resources and also increase the level of efficiency of government services.

67 Airport Capital Development Costs 2009-2013, ACI North America, February 2009.

3.5.3 Airline ticketing

Airlines offer different qualities of service, for example, business and economy class, flexibilities in booking, and variable prices designed to attract different types of passengers (Reisiger, 2005). Taking into consideration potential passengers using LCCs, air fares are normally quoted as one-way to allow the customer to have flexibility in selecting the cheapest flight(s). As the LCCs are offering fares that are 50% to 75% below the normal scheduled fares, they must obviously maintain a sustainable operating unit cost advantage compared to network carriers (Doganis, 2001). The level of the cheapest fare may be set on the basis of supply and demand. Using yield management to increase prices as seats as sold, the LCCs benefit in terms of probability of take-up while still offering low prices compared with network carriers. However, as stated by O'Connell and Williams (2005), the network airlines have in turn reduced their unit costs to such a level that they now often challenge their low fares rivals.

Taking into consideration advanced technologies used by LCCs, such as online booking and check-in, these will be beneficial in terms of operational cost savings for airlines by the introduction of ticketless check-in processes. According to Venegas (2005), 55% of the LCC carriers use the self-service kiosk system and this has encouraged the introduction by airports of self-service (CUSS) kiosks to simplify the check-in process and to reduce space requirements. The use of the internet to purchase tickets has also been encouraged by airlines, since it is an effective and fast medium, which also reduces airline operation costs. For example, Northwest Airlines has installed e-ticketing facilities for 99.9% of its interline ticketing contracts in the USA, and on 99.2% of its international agreements, including all of its SkyTeam partners[68].

3.5.4 Airport Aeronautical Charges[69]

With regard to Paragraph 22(i) of Policies on Charges (IATA, 2004), it is stated that "the cost to be shared is the full cost of providing the airport and its essential ancillary service, that includes appropriate amounts for cost of capital and depreciation of assets, as well as, the cost of maintenance and operation, and management and administration expenses but still allowing for aeronautical revenues plus contribution from non-aeronautical revenue, accruing from the operation of the airport to its operators". Aeronautical charges are defined as charges for services or facilities related to the processing of aircraft and their passengers in connection with facilitating travel (IATA, 2004). The variability of airport charges has an impact on LCCs operating costs. Aeronautical charges may include landing, passenger charge, security, terminal

68 http://news.cheapflights.com/airlines/northwest_airlines.

69 Charges are fees paid by airlines for services and facilities provided by airports and Air Navigation Service Providers such as use of the runway (landing charges), use of the airport infrastructure (parking and boarding bridge charges, use of the terminal building (passenger charges), airport security (security charges) etc. http://www.iata.org/whatwedo/airport-ans/charges/airport-atc-charges.htm.

navigation, air-bridges, parking, ground handling, fuel and government taxes (Graham, 2003, IATA, 2004). On average, the charges may be between 20% and 25% of 'airport-related' airline operational costs. Currently, charging policies for terminal facilities may be imposed differently for LCCs and network scheduled airlines.

For example, at some airports (Budget Terminal, Singapore), current charging practices allow LCCs to pay less for airport charges while using the same runway and taxiway as the network carriers. In another example, the departure tax for international passengers at KLIA LCT is lower than that at the main terminal at the same airport which led to IATA demanding assurances from Malaysia Airports Holdings that both passengers and airlines using the main terminals should be charged at the same levels so that there is no subsidisation of those using the KLIA LCT.

For example, the current charging policy would be against the charging standard set by European Union competition rules[70] in order to follow the principle of non-discrimination (Venegas, 2005). Furthermore, from the regulatory framework, identified charges should not exceed costs, be transparent, be imposed without discrimination between users, be based on ability to pay, and pay for infrastructure and services that they use. Additionally, airport authorities should consult with the airlines and communicate the charges to users in order to ensure non discrimination in charging, no over-charging and no anticompetitive practices thereby, which are ensured by transparency and presentation of financial data (IATA, 2005).

However, the drive to increase airport commercial revenues, and other challenges faced by airports, are increasing pressure on facilities, environmental concerns and rising security costs (Graham, 2003). Airport commercial charges (revenue, costs) are defined as charges related to the ancillary commercial services, facilities and amenities available at an airport (IATA, 2004). Concession fees from commercial activities, revenues from car parking and car rentals and rentals for airport land and space in building (including advertising space) and equipment are related to the LCT design and development. Since LCT design is intended to reduce the commercial areas as well as other terminal facilities, because of space restrictions, the airport is faced with the burden of looking for possible alternative revenues in order to increase airport revenues while at the same time introducing differential charges for LCCs that use the same facilities as network carriers. As a result, airport planners have to take into consideration both negotiable and non-negotiable charges for the LCCs and other carriers.

Table 3.9 shows the scope for variable (negotiable) and fixed (non-negotiable) aeronautical charges for passenger services, ground handling, landing / parking fees and fuel prices. It also shows the limited scope for the range of aeronautical charges that can be negotiated between LCCs and airports. Therefore, this forces the airports to adapt new methods or tools to stimulate a significant increase in traffic, as well as encouraging new carriers. As stated by Venegas (2005), airport incentives may include reduced landing fees for new routes, reduced overnight parking fees for aircraft or

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70 Articles 81 and 82 of the European Community Treaty.

agreement on a reduction of passenger service charges as a trade-off against passenger traffic generated. The debate on negotiated aeronautical charges has been joined by Air Asia[71], being concerned with the terminals' coping with increasing passenger volumes as well as the rapid growth of LCCs. As a result, there is perhaps a need to balance the aeronautical charging structure against an increase in the number of terminal passengers.

Table 3.9 Variable and Fixed Airport Charges (Author)

Charges, fees and taxes[72]	Variable (Negotiable)	Fixed (Non-negotiable)
Aeronautical revenue		
Airport security charges	No	Yes
Passenger service facility charges	Yes	No
Government taxes	No	Yes
Landing and parking fees	Yes[73]	Yes
Air navigation fees	No	Yes
Non - Aeronautical revenue		
Rentals	Yes	No
Car parking	Yes	No

The emergence of LCCs has put significant pressure on airports seeking to maintain the current level of airport charges (landing and parking fees) as the LCCs have demanded a reduction in airport charges for using LCTs. For example, LCCs often refuse to serve airports that were not willing to meet their demands and this has also led to operational bases and existing services being moved to other airports. As pointed out by Gillen and Lall (2003), Ryanair discontinuing Rimini Airport operations was a case in point. In another example, it should be noted that Ryanair will no longer use Valencia Airport as an operational base (from November 2008), after the airline was dissatisfied about the decision of Comunitat Valenciana regional government's decision on USD15 million grant offered for marketing support to local carrier, Air Nostrum. The decision of Ryanair has led to the loss of 70 weekly flights and (potentially) 750,000 passengers through Valencia Airport[74].

However, at most airports around the world, decisions on the level of aeronautical charges structures are subject to government agreement[75]. Considering the fact that one

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71 Low Cost Carrier (LCC) which is based at Malaysia.

72 Charges mean those charges levied in respect of landing, lighting, parking and passenger processing (i.e. "aeronautical charges") and any other charges, rates and fees over which the airport has a monopolistic control. Conference on the Economics of Airports and Air Navigation Services; ICAO, Montreal, 2000.

73 Many airports offer discounts on landing fees for starting a new route and also new airlines (Venegas, 2005)

74 Ryanair confirms closure of Valencia base; http://news.cheapflights.co.uk/flights/ryanair/

75 Because of airport ownership.

of the aims of (local) government is to promote the region by attracting visitors and increasing local socio-economic development, a positive decision on airport charging incentives offers potential benefits to the LCCs and, in turn, this should stimulate LCC traffic at that airport.

A recent case of France's Civil Aviation Authority's (DGAC) making use of French law in setting the level of PSCs led to considerable arguments between airports and airlines. DGAC introduced different levels of PSCs in separate terminals (Terminal 1, 2 and 3 of Charles de Gaulle Airport)[76] (IATA, 2007). At €1.22 ($1.78) per passenger, the passenger service charge at Terminal 3 was considerably lower than that at the main terminal where charges vary according to domestic passengers (€2.82), European Union passengers (€6.12) and non-EU passengers (€6.66). However, the decision on PSC was objected to by ICAO, because of the requirement that the airport should be fair in dealing with cross-subsidisation between the 'normal' terminal and the LCT, although there may be different service levels in each terminal.

With different levels of charging structure, this effective subsidisation of airport charges would be beneficial only to the LCCs and not to incumbent carriers (Barbot, 2006). In general, taking the PSC as one of the elements of airport charges, the LCT PSCs have in some cases been reduced to about half of the 'normal' PSC. There are also variable PSCs linked to cross-border travel irrespective of whether there is a LCT or not. For example, Table 3.10 shows the PSC charging structure at London Luton Airport. It should be noted that Luton charges apply at all time for domestic travellers which is £5.86, for all routes, but the PSC is increased for international passengers to £7.83. Luton Airport imposes similar charges for both the summer and winter seasons.

Table 3.10 PSCs at London Luton Airport[77]

PSC Per departing passenger	Amount at all times (£)
Domestic	5.86
International	7.83

Most LCT terminal designs are now based on the non-provision of air-bridges, walking across the apron being used to provide direct access to the aircraft for purposes of loading and unloading passengers. In this case, the objective of apron design is to develop a layout which meets all safety-related requirements, while maximising efficiency of use for aircraft moving in and out of the apron area (de Neufville and Odoni, 2003).

Table 3.11 below shows an example of the price difference between using the air-bridge and contact stand, at Nice, France. The Table clearly shows that the air-bridges and

76 Budget buildings: the rise of low cost terminals. Airline Business, 2007.
77 London Luton Airport website.

contact stand charges contribute to large proportion of airline turnaround cost, and that the air-bridge charges are significantly higher than for use of contact stands.

Another example of apron charges, shown in Figure 3.12, is for London City Airport (LCY) where different levels of charges are linked to the seating capacity of aircraft. For example, Table 3.12 shows that the apron charges are set at £48.00 for aircraft with 51-69 seats[78].

Table 3.11 Comparison between Air-bridges and Contact Stand Charges[79] (Updated by Author)

Boarding charge	Nice, France € (per aircraft movement)
Air bridges	37.32
Contact stands	
A/C up to 13 tonnes	14.93
A/C over 13 tonnes	26.12

Table 3.12 Structure of apron service charges at London City (LCY)[80] (Updated by author)

Apron Service	Charges (£)
Arriving & departing passengers	1.33 per person
Minimum charge	
Up to and including 50 seats	43.00 per aircraft movement
51-69 seats	48.00 per aircraft movement
70+ seats	53.00 per aircraft movement
Freight Load Supplement	0.04 per kg loaded/off-loaded
Use of forklift	31.00 per hour or part

The charging policy for using terminal facilities by LCCs contributes to the total airport revenue. Many airports are likely to be willing to set charges at a lower level compared with 'normal' terminals, if the LCCs agreed to use only basic terminal facilities that have been provided. In addition, IATA indicated that the minimum cost principle to be imposed on airlines should consider the use of basic terminal facilities, exclusively for LCCs. The basic principles addressed by IATA[81] are as follows (IATA, 2004):

1. Charging policies and charges must be non-discriminatory and bear a direct relationship to the level(s) of service offered and the relevant costs;
2. Be fully transparent; and

78 There are no air-bridges at LCY.
79 Nice Airport website.
80 London City Airport website.
81 Effective from July 2004.

3. Set in consultation with the airline industry.

However, the security charges for LCTs are similar to those for 'normal' terminals. Security charges must be the same for all passengers regardless of terminal used and level of service. Table 3.13 shows a comparison of security charges imposed for airlines serving the primary airports [London Heathrow (LHR), Manchester Airport (MAN) and secondary airports [London City (LCY), London Luton (LTN)]. The differences in security charges are also dependent on the airport location as well as manpower allocation at the airport. For example, the charge at LCY is higher (£8.40 per passenger) compared to LTN (about £0.58 per passenger).

Table 3.13 Security charges at UK airports (Updated by Author)

Airport Type	Airport/Charges	
Primary	London Heathrow (LHR)	Manchester Airport (MAN)
	Included in PSC	£2.88 / passenger
Secondary Airport	London Luton (LTN)	London City (LCY)
	£0.58 / passenger	£8.40 / passenger

3.5.5 Airport commercial revenues

In LCT design, commercial activities offer the flexibility to increase total airport revenues (Venegas, 2005) in addition to those that can be generated from the 'landing and handling' fees. The latter may be limited because of economic regulation by the competition authorities and lobbying of organisations such as IATA (Kadza and Caves., 2000). Therefore, airports seek to increase airport revenues from their commercial activities. These include concessions, rents, direct sales (shop, catering, etc), recharges (for gas, electricity, etc) and other non-aeronautical revenues (consultancy, visitor / development services, property development, etc).

Consequently, the ability of airports to generate commercial revenues from the LCTs has been subject of much debate among airport planners. LCTs have been designed with restricted space for operational and commercial functions in order to minimise capital investment. Most of the recent development of LCT models has concentrated on the availability of the functional space for operational rather than commercial use.

Planning for commercial areas has been influenced by such factors as passenger profile, land availability, cost of construction, terminal space, destination, shopping behaviour, running costs and concession agreements. The commercial areas need passengers to use their facilities, while LCCs require their passengers to be ready for boarding as soon as possible (Venegas, 2005). Most of the commercial activities are dependent on the space availability at the airport and on the passenger volumes (Kadza and Caves, 2000). However, commercial space has been reduced in current LCT designs. The LCT design is only concerned with the efficiency of terminal facilities and tries to ignore the ability of commercial initiatives to generate additional income. Therefore, there are some conflicting issues on the overall terminal size and space requirements to cater for commercial activities.

However, recent LCT designs (KLIA LCT) have taken into account the need to generate additional income contributing towards total airport revenues as well as the availability, size limitation and dimensions of the terminal building. An increase in dimensions will require more land and additional floors and this will increase the cost of construction (Venegas, 2005). The charging structure for lounges and offices has no direct influence on passenger numbers. It could be argued that the cost of lounges and offices is (partly) subsidised by the passengers or airlines hence a reason for not having them in the LCT. Commercial activities often provide the main part of an airport's revenues, for examples, by generating up to 80% of all revenues in 50 major world airports (Oum, Yu et al. 2001). At Singapore Changi Airport, for example, the new LCT terminal has been designed by focusing on its basic functions rather than the commercial interests, firstly, by achieving the aim of minimising turnaround time as well as meeting airline needs.

The design of food and beverage (F&B) facilities at LCTs should also take into account passenger lifestyles (business travellers and holiday makers). In order to match market preferences, KLIA LCT is currently offering simple and convenient services in the F&B outlets. Thus, the establishment of fast food and kiosks is advised in order to meet passenger needs. As an example, the footprint of the fast food restaurant is about $375m^2$ which is smaller when compared with that in the main KLIA terminal building. Tables 3.14 and 3.15 show the relative proportions of commercial areas in KLIA LCT.

Table 3.14 Retail outlets KLIA LCT[82]

BUSINESS	LOCATION	FLOOR AREA (m^2)
LCCT Emporium	Public Concourse	125.0
Airport Emporium	Domestic Departure	125.0
Pharmacy	Domestic Departure	71.25
Carlo Rino	Domestic Departure	62.5
Eraman Duty Free	International Departure	141.3
Pusrawi Pharmacy	International Departure	67.44
Eraman Duty Free	International Arrival	108.2
Total		**700.69**

Unusually, the basic terminal facilities concept for the commercial area of KLIA LCT does not follow other LCT models. As a comparison, the established concept of most LCT models in European Countries has considered the importance of processing activities which will account for more functional space rather than commercial. At Warsaw Airport, for example, the introduction of self-service dispensing machines are used for retail and F&B activities was a means of reducing the area of commercial space in the LCT design.

The restriction of space encourages airport commercial planners to make more efficient use of available free space (i.e. corners of the building and wasted space in the public

[82] KLIA Commercial Department Internal Presentation, 2006

concourse) by to being converted for commercial use. In the recent development of LCTs, the efforts of KLIA LCT to create additional revenue through exploitation of free spaces seems an interesting idea. Table 3.16 shows the efforts of the commercial department at KLIA to generate extra income and reduce wasted space in the LCT.

Table 3.15 F & B operations KLIA LCT[83]

BUSINESS	LOCATION	FLOOR AREA (m^2)
McDonald's	Public Concourse	375
Asian Kitchen	Public Concourse	160
Coffee Bean & Tea Leaf	Domestic Arrival	120
Café Espresso	International Departure	40.0
Buy & Fly	Domestic Departure	71.25
Total		**766.25**

Table 3.16 Commercial Initiatives KLIA LCT[84]

Observation	Recommendation
Seating in public concourse	Realign seating arrangement and allocate prime retail or promotional space
Wasted space in public concourse	Open up blocked space to accommodate seats and other activities
Unused check-in counters in public concourse	Convert counters into commercial space
Dead areas in public concourse	Convert dead areas into commercial space
Passageway to toilets too wide	Convert into mini outlet(s)
Pillar 'face' unused in public concourse or domestic/ international departures	Maximise use of pillars for advertising activities

Table 3.16 shows the efforts undertaken by the Commercial Department of KLIA to convert wasted space to commercial areas. The conversion of the wide passageway to the toilets with mini outlets has successfully generated additional income for airport. However, several options for F&B outlets are also worth including in the terminal design. To achieve the aim of KLIA LCT to increase the airport revenue by about 50% in 2008, the airport makes use of billboards, trolleys and toilet walls for advertising to generate extra revenue for the airport.

Dedicated space to encourage the airlines or third parties to use for their promotional activities can also increase LCT commercial revenue through renting activities. Counter services could be rented by tourism agencies, and hotel and travel / tours agencies to provide service offers to LCT passengers. Other commercial entities (vending machines for snacks and drinks, postal and photo services) can also be introduced into the terminal design in order to generate extra commercial revenues through renting activities.

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83 KLIA Commercial Department Internal Presentation, 2006
84 KLIA Commercial Department Internal Presentation, 2006

3.6 Summary

The LCC market, having started in the USA and then moving to Europe, has now become a worldwide phenomenon. Growth in the LCC market has not only made air fares more competitive but has also put pressures on airports to introduce a more competitive charging structure for the airlines.

The LCC market is no longer concentrated almost solely on secondary airports but operators are now moving into major international and gateway airports in recognition that significant LCC passenger markets exist within the hinterland of these airports.

There are continuing pressures on reducing airport usage costs to the airlines. The arguments for this follow the line that reduced airport charges will lead to reduced air fares. This is turn will generate additional passenger growth with consequent benefits in terms of direct or indirect employment, inbound tourism and stimulation of local economies. These arguments should be understood in the overall context of airline and airport charges, costs and revenues.

Airline operating costs includes direct and indirect operating costs. Direct operating costs includes handling, insurances, lease charges, flight crew, maintenance, passenger service charges, fuel and oil, airport fees and navigation fees. Indirect costs include administration, marketing, staff, depreciation, and interest. Airport charges include aeronautical and non-aeronautical charges. Aeronautical charges are levied in respect of landing, lighting, parking, passenger service charges, security, aircraft noise and en route air navigation. In terms of non-aeronautical revenues these may include office space, beverage, maintenance facilities etc.

Funding for the LCTs has been obtained from airport cash flow, local and national government, and private investment. Other funding has been obtained from sources such as revenue bonds, government subsidies and passenger facility charges. Airport capital investment costs include construction, maintenance, amortisation and depreciation. The development of LCTs could possibly reduce the amount of capital investment by simplifying provision of terminal facilities.

Airport direct and indirect revenues from air carriers and tenants are received for the right to conduct an activity on the airport or use or occupy airport property (check-in desk and offices) as is the revenue from government activities which is any activity conducted by the government on airport property (immigration and custom offices). It is therefore worth examining the selected cost and revenue structures (airport charges) and their impact on LCT design and development.

Also, it is worthwhile to examine the trade-off between airport charges, air fares, traffic growth, revenues, social and economic benefits, capital investment and basic terminal facilities for LCT design. Chapter 4 will discuss the design of recent LCT models after considering implementation of the basic concept LCT design.

CHAPTER 4

4 RECENT LOW COST TERMINAL DESIGNS AND DEVELOPMENTS

4.1 Introduction

The essence of this Chapter is to discuss recent LCT models established throughout the world. Compared with normal terminals, the design is simplified with basic concepts and the provision of limited facilities. Other issues which may relate to LCT design have been discussed in Chapters 2 and 3. In this Chapter, recent development of LCT models will be further discussed in order to have a better understanding of the basic terminal facilities which led to the justification of the research elements (Chapter 5). The Chapter is divided into three parts. Section 4.2 briefly discusses the growth of air transport worldwide which has had a positive effect on the establishment of LCTs. Section 4.3 gives a brief overview on the LCTs models that have been recently developed. Finally, Sections 4.4 to 4.6 analyse the different LCT models to be found in the European, Asian and USA regions, all of which have been driven by the desire for a simplified terminal building design.

4.2 Growth of passenger traffic

The continuing increase in passenger traffic has encouraged aircraft manufacturers to produce a 10-year traffic forecast to predict the levels of aircraft orders. One of the manufacturers, Airbus, has produced an exclusive report, *Airbus Global Forecast 2007*, which aims to forecast market demands. The report stated that, in the next 20 years, an average growth of 3.6% in North America is predicted as an example of the slowing growth of the airlines, having posted a 5.5% passenger traffic growth for 2007, slowing slightly from 5.7% in 2006.

Elsewhere in the Airbus forecast[85], air traffic growth has been predicted at about 6.8% and 6.1% in the Middle East and Asia Pacific regions, respectively, where the Asia Pacific region has had the advantage of increasing airport capacity, the latter as a result of liberalisation and traffic growth in Asia. Taking the Chinese air transport industry as an example, it should be noted that about 3.28 billion revenue tonnage kilometres (RTK) have been achieved in 2007. At the same time, the volume of passenger traffic has been predicted as 58 million in 2009[86]. Also, the entrance of LCCs contributes to the growth of air transport in the region. An expansion of new routes by Air Asia X, one

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85 By contrast, the Rolls Royce 2008 Forecast indicated major changes in the air traffic market for different regions over 10 years, Latin America (5%), Middle East and Africa (8%), North America (24%), Europe (24%) and Asia Pacific (36%) and the Asia traffic was expected to overtake North America in 2027.

86 Airport reports slow passenger growth, November 2008, http://www.china.org.cn.

of the subsidiaries of Air Asia in Malaysia has stimulated new long haul-low cost routes between Kuala Lumpur, Australia and China.

Regions	2007-2016 (%)	2017-2026 (%)	20- Year growth (%)
North America	3.6	3.5	3.5
Central America	6.7	4.8	5.7
Europe	4.8	4.3	4.5
Middle East	8.1	5.5	6.8
Africa	6.1	4.5	5.3
Asia	7.2	5.0	6.1

Figure 4.1 Passenger Traffic Growth Forecast (Source: Airbus Co.)

European countries have seen the use of secondary airports for LCC operations as previously discussed in Chapter 3. Conversion of secondary airport terminals to LCTs has been driven by the prospect of reduced airport costs and increased terminal efficiency. Thus, the effort of airport operators to build LCTs can successfully increase passenger traffic throughput. According to Airbus Global Forecast 2007, air traffic growth in European countries has been predicted to rise by 4.5% per annum over 20 years' time, a slow rate of growth compared with Asian and Middle East countries. It has been noted that the predicted more constrained growth of air travellers in the

European region is due to the maturity of the European market. In addition, highly dependent US economy policies due to instability of oil pricing have contributed to a slower growth of passenger traffic87. However, the emergence of LCCs has been stimulated where airport operators have made a decision to offer facilities that may suit the LCCs' preferences. Geneva International Airport, for example, has converted its original main terminal into a basic facilities terminal due to the 50% increase in traffic generated by the LCCs (easyJet).

In the Middle East region, route development by Emirates, Etihad and Qatar Airways has successfully increased passenger traffic in the region. The establishment of 6th Freedom traffic rights has resulted in long haul traffic88via the Middle East region hubs slightly increasing to about 53% of the total traffic between Europe and Asia Pacific. In the African and Latin America regions, the expected growth of the aviation market has been expected to increase by 5.3% and 5.7% per annum, respectively, over the next 20 years. The steady growth in demand for air transport has been driven by removing bilateral constraints and boosting intra-regional traffic (O'Connell, 2007).

4.3 Development of low cost terminals (LCTs)

The development of LCT models has changed the market since 2000. As a result of the rapid growth of LCCs, pressure has already been put on airports to develop LCTs as well as changing airport practices towards terminal operations. These practices have been dramatically changed to fit into the simplified terminal design concept (Section 2.4.1), and also to cope with LCCs' demands (Section 3.4). A report published by the Centre of Asia Pacific Aviation (CAPA, 2008) stated that they had noted actual and potential low cost airport terminals for 13 European airports, 7 North America and Canadian airports and 10 Asia Pacific airports. The report also shows potential prospects for the introduction of LCTs have been found in Indonesia, New Zealand, India and South Asia, Japan and North Asia, Africa, Latin Africa, Middle East (Gulf States) and Russia.

Taking typical European LCTs (Coventry Airport, UK, Marseille Airport, France, Hahn Airport, Germany) as examples, the establishment of LCTs saw an increase in passenger traffic in 2007 to 0.6 million, 6.9 million and 4.0 million, respectively. Also, it seems that the apparent growth of LCTs in most European Countries is likely to continue after taking into consideration the rapid growth of LCCs in the European market. In another part of the world, the establishment of LCTs is now seen to be concentrating on the Asia Pacific market, although deregulation is slowly changing the outdated bilateral rules, thus allowing carriers to operate independently of any regulatory market (O'Connell, 2007).

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[87] www.atwonline.com/magazine/article.html

[88] 6th freedom refers to the right of airlines to carry passengers between two countries via its own country (O'Connell, 2007).

It was also noted that the US airports have already seen a change in the move by secondary airports towards developing LCTs, including the establishment of Texas Austin Bergstrom, Baltimore, and Washington International Airport. A recent example is Pittsburgh, which has been forced to adopt low cost principles by the withdrawal of major hub carriers. Another example is Austin Bergstrom Airport (Texas), where the development of the LCT successfully attracted LCCs to make use of the airport as a base (Jet Blue Airways) and as an airport serving other LCCs (Southwest Airlines, Frontier Airlines and Viva Aerobus). On the following pages, Tables 4.1 to 4.3 show examples of LCTs in the US, European and Asia Pacific markets.

Table 4.1 A selection of LCTs in the European region (CAPA, 2008, updated by author)

Airport	LCCs Operating	LCC bases	LCT Type
Coventry[89] (West Midlands International) Airport, UK	Thomsonfly, Wizz Air	Thomsonfly	Dedicated facility
Geneva International Airport, Switzerland	easyJet, Virgin Express, Eurowings	easyJet Switzerland	Converted arrival terminal
Marseille Province Airport, France	easyJet, hlx.com (Hapag Lloyd Express), Jet4 you, Ryanair, Eurowings	None	Converted cargo building
Amsterdam Airport Schiphol	Air Berlin, SkyEurope, Bmibaby, Sterling, easyJet, Thomsonfly, Jet2, Transavia, Vueiling	Transavia	New pier
Basel Airport, Switzerland	Air Berlin, easyJet, SkyEurope	easyJet	Shared facilities
Charles de Gaulle Airport, France	Air Berlin, Bmibaby, easyJet, flybe, Vueiling, Germanwings, Jet2, Niki, Thomsonfly	None	Shared facilities
Brussels National Airport [90], Belgium	Wizz Air, Ryanair, Jet4you	None	New pier
Budapest Ferihegy Airport[91]	Germanwings, easyJet Switzerland, WIZZ Air, Eurowings, Clickair, Virgin Express, easyJet	Wizz Air	New dedicated terminal
Warsaw Frederick Chopin Airport, Poland	Centralwings; easyJet; Germanwings; Norwegian; SkyEurope; Wizz Air	Wizz Air, Centralwings	Converted supermarket
Parma Airport, Italy	BeleAir, Ryanair	None	New dedicated terminal
Tempere-Pirkkala Airport, Finland	Blue1, Ryanair	None	New dedicated terminal

89 Thomsonfly and WIZZ have pulled out of Coventry (2009)
90 Ryanair's first European mainland base
91 Refurbishing and opening the LCT which boosted long-term investor interest

Table 4.2 A selection of LCTs in the USA and Canada (CAPA, 2008; updated by author)

Airport	LCCs Operating	LCC bases	LCT Type
Pittsburgh Airport, USA	Jet Blue Airways, Southwest Airlines	None	New dedicated terminal
Chicago Midway Airport, USA	Frontier Airlines	None	Shared facilities
Baltimore-Washington International Airport, USA	Southwest Airlines, VIVA Aerobus	None	Low cost airport facilities
New York J. G. Kennedy Airport, USA	Zoom Airlines	Jet Blue Airways	Shared facilities
Austin Bergstrom Airport, Texas, USA	Jet Blue Airways, Southwest Airlines, Frontier Airlines, VIVA Aerobus	Jet Blue Airways	Converted cargo
Dallas Love Field, USA	Southwest Airlines	Southwest Airlines	Shared facilities
Hamilton, Ontario, Canada[92]	WestJet	None	Shared facilities

4.4 LCT development in European market

To date, in the European market, most LCCs have used secondary airports as operational bases and which generally have the potential advantage of reduced airport charges. As previously discussed in Chapter 3, with the decision to make use of secondary airports with the downgrading of terminal facilities for LCC operation, not all airports offer the same deals to the LCCs, and not all airports have the authority to negotiate (Venegas, 2005). Recent airport models show that most European airports have downgraded terminal facilities to cope with increased LCC traffic and passengers. The emergence of LCCs is expected to boost the current market share and the effect of transforming the air travel market generated by LCCs had seen a 5% increased annual passenger growth since 2000. However, the penetration of the European LCCs unexpectedly grew to around 24% of the total annual passenger market by 2006 (O' Connell, 2007).

The rapid increase in passenger numbers has led some of these airports to plan the extension of their facilities to meet future demands (Venegas, 2005). Noting the example of Marseille Airport, they have already taken the initiative to develop an LCT. Recent developments of LCT models make use of the need for simplified terminal design in order to reduce the capital cost during building construction. The establishment of the LCT can be seen as an opportunity for airports to increase the passenger traffic as well as attract the LCCs to come to the airport. From the literature review (Chapter 2), there are several LCT models which have been used for different types of terminal design (dedicated and converted terminals) in European countries.

Interestingly, the designs have followed different philosophies to be suited to the LCCs' preferences, budget restrictions and volume of passenger traffic. However, for current models of LCTs, the main interest of airport operators is to reduce development and

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[92] A benchmark for low cost airport operations in Canada.

construction costs, reduce the commercial area, increase terminal efficiency and minimise transfer operations, compared with 'traditional' terminals.

Table 4.3 A selection of LCTs in the Asia Pacific Region (CAPA, 2008, updated by author)

Airport	LCC Operating	LCC bases	LCT Type
Kuala Lumpur International Airport, Malaysia	Air Asia, Jet Airways, Lion Airways, Tiger Airways, Thai Air Asia, Air Asia X, Jetstar, Jetstar Asia	Air Asia	New dedicated terminal
Subang Airport, Kuala Lumpur	Firefly	Firefly	Renovated at old domestic airport
Kota Kinabalu International Airport, Labuan	Air Asia	Air Asia	New dedicated terminal
Changi Airport, Singapore	Air Asia, Jetstar, Jetstar Asia, Jet Airways, Thai Air Asia	ValuAir, Tiger Airways, Jetstar Asia	New dedicated terminal
Bangkok Don Muang Airport	Nok Air, one-two-go	Nok Air, One-two-go	Shared facilities
Macau Airport	Jetstar, Air Asia, Thaï Air Asia, VIVA Macau, Cebu Pacific Air, PAL Express, Tiger Airways	VIVA Macau	Shared facilities
Zhuhai Airport, China	Spring Airlines	None	Shared facilities
Diosdado Macapagal Airport (Clark), Philippines	Air Asia, Tiger Airways, Cebu Pacific Air	None	New dedicated terminal
Melbourne, Airport, Australia	PAL Express, Virgin Blue, OzJet Airlines	Virgin Blue, Tiger Airways Australia, OzJet Airlines, JetStar;	New dedicated terminal
Gold Coast Airport, Coolangatta, Queensland, Australia	Jetstar; Qantas, Air Asia X, Virgin Blue	Virgin Blue	Converted terminal
Sydney Airport, Australia	Jetstar, OzJet Airlines, Virgin Blue, Jet connect, PAL Express, VIVA Macau	OZ Jet Airlines	Dedicated terminal

4.4.1 Coventry (West Midlands International) Airport, UK

Coventry (West Midlands) Airport appealed[93] against the UK Government ruling turning down plans to construct a permanent passenger terminal. However, the development of an LCT at Coventry Airport had been supported by the local community where, as stated by Roberts (2006), the 'scope and limits of the permission'

93 It should be noted that the appeal for planning permission has now been refused (6 October 2008) and that Thomsonfly and Wizz Air have ceased operations at the airport.

had been drawn-up after considering the Warwick District Local Plan (WDLP) for land use including the location and nature of the new LCT development. Table 4.4 summarises the planned LCT development at Coventry Airport.

The airport, which was used by Thomsonfly, served eight European destinations (including. Faro and Malaga). The routes had successfully increased passenger traffic to 0.6 million by 2007 and were expected to generate further growth to about 2 million in 2014. Expansion of the LCT would cater for the maximum passenger throughput expected to be reached in 2014 with further infrastructure development for additional car parking, apron expansion and surface access.

Table 4.4 Coventry Airport Planning Permission (Roberts, 2006) [94]

Item	Description
Terminal Dimensions	Allowed maximum gross floor area of 10,250m^2
	Terminal retail area to be located airside with exception of a maximum of 445 m^2 planned for landside of terminal building.
	Height of terminal not to exceed 9.75m.
Passenger Traffic	Passenger traffic not exceeding two million per annum (within the timeframe of 1st April to 31st March of the following year).
Terminal Facilities	No car parking development at Airport West (area across the airfield currently used by business aviation). Car parking at Airport South to be maintained.

The then existing terminal facilities at Coventry Airport separated arrivals and departures into different terminals. In the departure area, four check-in desks were situated inside the terminal with each serving one queuing lane. Most of the terminal processes in the departure area require manual handling activities which include the check-in counter, baggage scales and the x-ray machine for baggage screening. Figure 4.2 shows the check-in layout in the departures processing area.

For the boarding area, Coventry Airport followed the simplified LCT terminal concept in order to reduce investment costs. The following facilities were located in the boarding area: a small security checkpoint, a small retail concession (selling books and magazines), seating, standing areas and small café kiosks (offering basic snacks and drinks). The departure lounge area is shown in Figure 4.3.

For arrival passengers, they were required to walk from the parked aircraft to the terminal building arrival hall. The flow of the arriving passengers was constrained because of the small dimensions of the arrival hall. Two immigration check-points with limited queuing space were provided. Other facilities such as a single baggage reclamation belt, television and waiting area for baggage collection were available. In order to increase airport commercial revenues, the airport took an initiative to develop rental activities (advertising and car rental services) in the landside area of the terminal. Figure 4.4 shows the simple design for the arrival hall and Figure 4.5 shows a single

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94 This was a replacement for the existing LCT building.

baggage reclaim belt, with a length of approximately 14 metres, installed in the arrival area.

Figure 4.2 Check-in Coventry Airport, UK (Source: Coventry Airport)

Figure 4.3 Departure Lounge in Coventry Airport (Source: Coventry Airport)

Figure 4.4 Arrival Area in Coventry Airport, UK (Source: Coventry Airport)

Figure 4.5 Single baggage reclaim belt in Coventry Airport, UK (Source: Coventry Airport)

4.4.2 Marseille Provence Airport, France

Marseille Airport has been established since 1934 and is managed by CCI Marseille Provence. There are about 40 airlines serving this airport with destinations including Europe, Canada, the Middle East and Africa. The arrival of LCCs (i.e. easyJet, Germanwings, Ryanair, amongst others) at the airport has boosted passenger traffic from 5.7 million in 2004 to 7.0 million in 2007. In 2006, this airport served about 6.16

million terminal passengers [comprising domestic (3.3 million) and international (2.7 million)], and about 0.16 million transit passengers also used the airport.

The growth of terminal passengers at Marseille Airport had drawn attention to the need to increase the terminal building's capacity. With regard to reducing the development costs, a basic concept was adopted for the terminal design after taking the decision to construct a new terminal building specifically for LCC operations. As a result, the LCT was opened in 2006 with an additional capacity of 3.5 million passengers after converting the cargo terminal. The terminal is currently capable of handling most narrow-bodied aircraft with minimum turnaround time. The terminal design includes a new pier and six stands combined with a simplified terminal design with basic terminal facilities. To reduce capital investment costs, the terminal has used basic materials (to fit with the simplified design) during the construction of the terminal building. Figure 4.6 shows the location of the LCT relative to the main airport complex.

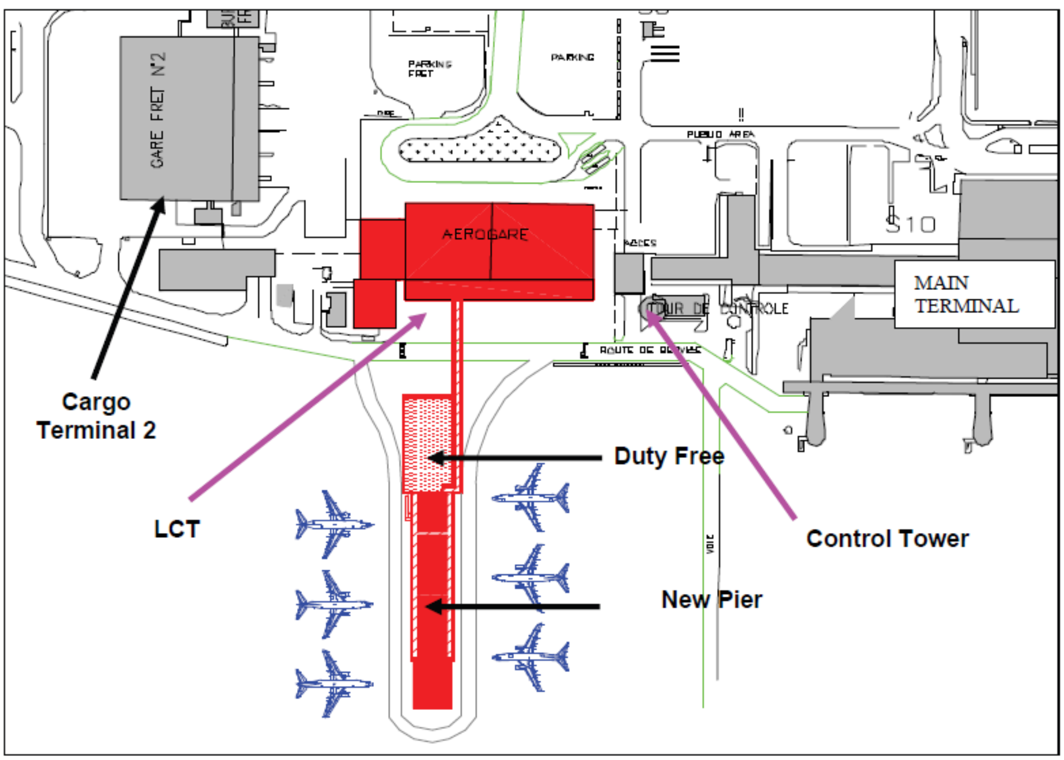

Figure 4.6 Location of Marseille LCT (Source: Marseille Airport)

Figure 4.6 illustrates the position of 6 contact stands. The terminal has only included basic terminal facilities compared with 'traditional' terminals. For example, the airports decision to use a simplified design has removed from the LCT most secondary facilities. Luxury facilities such as pre-departure check-in, seating area near check-in and fast track facilities are totally absent in the terminal design. The decision to eliminate secondary facilities took into consideration the space restrictions of the terminal area and also the need to increase the efficiency of processing activities in the departure area. Figure 4.7 illustrates the principal departure facilities and also shows the provision of basic terminal facilities for arrivals. These include baggage delivery, customs, immigration and toilets.

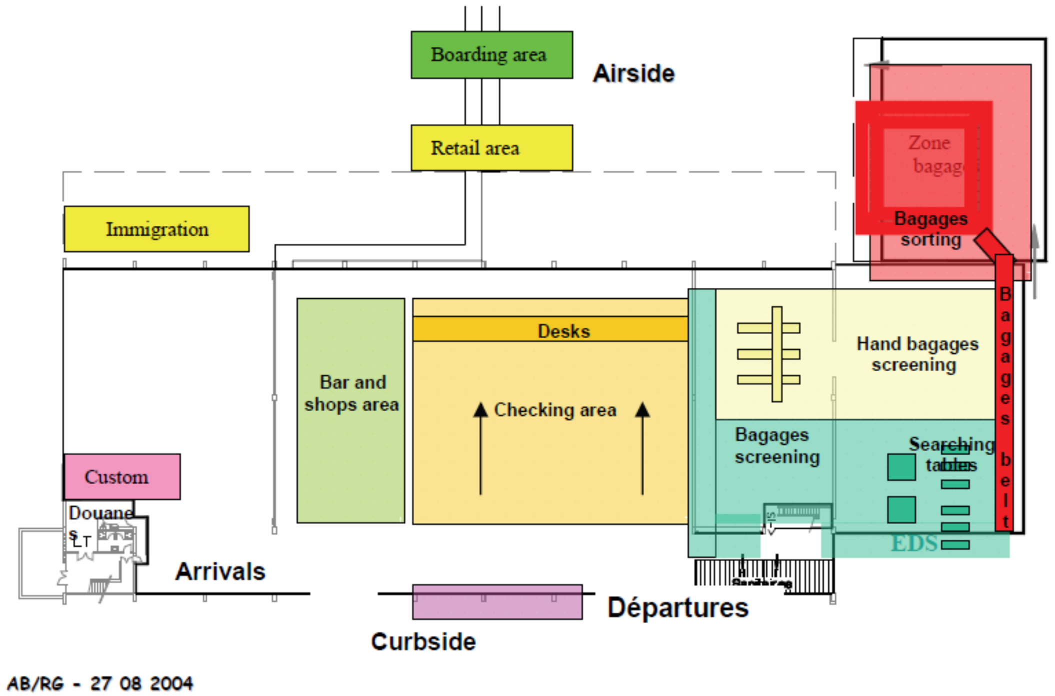

Figure 4.7 LCT Departure and Arrival Layout, Marseille Province Airport (Source: Marseille Airport)

As shown in Figure 4.8, in order to meet regulatory standards that have been set, the departing passengers are divided into two streams, Schengen[95] and Non-Schengen traffic. The separation of passenger flows is to allow the elimination of checks on persons at emigration (departure) and immigration (arrival) for Schengen passengers. However, the national laws implementing the Schengen Treaty in the signatory states stipulate that documents must still be carried and presented on request to confirm identity (passports or equivalent documents) entitling the bearer to cross the border[96].

Departing passengers are required to use the manual check-in desk and to carry their own hold baggage for security checks. In order to ensure safety in the departure area, baggage screening facilities has been provided with Explosive Detection System (EDS). After security clearance, the passenger flows lead directly to the commercial area while waiting for boarding.

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95 The objective of the Schengen Treaty of 1985 is the complete elimination of checks on persons at the internal borders between the signatory states (Belgium, Demark, Germany and others).

96 Munich Airport website.

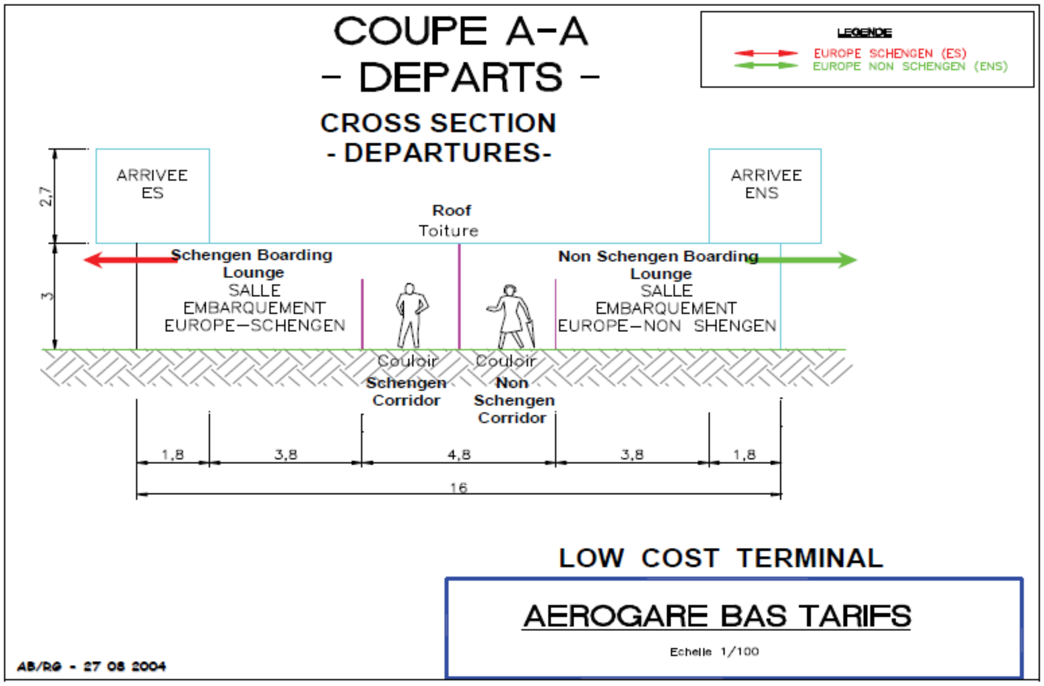

Figure 4.8 The cross section through the corridors leading to the piers (Source:Marseille Airport)

Figure 4.8 shows the cross section through the corridors leading to the piers and the terminal facilities' provision in the boarding area. According to Blow (1998), a single pier configuration may replace an open apron operation allowing nose-in / push back aircraft stands so that the aircraft are located either directly nose inwards or at an angle for self manoeuvring stands (Kadza and Caves, 2000). The nose-in / push back system has the advantage of reducing the aircraft parking area and aircraft on stand are not blocking the apron taxiway behind it. The design also avoids the provision of bussing as the passengers can walk between the terminal building and apron.

4.4.3 Warsaw Frederic Chopin Airport (Terminal Etiuda), Poland

Warsaw Frederic Chopin Airport (WFC) is the main gateway international airport to Poland. The Polish Airport State Enterprise owns 100% of the equity of Warsaw Frederic Chopin Airport (WFC) and is responsible for airport operations. WFC Airport was established after The Central Airport (Okecie) authority decided to convert the military base to civil use in 1956. The Etiuda was the original arrival terminal[97]. When Terminal 1 was constructed, Etiuda Terminal became a function store (supermarket), and then was converted back to a terminal with a capacity to accommodate 3 million passengers per annum. The Etiuda Terminal currently serves LCC airlines including bmibaby, easyJet, Germanwings, Ryanair and Wizz Air.

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97 In 1969 a new international terminal was opened; domestic flights continued to operate from the facilities built on the site of the pre-war terminal.

The LCT size is smaller compared with Terminals 1 and 2 (the latter being recently opened). The provision of terminal facilities is limited so as to keep in airport charges low. The terminal has been constructed with a useable floor space of 2,281m^2 (including an airside departure area of 677m^2 and airside arrival area of 456m^2)[98]. Figure 4.9 shows a schematic layout of the Etiuda Terminal.

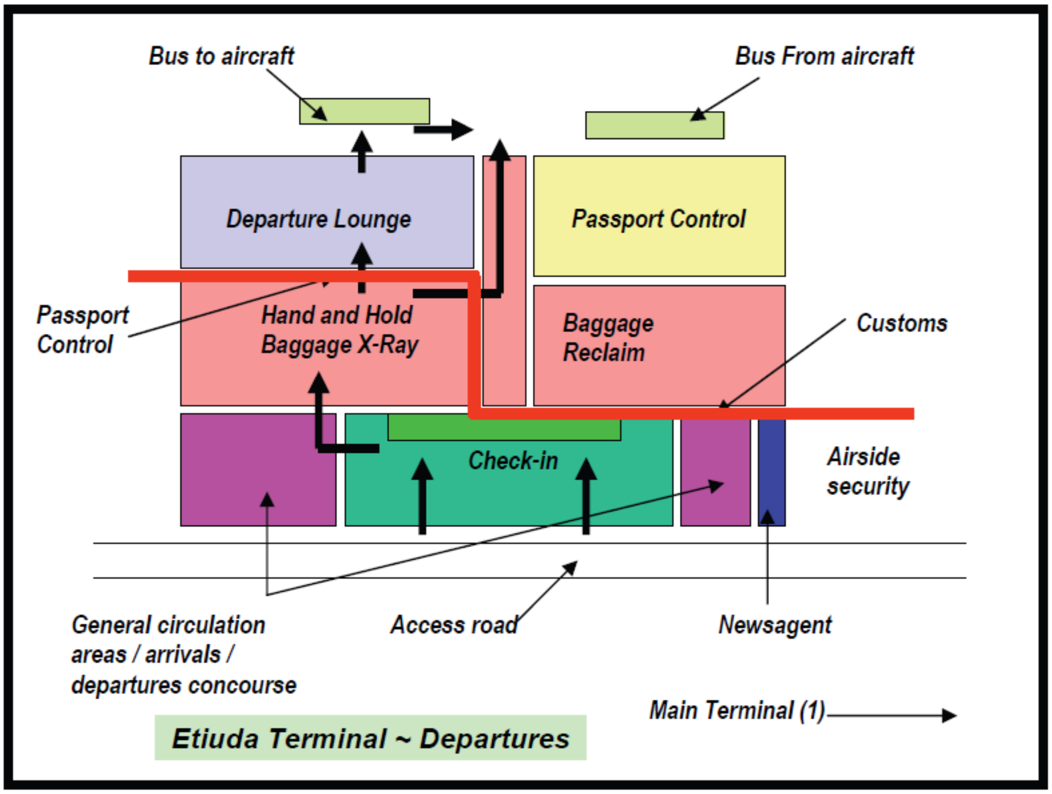

Figure 4.9 Schematic of Etiuda Terminal, Warsaw (Departure flows) [Author]

In the departure area (Figure 4.9), passengers are required to use simplified terminal facilities to complete their boarding. For example, the check-in area has combined the hand and hold baggage screening facilities and a conveyer belt links the screening process with the hold baggage collection area. Passengers then access the departure lounge where they can make use of the limited commercial facilities that are available. The passengers are then bussed to the aircraft. This is an unavoidable additional expense due to the fact that the apron is not located adjacent to the terminal building.

Figure 4.10 shows the passenger arrival flows. Arrival passengers are required to take the bus from the aircraft to the arrival hall. The passengers then pass through passport control before entering the baggage reclaim area. This is a single baggage conveyer belt for baggage reclamation (Figure 4.11). Once the baggage has been collected, the

98 http://www.emsacouncil.webpark.pl/howtoget.html

passengers are free to pass through customs and enter the public zone of the arrival area and exit the terminal. Space restrictions have resulted in limited support facilities including a newsagent, left luggage, bureau de change and self-service machine (snacks and drinks). The development of the Etiuda Terminal as a LCT concentrated on reducing capital investment by converting an existing building and providing minimum facilities.

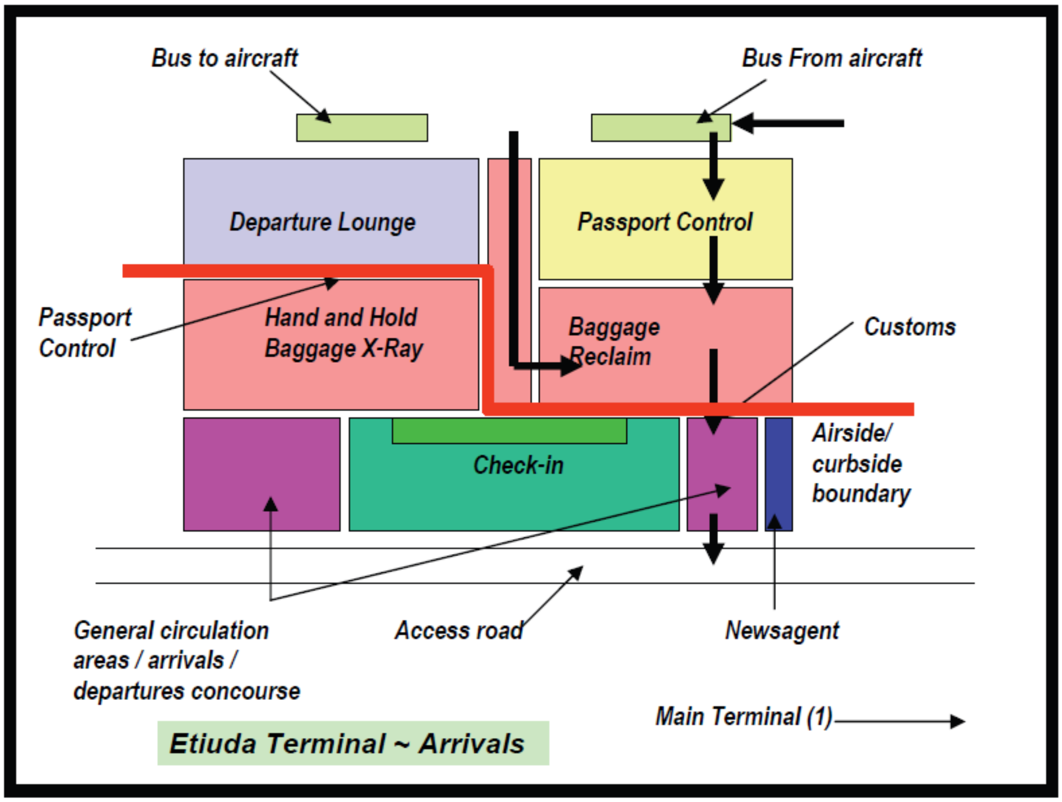

Figure 4.10 Schematic Etiuda Terminal Warsaw (Arrival flows) [Author]

4.4.4 Hahn Airport, Germany

The development of Frankfurt Hahn Airport[99], from a military air base, started in 1993, when the Hahn Air Base was converted to civil airport operation. As stated by Gillen and Lall, (2004), in order to stimulate growth of passenger traffic, the terminal facilities at Hahn are more functional and cost effective after converting a former military airfield into a civil airport. In 2005, the basic terminal concept was adopted when Hahn airport introduced lower airport charges. The establishment of the LCT has successfully minimised capital investment at Hahn Airport in line with one of the airport aims to be a LCC base. Ryanair, Wizz Air and Iceland Express are examples of LCCs using this

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[99] It is reasonable to assume that the use of Hahn airport, a former military airfield, has made a small contribution to relieving congestion at Frankfurt-Main airport.

airport as a base after the airport authorities offered the incentive of reduced passenger service charges (PSCs) compared with a ‘traditional’ airport.

Figure 4.11 Baggage reclamation belt in Terminal Etiuda [Source: Warsaw Frederic Chopin Airport]

As a result, the number of terminal passengers has increased at Hahn Airport. In 2006, the passenger traffic amounted to 3.7 million; 16% business travellers and 84%, visiting friends and relatives (VFR) and leisure. About 1.88 million of these passengers used LCC airlines.

As the number of passengers has grown, so has the demand for services and infrastructure to serve their needs. Therefore, the development of terminal facilities at Hahn Airport has seen an investment of £3.9 million in order to increase terminal efficiency and improve passenger flows within the terminal area. Hahn LCT includes basic terminal facilities such as manual check-in counter, departure gates, baggage carousels, shops, restaurants, car-hire service counters, information counters, photocopying, fax service, lost property office and Internet service. Table 4.5 gives a breakdown of the LCT facilities at Hahn Airport.

In addition, the expansion of the Hahn LCT Airport has encouraged the upgrading of surface access facilities for passengers. Therefore, the airport operator has improved road and bus services. This has increased capital costs, but at the same time created new jobs for local people. As of June 2006, the creation of the Hahn LCT had created 3,158 jobs in airport services.

Table 4.5 LCT facilities at Hahn Airport, Germany (Author)

Terminal Facilities	No.
Manual check-in counter	17
Departure gates	11
Baggage carousals	4
Shop	13
Bank	2
Restaurant	10
Car- hire service counter	6

Figure 4.12 Check-in Area at Hahn Airport (Source: Hahn Airport)

4.4.5 Bordeaux Budget Terminal, France

The availability of a new Greenfield site has encouraged France's Bordeaux Airport to propose the first new dedicated LCT in Europe as the result of an increase in passenger traffic. Bordeaux's existing carriers, which included EasyJet, Aer Lingus, BMIbaby, Flybe, Germanwings, MyAir, Atlas Blue, FlyNordic and Norwegian, were seeking more efficient terminal operations (for example, check-in processing) in order to reduce aircraft turnaround time. The LCCs supported the construction of a new dedicated building for low cost operations with the prospect of increasing passenger traffic growth up to 2 million per annum.

Construction of Bordeaux Airport LCT was scheduled to begin in February 2009 and is expected to be completed in November 2009. The terminal is planned to be built with an area of 4,000m^2 which includes a simplified design with a single-storey terminal building, at a capital cost of €5.5 million. In the terminal design, the basic terminal facilities in the departure area include a manual boarding system allowing passengers to carry their baggage to the central collection point. The design of Bordeaux Airport will not include air-bridges as aircraft will be parked on contact stands.

4.5 LCT developments in the Asia Pacific market[100]

The development of LCCs in the Asia Pacific market is still in its infancy, comprising about 5% of the intra-regional market, as opposed to 10% in Europe, 25% in the US and 40% in Australia[101]. The total population of Asia is 3.8 billion people and flying time between the major Asian cities is generally between 3 to 4 hours (O'Connell, 2007). In addition, about 500 million of the ASEAN[102] population are living within this region which represents a huge potential market as the LCCs have the opportunity to fill the gap of market needs for air travellers. By looking at recent examples of demographic and geographical trends of the Asian markets, there is a significant annual growth of air travellers in Asia Pacific compared with the USA and European markets.

Through liberalisation of the Air Service Agreements[103] in Asia, most of the countries have encouraged the development of LCTs in order to attract LCC use of their airports. However, it should be noted that the operating environment in Asia is vastly different from that in the US or Europe[104] (APAN, 2006):

1. In major Asian cities, international services from secondary airports are still uncommon, therefore, the LCCs use the same facilities at airports from which network (flag) carriers also operate.

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100 Asia Pacific region or APAC includes countries members from East Asia, Southeast Asia, Australasia, Pacific Ocean and Oceania (i.e. Australia, Brunei, Cambodia, People's Republic of China, Hong Kong, Macau, Fiji, Indonesia, Japan, Kiribati, North Korea, South Korea, Laos, Malaysia, Marshall Island, New Zealand, Papua New Guinea, Philippines, Samoa, Singapore, Thailand and Vietnam)

101 Business Traveller – Asia Pacific, brokerage firm CLSA report, April 2005.

102 ASEAN is defined as the Association of South East Asia Nations that belongs to a geo-political and economic organization of 10 countries (including Singapore, Thailand and Malaysia). The aims of the association are to accelerate economic growth, social progress and promoting cultural development of the countries.

103 From the Singapore point of view, through bilateral negotiations and Open Skies Agreements (OSAs) with all countries willing to do so, then such agreements are of mutual benefit to the partner countries, their economies and their people.

104 In the US and Europe, LCCs have brought significant benefits to consumers. They have stimulated new travel patterns, adding much growth and dynamism to other sectors of the economy.

2. Low Internet penetration in most of the countries means that LCCs cannot rely solely on online sales booking. The LCCs have to make use of call centres and travel agencies, thereby increasing cost.
3. China, Thailand and Brunei are still very protective of their air rights and regulate their aviation market. Governments such as Malaysia and Singapore prefer to protect the national airlines, in terms of stimulating the growth of air travel and tourism of the countries as well as being concerned about the new dimension of competition created by LCCs which would bring the potential disadvantage of attracting passengers from the flag carriers.

The recent growth of purpose-built LCTs in the Asia Pacific market has been driven by competition[105] from neighbouring airports. For example, competition between KLIA (Malaysia) and Singapore Changi International Airport (Singapore), both with an interest in the increasing passenger traffic, has been a core factor for establishing LCTs. For example, in Southeast Asia, neighbouring countries which constitute the Association of South East Asia Nations (ASEAN)[106] (Singapore, Malaysia, Indonesia and Thailand) have already developed their own definition of LCTs. Insufficient surface transportation restricts the opportunity for fast surface transport within the region. As a result, the establishment of LCTs can be seen as the most effective way to enhance the air transport systems in the ASEAN region.

By looking at the economic status and demographic factors of ASEAN residents, it has been noted that the establishment of LCTs offers an alternative to the public perception of air transport as being a high-value industry, unaffordable and only serving a highly focused market. It has been a challenge to establish an ideal LCT, in the Asia Pacific region where most of the passengers use the major airports as a hub for long-haul flights. Noting the example of KLIA LCT, passengers from Singapore, Indonesia and Thailand used KLIA LCT as a hub to travel to China or European countries. In fact, most of the regional and secondary airports in Asia Pacific have limited airport capacity (for example, inadequate terminal facilities) to meet an increase in LCC traffic.

As a consequence of this, most LCT models in Asia Pacific have been developed using minimal resources (cheap labour, lower capital investment) and by using green-field sites for the terminals. Examples include KLIA LCT and the Budget Terminal, Singapore. In both cases a dedicated LCT has been constructed benefitting from lower labour costs.

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105 Competition is acknowledged as a serious threat among the ASEAN countries by the fact that most of the countries are still considered as developing countries with distinctive multidiscipline industries.

106 The association provides a platform for collaboration and networking among members on sharing ideas, expertise of industrialisation, tourism and aviation.

A recent development by LCCs to commence long-haul services has placed an additional burden on airport operators. Air Asia X[107], one of the subsidiaries of Air Asia Group, has been launched as a long-haul carrier which uses KLIA LCT as an operational base, thereby putting pressure on the airport planners to design adequate facilities for LCTs. The airlines have pressured the airport planners to design new facilities for long-haul traffic[108], as noted from Air Asia which stated that the route development of the carrier is planned to include 45 long-haul destinations in eight countries throughout Asia, China, Europe and India, offering daily point-to-point services.

4.5.1 Budget Terminal, Changi International Airport, Singapore

Development of the Budget Terminal in 2006 was aimed to ensure sufficient capacity to accommodate growth in the Singapore LCC aviation market. The Budget Terminal is expected to be able to handle 7 million passengers per annum (at full capacity) and is currently successfully attracting 2.7 million point to point passengers per annum (APAN, 2006). Tiger Airways and Jetstar had urged construction of a Budget Terminal with basic terminal facilities in order to minimise turnaround time as well as having a reduction of airport charges for using LCT facilities. As an example, for Tiger Airways the use of the LCT will decrease the ground-based operational costs by 50%, including USD500,000 it no longer pays in air-bridge usage fees (CAPA, 2006).

The growth of passenger traffic has been driven by the LCCs currently operating 175 weekly services to 15 cities, which now account for about 7% of Changi's flights. For example, for Tiger Airways and Philippines' Cebu Pacific Air, the total weekly schedule has been doubled from 124 in March 2006 to 284 in 2007. The Budget Terminal is now connecting through to 20 cities in the Asia region, in comparison to 12 when it first opened.

The terminal has been built with a construction cost of USD27.5million by incorporating basic concepts and simplified terminal design. As previously stated, LCCs do not require certain terminal facilities such as business lounges, people-movers or air-bridges as they are designed to be simple and efficient while allowing passengers to embark and disembark quickly. The floor area of the terminal building is about 28,700m^2 (£479/m^2) including basic facilities for the departure hall, boarding area and arrival hall. The terminal is fitted with air-conditioning in most areas for the comfort of

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107 The core differences of Air Asia X are that this carrier has pursued simplicity, efficiency, productivity and high utilization of assets in order to offer low fares (O' Connell & Williams, 2005) for long haul flights, while Air Asia flights which are also offering low fares for point to point short haul services.

108 Francis et. al. (2007) show that the transferability of the LCC model to long-haul traffic is limited but Franke points out that LCCs are likely to continue their expansion into new market segments (Franke, 2007). Therefore, demands towards specific LCT facilities (for example, comfortable waiting lounges that require more seating space) are possible but not the most important characteristic of LCC operations which is still that of minimising turnaround time.

passengers. In addition, the airport authority endeavours (for example, by faster check-in) to create a pleasant atmosphere in the LCT. Surveys carried out throughout last year at Changi Airport have revealed that about 70% of passengers of budget carriers travel for leisure and to visit friends or relatives (APAN, 2006).

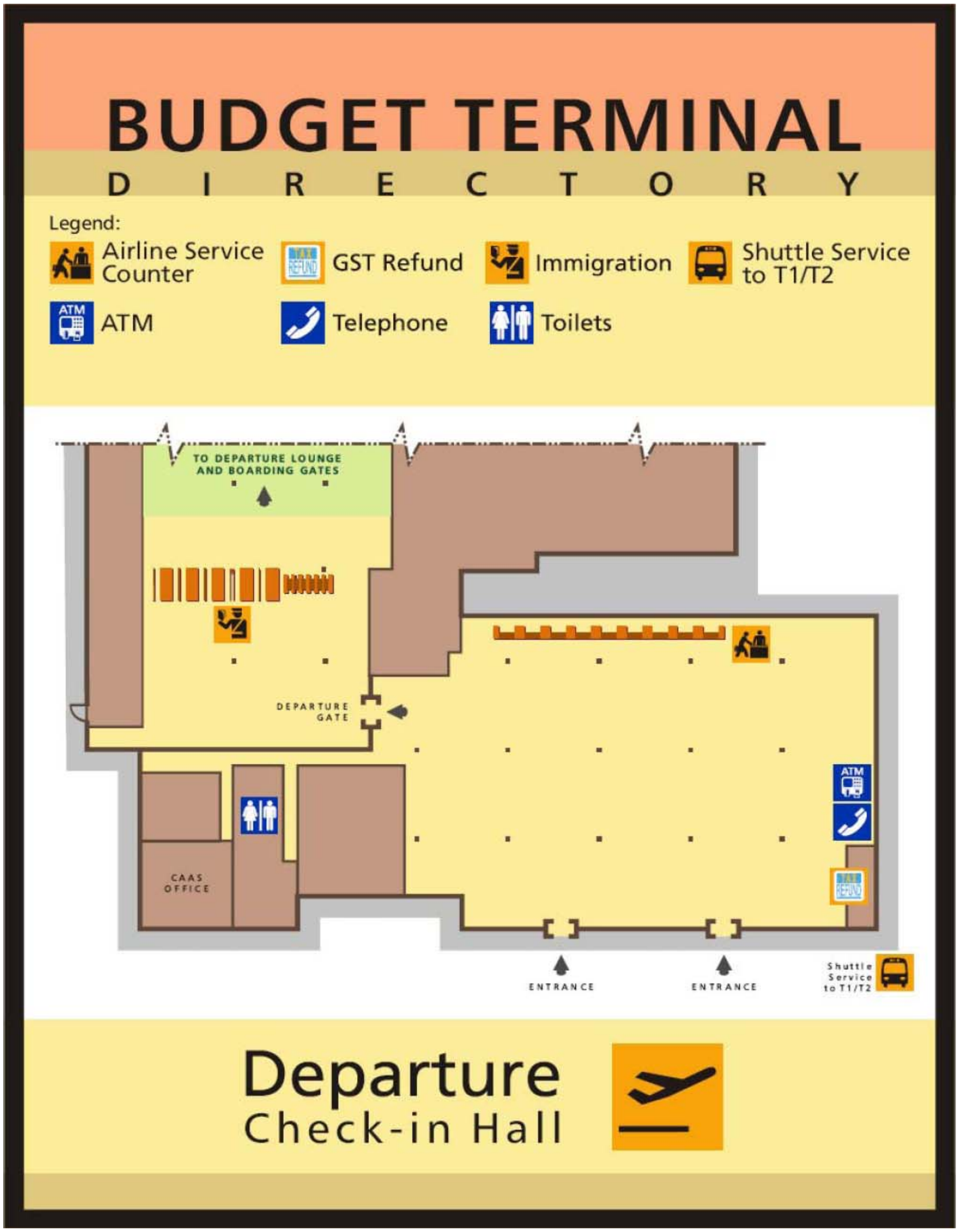

Figure 4.13 Departure Check-in hall facilities in Budget Terminal, Changi (Source: CAAS)

In the terminal design, processes have been simplified to fit with the basic LCT design concept. Most of the terminal facilities are run manually in order to reduce operational costs. Noting a small check-in hall as an example (Figure 4.13), it contains 18 manual check-in desks with queuing spaces for the check-in process. The check-in facilities are supported with a basic computer terminal to enable printing of baggage labels, but most of the processes in the check-in hall are operated manually[109]. Other facilities such as baggage weighing machine, children's play area, customs inspection for tax refund, lost and found or left baggage counters, automatic teller machine, post box and public phone are also located in the check-in area.

Figure 4.14 Departure lounge facilities in Budget Terminal, Changi (CAAS)

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109 There are no self-service check-in kiosks operating in the terminal area of the Budget Terminal, Singapore (October 2008).

In the departure lounge of the terminal (Figure 4.14), the facilities include a free Internet kiosk, free laptop access, free local telephone calls, money changer, outdoor smoking area, prayer room, automated teller machine, post box and TV lounge to be used by passengers waiting for boarding. Ten of the boarding gates have been built without air-bridge facilities, thus travellers need to walk a short distance from the gate to and from the aircraft. The terminal is made up of two adjacent single-storey buildings connected via link ways. This design facilitates smooth passenger flows in the single storey buildings, as arrival and departure procedures are processed in separate buildings (CAAS, 2007).

Figure 4.15 Arrival facilities in Budget Terminal, Changi (CAAS)

The baggage reclaim hall (Figure 4.15) provides free local telephone calls and baggage trolleys, while in the arrivals hall, the following amenities have been provided: airport shuttle service to city hotels, hotel reservation counter, money changer, passengers meeting area, public phones, automatic teller machine and vending machines. In order to help intra-terminal traffic, a free shuttle bus service between the Budget Terminal and Terminals 1 and 2 is available for the users. The baggage reclamation area includes 3 baggage claim belts with an integrated baggage handling system which increases the speed of baggage transfer. The baggage system takes three minutes per bag within the terminals and is also integrated with a multi-level baggage screening system.

As commercial issues are linked to LCT development, the Budget Terminal has included commercial activities in the terminal. For this terminal, the airport made available a small restaurant, internet access, public phone, money changer, etc. inside the terminal area. About 3000m^2 of the total LCT area has been dedicated to commercial activities to generate non-aeronautical revenues from a range of shops including money changers, retail shops and food & beverage outlets both in the airside and public areas. The food & beverage offerings focus on fast service and easy takeaway concepts such as fast-food and quick bites.

4.5.2 Kuala Lumpur International Airport – KLIA LCT, Malaysia

KLIA LCT was specially constructed to accommodate the growth of LCCs and especially for the 'no-frills' airline, Air Asia. Pressure by Air Asia for a reduction in aeronautical charges was the motive behind the construction of the LCT. The LCT has been built with separate arrivals and departures in a single level terminal design. For this design, the capital investment has been limited to USD29.2 million (USD827/sq.m^2) which includes only basic terminal facilities (CAPA, 2006). KLIA LCT is located about 20km[110] away from the main terminal building (MTB) of KLIA and is linked by an access road which restricts the passengers to use only car, bus or taxi as a means of transport to the terminal.

Figure 4.16 shows the location of the KLIA LCT. In the departure area, there are fifty two manual check-in baggage counters, twenty no-baggage manual check-in counters and five self-service check-in machines. In this design, the number of check-in counters has been increased from a current 'traditional' terminal to accommodate the growth of Air Asia passengers. The terminal also includes twelve departure immigration counters and two immigration auto-gates to meet the needs of international passengers and increase efficiency of traffic flows. After the check-in processes, the passengers are required to use three hand-luggage screening machines for security clearance for both international and domestic passengers. Figure 4.17 shows an example of manual check-in counters at the KLIA LCT.

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[110] Source: KLIA Malaysia website.

In the apron area, 30 aircraft stands adjacent to the terminal have been constructed (Figure 4.18). The use of contact stands was advised in order to reduce capital investment when the LCT was constructed. The passengers embark and disembark using the front and rear stairs and have a short walking distance to and from the terminal. KLIA introduced a covered walkway after the experience of bad weather conditions (rainfall). Use of the covered walkway has created an interesting discussion among airport designers with regard to airside operational safety concerns. For example, use of the walkways may be affected after taking into account problems with jet blast.

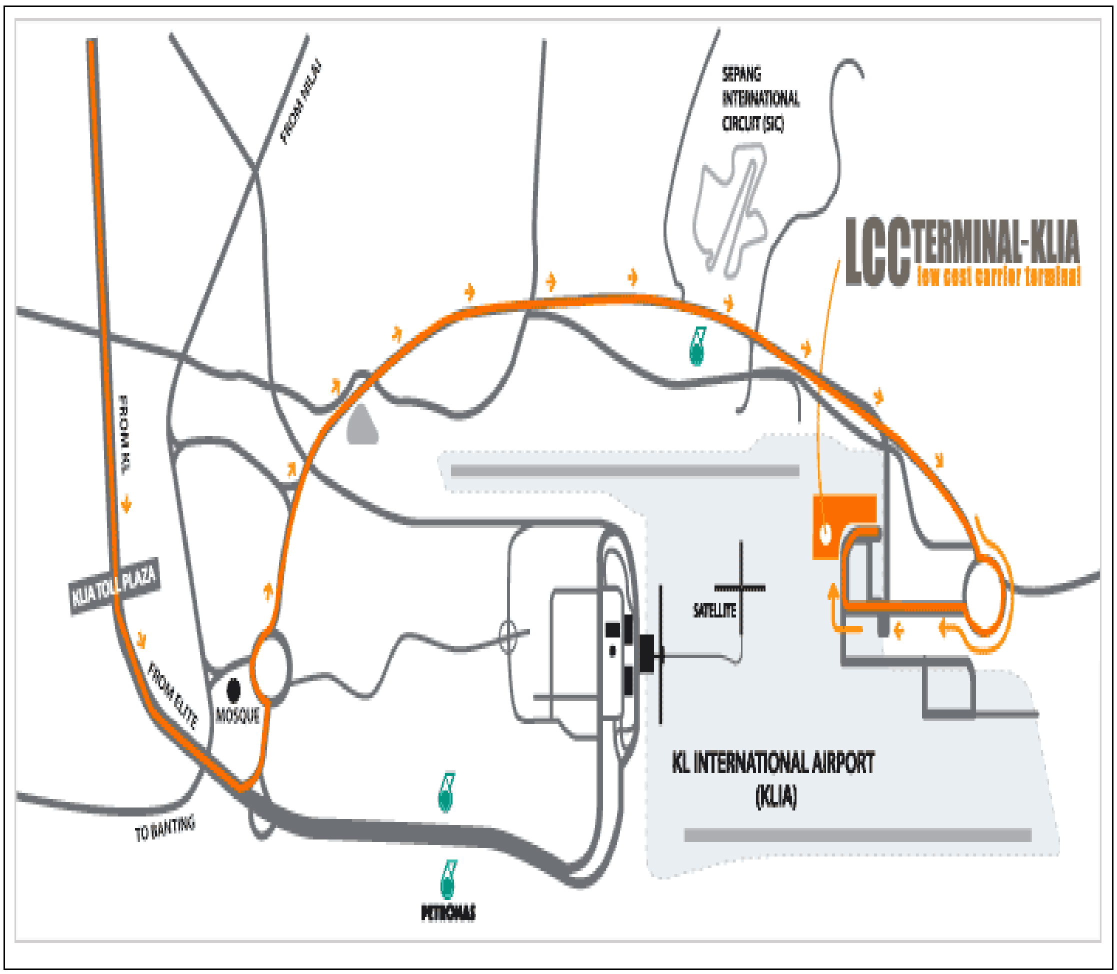

Figure 4.16 Location of KLIA LCT (Source: MAHB)

Figure 4.17 Manual check-in counters (Source: MAHB)

About 400 seats for domestic passengers and 800 seats for international passengers have been provided in the departure lounges. The separate lounges can hold 1500 domestic and 3000 international passengers at the same time. The development of the departure area of the LCT is interesting since the dimensions of this area are larger in comparison with other LCT models (Table 4.6).

Table 4.6 KLIA LCT Dimensions (Source: MAHB)

Facilities (area)	Dimension (m^2)
Check-in	2650
Domestic departure hall	4430
Domestic arrival hall	1900
International departure hall	3240
International arrival hall	4340
Public concourse main area	4355
Public concourse international arrival area	325
Common and circulation area	6760

Arriving passengers walk from their aircraft to the arrival hall to use shared facilities for baggage reclamation. The passengers use two arrival gates followed by twelve immigration counters and auto-gates for international passengers. The LCT has six customs counters to deal with baggage inspection and clearance before passengers enter the country. To cater for the needs of arriving passengers, three domestic and two international baggage carousels are provided in the arrival area.

Figure 4.18 Aircraft parking (Source: MAHB)

With regard to commercial revenues, KLIA LCT has introduced a variety of commercial activities that have contributed to the overall airport revenues. The commercial activities of retail, and food and beverage services encourage passengers to spend money in the airport. The sales of KLIA LCT outlets have increased by up to RM3.5 million and RM1.5 million, annually, in both retail and food and beverage (F&B) respectively[111]. In total, the LCT area is about 35,290m^2 (£437.2/m^2) which includes the domestic and international areas, public concourse and circulation areas. Table 4.6 shows the dimensions of terminal areas at KLIA LCT.

4.5.3 Other LCTs

1. **Terminal 3, Jakarta Airport, Indonesia**

The Hajj Terminal (Terminal 3) has been constructed by converting an existing terminal to provide better facilities for Muslim passengers travelling to or from Mecca. The development cost was about USD22 million to expand the building. The development of the Hajj Terminal takes into account the pressure from airlines wanting better terminal services (for example, airline lounges). The terminal was expected to be fully operational by December 2008 and is planned to accommodate up to 4 million passengers.

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[111] KLIA Commercial Department Internal Report.

2. **Don Muang Airport, New Bangkok International Airport (NBIA), Thailand**

The initial development proposal of the New Bangkok International Airport Terminal was released in 2007. The aim was to construct the terminal with a view to accommodating 15 million passengers per year. The cost of construction is to be more than $16 million. Expansion of the terminal will encourage LCCs to use the facilities and the airport is currently served by three locally based LCCs which are Orient Thai, One-Two-Go and Thai Airways (affiliated with Nok Air and Thai Air Asia), as well as other LCC services that include Air Asia, Tiger Airways and Jetstar Asia.

3. **Kota Kinabalu International Airport, (KKIA), Malaysia**

The construction of Terminal 2 as an LCT for special use of LCCs is important following high travel demand from low cost passengers in Eastern Malaysia. The terminal cost was estimated at USD17 million and the terminal has begun operations following seven months of construction. Air Asia currently operates as a low cost service to Terminal 2 and the network carriers take advantage of facilities at the Terminal 1. The new terminal is capable of handling 1,200 passengers per hour. The terminal facilities include 26 check-in counters and self-service check-in machines for international and domestic flights and six aircraft stands designed to minimise turnaround time.

Figure 4.19 Check-in area at KKIA, Malaysia (Source: MAHB)

4.6 Growth of LCT development in the USA market

A revolution in air transport began in the US with the emergence of new airlines as a result of the US Deregulation Act in 1978. US deregulation emphasised the need to reduce air fares in order to attract an increased volume of traffic. The act covered the control of decisions on important activities such as fares, route entry, capacity, flight products and mergers through the Civil Aeronautics Board (CAB) which, itself, was established seventy years ago. The purpose of the Act was to enable the airlines to decide which market to serve and what fares to charge and to make other operational decisions previously under the control of the government (Vowles, 2001). O' Connell (2007) notes that the low cost models began within the liberalised states of Texas and California some twenty years before deregulation which eventually led to the establishment of low cost airlines in the US.

The Deregulation Act, which encouraged greater freedom for carriers to enter or leave any market, together with increased competition due to deregulated fare policies, made it necessary for carriers to improve cost-effectiveness (Chou, 1993). As a result, in 2002, new entrant LCCs such as Air Tran, Vanguard and Frontier entered the marketplace, providing low fare options in a number of different markets across the US (Vowles, 2001). However, the debate (market share, fare structures and competition) on air traffic deregulation is still ongoing after the LCCs seem to have gained an advantage in terms of increased market share and profit. For example, noting recent examples of airlines such as Southwest and Pacific Southwest Airlines (PSA), the LCCs seem to be more efficient and capable of growing the markets they enter, due to low fares, which in turn results in an increased demand for adequate terminal facilities. Southwest Airlines, for example has already captured significant market share by offering low fares to travellers and now controls the 16% of the low cost market.

Leading from the success of Southwest Airlines as a LCC, the 'Southwest Effect' has become well-known across the world, an effect defined as an increase in enplanements and a decrease in average fares at airports which Southwest serves (Vowles, 2001). According to O'Connell (2007), the entry of Southwest into the market had two effects: market diversion[112] and market creation[113]. These created a new dilemma of substantial overlap between routes served by LCCs and network carriers in which currently 70% of city-pair markets served by the network carriers are now also served by at least one of the LCCs.

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112 Where air travellers switched from high-fare network route carriers to take advantage of low fares (O' Connell, 2007).

113 Where low fares attracted more travellers to air transportation either for the first time or instead of other transport modes, especially those in the short haul markets (O' Connell, 2007).

Figure 4.20 Southwest updated gate design (Source: Southwest Airlines, 2008)

The successful operation of Southwest as a LCC has had a significant impact on airport development in US. Cohas et al. (1995) stated that due to the increase in the market share of smaller airports, the airports are required to have facilities which result in increased terminal efficiency and introduction of lower fares for passengers. The demand for adequate facilities, such as updated gate design[114], in order to offer a better airport experience for each of the target groups such as families, and leisure and business travellers, has been noted as important for LCT development in the USA. Figure 4.20 shows an updated gate design customisation showing the work area, family area and boarding area. Also, the provision of terminal facilities such as children-size tables and chairs and family-friendly television programming has also been included in the LCT gate design.

4.6.1 Austin Bergstrom International Airport, USA

Austin City Council has approved the development of 40 acres of land at Austin-Bergstrom International Airport for the construction of the first dedicated LCT in the USA. In terms of passenger traffic, the emergence of LCCs such as vivaAerobus and FunJet as airlines serving Austin has increased traffic through the airport and resulted in an additional burden on the airport in order to cater for LCCs and passengers. As the number of passengers has increased, the requirements for adequate terminal facilities are being encouraged by Jet Blue Airways, Southwest Airlines, Frontier Airlines and vivaAerobus.

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114 Gate redesign, to be rolled out by 2008, is one of the initiatives the LCCs are implementing in response to a recent period of lagging profits

Figure 4.21 Simplified design of South Terminal (Source: www.emediawire.com)

The footprint of the South Terminal is about 28,000m^2 including three gates for accommodating three aircraft at a time. A single storey building has been converted from that previously used by the National Guard to a no-frills terminal to cater for the needs of the Mexican carrier vivaAerobus. In order to reduce the development cost, the following facilities have been simplified: baggage handling system, common use departure gates and ticket counter areas. Amenities at the South Terminal include over 1000 parking spaces conveniently located a short walk from the terminal, food and beverages, news-stands, gift shops and tax-free or duty-free outlets. There are also a range of car rental providers and ground transportation options available.

However, the opening of the South Terminal as an LCT has been objected to by Southwest Airlines after the decision of the airport authorities to introduce lower airport charges for airlines, which leads to a cost advantage over airlines currently flying from the original terminal. Landing fees remain the same for all carriers but other airport charges are discounted for use of the LCT terminal facilities.

4.7 Summary

An increase in passenger traffic with an annual average growth rate of 8.1% in the Middle East, 7.2% in Asia and 6.1% in Africa between 2006 and 2015 has significantly influenced the preferences of passengers for the provision of specific facilities as part of LCT design.

Issues on LCT development have been raised, particularly on the preferences for basic terminal amenities as required by airlines and passengers. Recent models of LCT development have aimed to reduce capital investment, but also emphasise service efficiencies.

A basic terminal design has been proposed in Europe, Asia and USA after considering the reduction of airport charges, and operational and capital costs, as well as revenue structures.

Bearing in mind the set of preferences (for example, minimum turnaround time) by airlines for basic terminal facilities in order to reduce airport charges, they have been acknowledged as a major factor for the establishment of an LCT.

According to CAPA (2008), there are actual and potential low cost airport terminals at 17 European Airports (Coventry Airport, UK and Marseille Province Airport, France), 7 North America and Canadian airports (Austin Bergstrom International Airport) and 10 Asia Pacific airports (Budget Terminal, Singapore Changi Airport and KLIA LCT, Malaysia).

As to the roles played by airports with LCTs in European, Asia Pacific and the USA to attract LCCs, the introduction of lower aeronautical charges will attract more LCCs to use LCT facilities. The development of LCTs has been encouraged by the LCCs as providing an alternative for better services as well as increasing commercial revenues for the airport.

Conversion of part or the whole of existing, often under-utilised, airport buildings has been undertaken in order to reduce the capital investment costs developing LCTs. .

The most recent LCT designs include only basic terminal facilities which may significantly reduce the airport charges. Operational costs (for example, heating and lighting) are expected to be reduced by the smaller space and size of the terminal building compared to the normal terminals. Changes in the dimensions of the LCT area have a significant impact on the decision on manpower allocation and other processes in the terminal area. Overall, it is possible to reduce investment costs by up to 40%.

The ideal future LCT design should be considered after the characteristics of the existing LCTs are taken into account. In Europe, USA and Asia Pacific several characteristics of LCT design such as simplified design, construction time and efficiency in turnaround time have led to designers redefining LCT design. Most of the terminal buildings are constructed without air bridges and luxury terminal facilities, and with basic terminal facilities for check-in, departure and arrival areas. The characteristics of the basic terminal concept [for example,. simplified design (as discussed in Chapter 3)] have directly influenced the decision on the provision of terminal facilities in LCT design.

LCT models have been established with different aims and objectives which may vary from one region to another. A specific objective may influence terminal design which justifies the cost constraints to downsize the terminal building and reduce the basic terminal facilities. However, apart from the cost, the terminal design should follow

LCC and passenger preferences.. Therefore, the determination of appropriate terminal facilities will give additional information to contribute to new knowledge and introduce guidelines for terminal facilities after looking at the recent development of LCT models and also as a driver for the current research.

In many cases, single level terminals accommodating both LCCs and other carriers are under immense pressure due to capacity problems. However, a separate terminal for LCCs would increase passenger flows which could lead to less congestion and a more comfortable terminal experience.

Chapter 5 will discuss the research methodology which will be used as the first step in examining the conflicting interests of airline management, airport operator and passenger expectations

CHAPTER 5

5 Research Methodology

5.1 Introduction

This chapter discusses the research methodology adopted to accomplish the research aims and objectives. Section 5.2 defines the methodology for the research. Section 5.3 discusses the interrelationship between the research questions, research aims and objectives. Section 5.4 explains the methodology adopted through research methods. Sampling decision and elements of research variables are presented in detail in Sections 5.5 and 5.6, respectively. Section 5.7 briefly discusses the data collection methods. Sections 5.8, 5.9 and 5.10 explain the surveys conducted for Air Asia passengers, airline management and airport operator, respectively. An interactive research design was used as a guide to enhance the quality, validity and reliability of the research. Discussion of the research process and techniques adopted, which include the appropriate method to manage the research work, is also presented.

This chapter also discusses the proposed conceptual model development115 based on an evaluation of the provision of facilities (TFs)116 to be included in LCT design. Section 5.11 supports the argument for TFs evaluation. This section links the relevancy of the literature that has been reviewed (Chapters 2, 3 and 4) with the proposed methodology for evaluating the provision of TFs. Considering the cost and revenue structures, and airlines, airport and passengers' expectations, the resulting analysis is intended to make a significant contribution to knowledge by the development of suitable methodology to propose an optimum provision of TFs in LCT design.

Sections 5.12 to 5.13 discuss how the examination of the relationship between cost and revenue structures and airlines, airport and passengers' expectations will be bridging a gap in current knowledge. Based on the literature review summarised in Chapters 2, 3 and 4, a conceptual framework of the proposed methodology has been formulated (Section 5.14). The proposed conceptual model therefore takes into consideration issues which have arisen in current LCT development discussed in earlier chapters of the thesis.

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[115] The model refers to the preferences of TFs by considering airlines, airports and passengers views for LCT design.

[116] Terminal Facilities (TFs) refers to the selection of TFs provision in LCT design. The terminal is divided into three different critical areas: departure concourse, departure lounge and arrival areas.

5.2 Definitions

Research methodology is known as the adoption of a specific method of research in order to achieve the aim of the research as well as covering the entire research process (Creswell, 1994). The process includes scientific measurement to examine the research area that is being studied. The process also involves the collection of data or information on the research subject in order to achieve the research aims. Therefore, the research methodology could lead to the understanding of a tool or method of research in order to have a better understanding of the research concepts.

The research background for a social sciences approach deals mostly with the participants' thoughts117, and opinions, perceptions and experiences throughout the research activity. Research also requires the identification of a specific methodology to achieve the aims of the research and the entire research process (Creswell, 1994). The process includes specific measurements of the research activities in order to examine the activities that are being studied. It is, therefore, necessary to collect data and information to achieve the aims and objectives of the research. In addition, the research methodology could bring about a better understanding of a tool or method of research that has been used to examine the research concept.

The research approach allows the researcher to conduct an exploratory study to design a more systematic and extensive study. The approach could be one or more of the following: exploratory, descriptive and explanatory. The exploratory approach is used when the topics or issues have been explored in a less structured way (for example, asking questions and investigating the current problem or issue from different perspectives). The descriptive approach is the recommended approach for describing a situation or problem after extensive previous knowledge of it (Robson, 2002) has been identified. This approach is largely used in applied research methods and describes more accurately the portrayal of adequate persons, events or situations. The explanatory approach focuses on the research topic and examines the reason it exists or operates in the way it does (Neuman, 1994, Robson, 2002). The approach provides the reasons why something or an event occurs and builds on previous exploratory and descriptive researches. The exploratory approach has been adopted for the LCT research.

The research contains both qualitative and quantitative analyses that are used to test the hypothesis. This requires sufficient data collection in order to get an adequate response from the airlines, airport and passengers to test the hypothesis that has been constructed.

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[117] This shows the airlines, airports and passengers perceptions on the relationship between provision of terminal facilities and cost and revenue structures for LCT design.

The qualitative technique is the best approach to use in order to be able to understand the concept or phenomenon that has had little research previously undertaken on it (Creswell, 2003). It is used optimally for a situation that can increase understanding, expand knowledge, clarify real issues and also explain attitudes and behaviour. Similarly, it can be used to fill the research gap, establish the hypothesis and involve a large number of participants as well as using the exploratory approach to reveal new knowledge within the research. It is advisable to use a qualitative technique in order to explore in-depth and find reasons behind various aspects of behaviour (including perception and expression). It also includes in-depth interviews, focus groups etc.

Quantitative research is when scientific techniques are used to obtain quantified data that is evaluated in the light of existing knowledge (Bryman and Cramer, 1990). The quantitative method seeks to gather factual data in order to study relationships between research variables. It examines the relationships based on findings and theories of previous studies and research. It conveys a sense of solid and objective research by the use of numbers and is also capable of presenting the findings in the form of graphs and tables to contribute to model development.

5.3 Research Questions, Aims and Objectives

The research design proposes a better understanding through the conceptual procedure to set up the guidelines for the research process. As stated by Maxwell (1996), the research design includes the research questions, methods, purpose and conceptual context which results in increased reliability and research validity. Indeed, the research design acts like a mind map-map or a blueprint which enables conceptual and visual thinking on the research subject to be possible. Through the research design, it will be possible to create the steps of the research investigation and associated experiments to achieve the aims and objectives of the research.

As shown in Chapter 1, Table 1.1, the research questions were selected after identification of the problems which have influenced the LCT development. As previously discussed in Chapters 2, 3 and 4, it has been noted that airport planners are still struggling to identify accurately the TFs which can meet the preferences of airlines and passengers. In addition, cost constraints have already put additional pressures on airports to reduce the amount of capital investment through the introduction of a simplified terminal design and basic facilities. This is, therefore, why the research questions should be able to provide an answer to bridge the research gap and link with the research problems. Appropriate research techniques and procedures have been developed accordingly in order to achieve the research aims and objectives, after taking into account the relevance of the research questions. Moreover, the research questions have a direct impact on the research outcomes which lead to wider interpretation of the research results.

One of the research purposes is to contribute to new knowledge by proposing an adequate methodology for evaluating alternative LCT conceptual models. The designed research methodology should take into consideration the following elements: expectations of airline management, airport operators and passengers, and the influence of cost (capital investment, operational charges and airport charges) and revenue structures (airport revenues). These elements were used to develop guidelines for evaluating terminal facilities. Therefore, in return, the research will be beneficial for airline management, airport operators and passengers by providing specific guidelines on the prioritisation of which facilities should be included in LCT design.

As described in Chapter 1, Section 1.4, the research aims and objectives were developed based on the specific experiences of KLIA LCT after consideration of the design and development of various LCTs worldwide. It is expected that the specific research aims and objectives will be sufficiently robust to provide a guide on TFs provision to airport designers of similar LCT models. The research objectives and questions are used as a guide to the research. They also provide guidance for setting up an appropriate research methodology in order to achieve the research aims. The research aims were developed with regard to answering the questions 'what is the ultimate purpose of the study' and 'what is the essence of the research'. However, the research objectives are established specifically to define certain goals to be achieved. In other words, 'what precisely do you want to obtain from this research'? Also, the research questions were constructed so as to identify the problem areas which may lead to solutions.

The research objectives and questions will lead to the research design to achieve the aims of the study. Table 5.1 shows the interrelationship between research questions and objectives in order to accomplish the goal of the research.

Table 5.1 Relationship between research questions and objectives (Author)

Research Question (Table 1.1, Section 1.1)	**Research Objectives**		
	1	**2**	**3**
1	X		
2	X		
3	X		
4	X		
5		X	X
6		X	X
7		X	X

To fulfil the first aim of the research, a literature review was undertaken from various sources. The published sources include textbooks, refereed journals, magazines, conference proceedings, theses, websites, newspapers and organisation publications.

Keywords such as low cost terminal, terminal facilities, airport charges, aeronautical charges, non-aeronautical charges, commercial revenues, airports, low cost airlines and research methodology were used when seeking information from the internet and other sources.

Recommended high level databases have been extensively used such as Ecopus, Emerald and Science Direct after considering the reliability of their materials. The databases offer abstracts and indexes which include various professional journals covering the research subject. E-journal facilities were explored in order to give additional information on the intended subject. Access to organisational websites through the internet was beneficial for checking the progress of recent LCT developments. It was also worth while taking note of the views of relevant papers and reports prepared by aviation-related organisations such as IATA and ICAO. However, the literature review was necessarily a continuous process in order to acquire up-to-date information.

To fulfil the second aim of the research, which was to measure the relationship between the cost and revenue structures and the conflicting expectations of parties involved (airline and airport managements, and passengers), and to propose adequate facilities as required by the airlines, airports and passengers after taking into consideration cost and revenue structures at KLIA, Malaysia, the author chose multiple surveys as the principal research methodology.

5.4 Research Methods

The research component is defined as an application of scientific procedures towards acquiring appropriate answers to a wide variety of research questions (Adam and Schvaneveldt, 1991). It includes four main elements, which are selection of research approach, sampling decision, data collection method and data analysis techniques (Zainul Abidin, 2005). Selection of research approaches reveals the set of techniques or processes which may have taken account of the knowledge gaps and the research questions explained in Chapter 1, Table 1.1 and Chapter 5, Table 5.1. From the literature search, the research approaches can be encapsulated into three different categories: research foundations, approaches, and techniques; these will be further explained in this Chapter.

The methods have been adopted in the distribution of research tasks, which are literature review, pre-development survey[118] and post-development survey[119]. These tasks have been selected with the aim of achieving the research objectives. Table 5.2 describes the research tasks implemented in the research.

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118 The pre-development survey refers to research activities (pilot study and field study) that have been conducted during construction of the LCT.

119 The post-development survey refers to the research activities after KLIA LCT became fully operational.

The elements of pure research shown in Table 5.2 integrate the research tasks and objectives as they are aimed at exploring the selection of an appropriate methodology to examine the inclusion of TFs in LCT design. Pure research120 is first-hand knowledge which considers exploration of a new idea or concept in research. It also introduces advanced knowledge to support research theories and addresses more theoretical issues to acquire for knowledge (Holt, 1998). An exploratory approach121 is most common in pure research (Robson, 2002). The research indicates the influence of cost and revenue structures on LCT development, therefore, the development of a theoretical framework, with inclusion of cost and revenue structures, can be established. The first objective reviews current knowledge through an extensive literature search, bridging the present knowledge and research gap, by adopting an exploratory approach. In addition, an exploratory research approach is used when a new topic or issue is explored which requires additional information on LCT development. A less structured approach is encouraged to explore accurate information, ask questions and evaluate the current problem in different perspectives. Exploratory research enables the design and execution of more systematic or extensive studies (Neuman, 1994).

Table 5.2 Adopted Methodologies (Author)

No.	**Research Tasks**	**Research Objectives**		
		1	**2**	**3**
1.	Literature Review	X		
2.	Pre- Development Survey		X	
3.	Post-Development Survey		X	X

The second objective examines the different interests of airline management, airport operators and passengers' expectations for LCT facilities. The second objective intends to examine the relationship between the influence of cost and revenue structures and the provision of TFs. Exploratory research was conducted by surveying airline management, airport operator and passengers' needs for adequate TFs. Thus,

120 The research foundation consists of two types: pure and applied. Applied research is a descriptive approach which focuses on a problem solving solution to accomplish a research task. Applied research is more concerned with work on specific situations, events or answering specific questions.

121 The research approach includes three different categories which are exploratory, descriptive and explanatory. Descriptive research is the recommended approach to describe a situation or problem after extensive previous knowledge of it (Robson, 2002). Therefore, this approach is largely used in applied research methods. It starts with a well-defined research subject. It describes more accurately and portrays an adequate profile of persons, events or situations. The explanatory approach focuses on the research topic and provides a picture of it. It also examines the reasons why it exists or operates in the way it does (Neuman, 1994; Robson, 2002). This approach provides the reasons for something/an event occurring and it builds on exploratory and descriptive research.

quantitative techniques[122] were used to gather data from airline management, the airport operator and passengers through a series of surveys. According to Bryman and Cramer (1990), scientific techniques are used to obtain quantified data which are evaluated in the light of existing knowledge. The technique seeks to gather factual data by a study of relationships between facts, and examines the relationships based on findings and theories of previous studies. The mix of questions, which reflect open and closed questionnaires, was designed to measure this relationship. The questionnaire was designed with the aim of increasing the reliability and validity of the research in order to serve quantifiable and managerial purposes.

The pre development survey (Task 2) was conducted to explore new, preliminary issues after taking into account the basic LCT concept. The self-designed questionnaires were intended to explore the important needs of airline management, airport operator and passengers towards LCT facilities provisions. The results of the survey were interpreted and analysed by software (SPSS 14) in order to generate results in a format suitable for meaningful interpretation.

As a result of the pre-development survey, exploratory research was also adopted in Task 3 by determination of core and secondary LCT facilities. The determination of the core and secondary facilities of LCT design can be justified after the post-development survey has taken place. The survey also considers the practicality and current environment of LCTs, as well as airline management and passengers' experiences. This task involved measuring the influence of cost and revenue structures and provision of TFs in accordance with their experiences regarding the inclusion of TFs in current LCT models. To increase the reliability of the findings, an airport management survey was conducted to evaluate the response of the airport authority on the practicality of the providing specific LCT facilities.

A non-bias technique was introduced for the evaluation of the relationship between cost and revenue structures and TFs. A combination of open and closed questions was used in this research, which may lead to a quantifiable measurement of the research technique. In view of the unavailability of scientific evidence in published references or material in literature, the post-development survey was subjected to assessment through an exploratory approach before it was tested in industry.

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[122] In contrast, the adoption of qualitative techniques is the best approach to understand a concept or phenomenon with little research conducted in the area (Creswell, 2003). It is used optimally for situations which will increase understanding, expand the knowledge, clarify the real issues, and explain or explore attitudes and behaviour. It provides an input for a future stage of research or development (Gordon and Langmaid, 1988). This technique is able to find the research gap, establish the hypothesis and involve a large number of participants to represent the whole of the population. It also uses the exploratory approach in order to reveal new knowledge on research. It is advised to be used in order to explore in-depth studies relating to affective and subconscious motivation. It also includes in-depth interviews, focus groups and projective techniques.

5.5 Sampling Decisions

As stated by Sekaran (2003), a 'population' comprises an entire group of people, events or objects of interest that a researcher wishes to investigate. 'Element' defines a single member of the population. Taking passengers as an example, Air Asia passengers have been selected as an element of a population. A 'sample' is a process of selecting a sufficient number of elements from the population. Greater understanding of sampling decisions would make it possible to generalise characteristics of the population (Sekaran, 2003). The sampling focuses on a small numbers of respondents and attempts to investigate at field study level. The purpose of sampling is to select a representative and non-biased sample to ensure the reliability and validity of findings (Zainul Abidin, 2005). Sampling decisions are important to increase the research quality by an adequate sampling technique. The sampling decision is important as it can avoid a research bias in results analysis and interpretation. Adding to this, Davis and Girdler (1999) stated that validity of research outcomes can be established after taking into account that the 'element' has the knowledge, ability, capacity and willingness to participate in the research. Therefore, the sampling technique is designed to ensure that conclusions can validly be drawn from the sample, depending critically on both the population sampled and the procedures used for generating the sample (Sharp and Howard, 1996).

The sampling method is divided into two types: probability sampling designs and non-probability sampling. Probability sampling means that every member of the population has a statistically equal chance of being selected (Hannagan, 1986; De Vaus, 1990). Simple random sampling, stratified random sampling, systematic random sampling, cluster sampling and multi-stage sampling are categorised as probability sampling designs. Non-probability methods are chosen based on the judgement of the researcher in order to achieve the aim and objectives of the research. According to McNeille (1990) and Patton (1990), the type of sampling method is called 'purposive sampling' which provides advantages to the researcher in selecting the particular field group after considering the aim and objectives of the research. Non-probability samplings are in four groups-convenience sampling, quota sampling, purposely sampling and snowball sampling.

5.6 Justification of the data (research variables), analytical techniques used, and reliability and validity

5.6.1 Research variables

A variable refers to a characteristic or attribute of an individual or an organisation that can be measured or observed, and that varies among the people or organisation being studied (Creswell, 2003). Dependent variables are variables that depend on the independent variables as a result of the influence of the independent variables (Creswell, 2003). In this research context, elements of dependent variables[123] have been identified as TFs in three critical areas of LCTs, which are:

1. Departure Hall (for example, Flight Information Display System (FIDS), self-service and manual check-in)
2. Departure Lounge (for example, FIDS, seating and prayer room)
3. Arrival Hall (for example, baggage reclaim signage and the number of reclaim carousals).

As TFs were identified as dependent variables, this means the provision of specific TFs as part of LCT design is highly dependent on cost and revenue structures. Therefore, it is known that the cost and revenue structures appear as independent variables of the research. Independent variables can be described as phenomena that cause changes in the dependent variables (Gill, 2002). In this research context, the independent variables are also known as controlled variables or input variables that significantly influence the provision of LCT facilities (Chapter 3, Section 3.5). Also, the researcher has taken advantage of the independent variables to measure the willingness of respondents to trade-off cost / price against LCT facilities. The second set of variables, which are demographic profiles, was justified as independent variables such as those below:

1. Purpose of travel (business and leisure)[124] of Air Asia's passengers, therefore, it evaluates passengers' expectations and experiences towards the provision of LCT facilities.

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[123] 1. Selection of research variables was based on observation and internal documents (for example, master plan) associated with LCT terminal facilities.
2. In terms of passenger responses for other terminal facilities, interpretation and classification of significant variables has been made. For example, the passengers expressed 'movie' as important variable to be included at departure lounge. However, the author interpreted this as 'television' which is more significant to the research context. Most of other TFs are related to the terminal service levels such as speed, congestion and inconvenience. Therefore, these variables were excluded as they were not in the research scope.

[124] Leisure traveller includes holiday makers, visiting friends and relatives, and weekend with friends as stated in the pre-designed questionnaire for passengers.

2. Position of airline and airport managements (executives and managers), therefore, it measures the respondents position on their expectation and experiences towards the provision of LCT facilities.

5.6.2 Analytical Techniques (Spearman Correlation Test, Mann Whitney Test and Chi-Square Test)

1. Spearman Correlation Test

The Spearman Correlation Test has been used to give meaningful interpretation of the research outcomes. The test is used to assess the relationship between variables which are not measured on an interval or ratio scale. The test measures the variables on a rank scale, which means that the variables can be ranked in two ordered series and are measured on an ordinal scale (S. Mann, 2007). Spearman's correlation test (Figure 5.1) examines relationships between two ordinal variables and the measure of linear relationship between two sets of ranked data. Spearman's Correlation takes a value between -1 and +1. A positive correlation is one in which the ranks of both variables increase together. A negative correlation is one in which the rank of one variable increases as the rank of the other variable decreases. A correlation of +1 or -1 will arise of the relationship between two variables is exactly linear. A correlation close to zero means there is no linear relationship between the ranks. Spearman's Correlation assumes the variable is normally distributed and is used more frequently for research as it is of wider validity (Altman, 1991). Table 5.3 shows the Spearman Rho Coefficient Correlation values between -1.00 through 0.00 to +1.00 and the associated statistical interpretation

$$\rho = 1 - \frac{6 \sum d_i^2}{n(n^2 - 1)}$$

where:

$d_i = x_i - y_i$ = the difference between the ranks of corresponding values X_i and Y_i, and

n = the number of values in each data set (same for both sets).

Figure 5.1 Spearman Correlation Test

The Spearman Correlation Test investigates the TFs deemed as important by leisure and business travellers with variable fares at specific reduced decrements of 10%, 20%, 30% and no change. The questions were aimed to measure the willingness of low cost passengers to trade-off the amount they pay against the provision of TFs in LCT design. The data was cross-referenced with air fare reductions (10%, 20%, 30% and no change). The outcomes lead to a cross-price elasticity dynamic, whereby the optimum fare ranges are determined. The passengers had the option to use air fares as a main indicator in expressing their needs for TFs in the LCT area. The survey included business and leisure passengers using Air Asia services.

The Spearman Correlation Test was also used to measure the relationship of TF provision, in LCT design, for each reduced fare decrement (10%, 20%, 30% or no change). In this survey, each passenger was asked to express their reactions based on their experience of using the TFs in the LCT. The closed questions had two sections, departures and arrivals. In the departures section, questions were specifically asked to reveal what TFs are sensitivity correlated in the check-in and boarding areas. The arrivals section was used to evaluate the provision of TFs in the baggage reclaim area and arrival hall. The inclusion of commercial facilities in the questionnaire was to measure passengers' preferences to have those facilities included in the LCT design. Since meaningful interpretations on survey outcomes are considered of importance, selected cases were used with Spearman Correlation Test is used to rank scale[125] the TF importance level. Passenger preferences for adequate provision of TFs are shown by the appropriate tables, and were proved by statistical correlation between the stated preferences of business and leisure passengers.

The same Test has also been used to evaluate the TFs deemed important by LCC managers and executives based on expectations that airport charges may vary in reduced decrements of 10%, 20%, 30%, or no change. The questionnaires asked the Air Asia respondents if they would prefer to trade-off between the provision of TFs and a reduction of airport charges in these discrete decrements. The inclusion of specific TFs in LCT design is important if there was an option for a possible reduction of charges to the airlines. The data was cross-referenced with airport charge reductions of 10%, 20%, 30% or 'no-change' charges The LCCs have an option to suggest variable airport charges against the provision of TFs, by expressing their preferences for specific TFs in the LCT area.

In this survey, the managers and executives expressed preferences for the provision of specific TFs in the LCT. The open-ended questions (with the inclusion of discrete decrement of 10%, 20%, 30% or 'no-change' charges) were used to determine the correlation between charges and facilities in the three major parts of the LCT: check-in, departure lounge and arrival areas. The analyses of the survey results are important, as the selected cases used the Spearman Correlation coefficient to rank the importance level in accordance with the LCC's preferences. The Spearman Correlation coefficient measures the variables on a rank scale, which means that the variables can be ranked in two ordered series (Norusis, 2002), as the correlation analysis is used to determine the extent to which changes in the airport charges of an attribute are associated with changes in provision of TFs.

Then, use of the Spearman Correlation Test continued to investigate the provision of TFs linked to flexibility of cost (airport charges, capital investment and operations) and

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[125] Scales used to test preferences between two or more objects or items (Sekaran, 2003)

revenue (airport revenue) structures in general, as deemed important by the perception of airport management. The questionnaire aimed to investigate the willingness of airport management to trade-off between the provision of TFs and the flexibility of cost and revenue structures in LCT design. Selection of TFs is important to the design as this would influence airport charges, capital investment, operational costs and airport revenues. The results appear in the cross-price elasticity dynamic in general, whereby provision of TFs is decided regardless of manager and executive positions. The survey indicates the willingness of the group of managers to trade-off between the provision of TFs and cost and revenue structures.

The open-ended questions were used chiefly to determine the influence of the cost and revenue structure sensitivity correlated in the three major parts of the LCT design: check-in, departure lounge and arrival areas. The Spearman Correlation Coefficient[126] was used to rank the levels of TF importance in accordance with the airport operators' expectations, and to determine the extent to which changes in cost and revenue structures are associated with changes in provision of TFs. Table 5.3 shows that the relationship of TFs and cost and revenue structures signifies the statistical relationship between both managers and executives in accordance to low importance, moderate importance and high importance for specific TFs to be included in terminal design.

2. The Mann Whitney Test

This section investigates a hypothesis testing analysis using the Mann-Whitney-Wilcoxon (Mann-Whitney) test[127] to determine the allocation of core and secondary TFs in LCT design. The Mann Whitney Test (Figure 5.2) is used to measure statistical hypothesis by using a non-parametric test to determine the core[128] and secondary[129] TFs in LCT design. The Mann Whitney Test[130] has been selected to measure the relationship of two samples from the same population having same distribution (Coakes et. al., 2006). The Test is a nonparametric test for examining significant differences when the dependent variable is measured on an ordinal scale and the independent variable on a nominal scale (Sekaran, 2003).

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[126] Research Methods in Psychology, Department of Psychology, College of Arts and Sciences, University of Central Florida, USA, https://webct.ucf.edu/dav/psy3214a/reach/notes/notes4correlation.html

[127] The Test can be used when the sample size is small (less than 30)

[128] These are the most important facilities to be included into LCT design after considering business and leisure passengers' expectations.

[129] These are less important facilities to be included in LCT design after considering the business and leisure passengers' expectations.

[130] The test is used to compare the average value (median) of a quantitative variable or compare the average value of qualitative variable (ordinal).

Table 5.3 Interpretation of Spearman Correlation Coefficient

ρ (rho) value	Interpretation	ρ (rho) value[131]	Interpretation	Result
ρ > 0	There is a positive correlation between air fares / cost / revenue structures and provision of TFs If the value of one variable increases, the value of other variables will also increase	ρ < 0.39	It shows that there is a less positive correlation between two measured variables	Low importance
		ρ = 0.39 to 0.59	It shows that there is a moderate positive correlation between two measured variables	Moderate importance
		ρ > 0.59	It shows that there is a strong positive correlation between two measured variables	High importance
ρ = 0	There is no correlation between air fares / cost / revenue structures and provision of TFs			
ρ < 0	There is a negative correlation between air fares / cost / revenue structures and provision of TFs If the value of one variable increases, the value of other variables will be reduced	ρ > -0.39	It shows that there is a less negative correlation between two measured variables	Low importance
		ρ = -0.39 to -0.59	It shows that there is a moderate negative correlation between two measured variables	Moderate importance
		ρ < -0.59	It shows that there is a strong negative correlation between two measured variables	High importance

[131] Research Methods in Psychology, Department of Psychology, College of Arts and Sciences, University of Central Florida, USA, https://webct.ucf.edu/dav/psy3214a/reach/notes/notes4correlation.html

The test is useful for assessing between two independent samples if observations are related and have the same distribution. The two independent samples test is needed to compare the distribution of one or more numeric variables between two groups (Norusis, 2002). The test is a nonparametric test for examining significant differences when the dependent variable is measured on an ordinal scale and the independent variables are measured on a nominal scale (Sekaran, 2003). The Mann-Whitney test was considered useful to determine the core and secondary TFs for LCT design as the research hypothesis is designed to accept and reject the significant alpha of 0.05.

$$U = n_1 n_2 + \frac{n_2(n_2+1)}{2} - \sum_{i=n_1+1}^{n2} R_i$$

where samples of size n_1 and n_2 are pooled and Ri are the ranks.

Figure 5.2 Mann Whitney Test

a) The Mann Whitney Test[132] has been suggested as an appropriate means for measuring whether the combined purpose of travel (business and leisure) has a significant influence on the determination of core[133] and secondary[134] TFs.

b) The adoption of the Mann-Whitney test is useful as an appropriate means for measuring if the combination of airport charges (in discrete decrements of 10%, 20%, 30%, or 'no-change' rate) had any significant influence on the selection of core and secondary TFs in LCT design.

c) The test[135] is proven for evaluating between two independent samples of numeric variables between two groups, in order to propose a TFs model based on airport preferences. The test was also useful as an appropriate means for measuring the cost (airport charges, capital investment and operational costs) and revenue (airport revenues).

3. **Chi-Square Test**

Figure 5.3 shows a non-parametric statistical test that examines the significant relationship of demographic profiles and attitudinal profiles of arriving and departing passengers. The Chi-Square Test is used to measure a significant relationship between

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132 The research findings attempt to rank and group the provision of TFs to the core and secondary facilities based on the influence of air fares.

133 These are facilities of high importance to be included in LCT design, after considering business and leisure passengers' expectations.

134 These are facilities of low importance to be included in LCT design, after considering business and leisure passengers' expectations.

135 The test can be used when the sample size is too small (less than 30)

two categorical or numerical variables from an independent group of sampled data (Sekaran, 2003). The demographic factors were tabulated according to age (under 20 years, 21 to 34 years, 35 to 50 year and over 50 years), annual income (up to RM12,000, RM12,001 to RM24,000, RM24,001 to RM36,000, RM36,001 to RM48,000, RM48,001 to RM60,000 and over RM60,000) and purpose of travel (business and leisure). The Chi-square statistic results of demographic profiles and the attitudinal profiles of arriving and departing passenger are discussed further in Chapter 6, Section 6.4.

$$
\begin{aligned}
X^2 &= \frac{(x_1 - E_1)^2}{E_1} + \frac{(x_2 - E_2)^2}{E_2} + \cdots + \frac{(x_k - E_k)^2}{E_k} \\
&= \sum_{i=1}^{k} \frac{(x_i - E_i)^2}{E_i}
\end{aligned}
$$

Where: x^2 is the chi square statistic, x_i is the observed frequency, and E_i is the expected frequency

Figure 5.3 Chi-Square Test

1. Testing the statistical hypothesis analysis: The Chi-Square Test

This section discusses the statistical hypothesis testing analysis by using a non-parametric test to determine the demographic profiles towards the attitudinal profiles of arriving and departing passengers are significant (as discussed in Chapter 5, Section 5.6). A non-parametric statistical test was used to evaluate the expected frequency and the observed frequency. The hypotheses were derived generically in the form of a null hypothesis:

> Ho: If $p>0.05$, There is no significant difference between demographic profiles of passengers and attitudinal profiles of arriving and departing passengers;

The result will accept Ho if the p value is greater than 0.05.This means that there is no significant relationship between the demographic profiles towards the attitudinal profiles of arriving and departing passengers.

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H_1: If p<0.05, There is a significant difference between demographic profiles of passengers and attitudinal profiles of arriving and departing passengers

The result will accept H_1 if the p value is less than 0.05. This means that there is a significant relationship between the demographic profiles towards the attitudinal profiles of arriving and departing passengers.

Table 5.4 Chi- Square Test

Post Development	**Departure**		**Arrival**	
Significant Value (α)=0.05	Age	Income Levels	Age	Income Levels
Chi-Square	.0110	.0150	0.086	0.023

From Table 5.4, the results show that there are significant relationships between demographic profiles [age (.011), income levels (.015)] and departing passengers. The Chi-square test indicates that the age (0.086) and income levels (0.023) of arriving passengers are reliable. Therefore, the demographic profiles and the attitudinal profiles of arriving and departing passengers are significant and reliable at 0.05 of alpha.

5.7 Reliability testing

The reliability test is an indication of the stability and consistency with which the questionnaires were analysed. The process is able to avoid bias (error free) of the measured variable. In this research, Cronbach's Alpha (Cronbach, 1946) has been used to test the questionnaires. Cronbach's Alpha Coefficient measures the average correlation of items in a survey instrument to gauge its reliability. The Alpha coefficient ranges in value from 0 to 1. The higher the score, the more reliable that generated scale is.

The reliability test score of departing and arriving passengers was considered as high, being 0.711 and 0.812 respectively. The result is interpreted is being a high level of satisfaction for both sets of passengers from the pilot study test. The results encouraged the use of the predesigned questionnaire for use in the post-development survey.

5.7.1 Validity and Reliability

In order to improve the research quality, it was noted in the literature review that the research needs to be validated and reliable for the further research. Validity refers to the correctness or credibility of a description, conclusion, explanation or other sort of account (Hammersley, 1992). Validity is primarily important in a research context as it deals with the integrity of the research. Measures to reduce bias and improve validity, reliability and research ability were integrated into the research method. The validity and reliability of the process should bring about the advantages of the research process by consideration of the overall tasks in the research phase that are controlled by adequate techniques or approaches. The whole process was synchronised from the research approach, including aims, objectives, sampling techniques, data collection and data analysis.

In addition, the following measures were taken to improve validity and reliability:
1. The research aim and objectives were designed to answer the research questions;
2. The research methodology was tested in order to justify and evaluate the research variables and satisfy the aims and objectives. In addition, an appropriate research technique was adopted to reduce research constraints; and
3. Combinations of research methods, sampling, and data collection methods and data analysis techniques were employed.

The validity and reliability of the research questionnaires were determined as follows:
1. Several pre-and post-development questionnaires were developed to assist in achieving the research aims and objectives;
2. Pre- and post-development questionnaires were subjected to pilot studies in order to enhance the reliability and validity of the research and, hence, research quality;
3. Respondents from airlines and airports were selected from managerial and executive levels and who were directly involved in LCT development;
4. The questionnaires were directly distributed to target respondents to enable a clear understanding of the research questions so as to improve accuracy in responses; and
5. The Likert and Comparative Scales were uniformly applied to ensure consistency.

The reliability of the assessment method was enhanced through the following measures:
1. Adequate clarity in the definition of the purpose and process of questionnaire assessment;
2. Continuous attention was given to the working environment to ensure the information given was adequate; and
3. Scales within the questions were uniformly set in order to reduce information processing by respondents.

To ensure the validity and reliability, guidelines were applied as listed below:
1. The conclusion of the research was justified and the research gap fulfilled. The limitations or barriers encountered are presented;
2. The thesis is based on exploratory research, with accurate findings and with avoidance of bias;
3. The research method was justified, selected and presented; and
4. A compilation of data sources to strengthen research validity and reliability was used.

5.8 Data Collection and Questionnaire Analysis

Data collection is a core activity of the research process, achieved by gathering various sources of primary and secondary data to achieve the research aim and objectives. Selection of an appropriate data collection method is important to increase the research validity and reliability. As explained by Yin (1994), each of the data collection methods also reflects the method's initial orientation and its assumption about whether to follow the rules of scientific inquiry. Therefore, data collection involves different activities including literature review (as discussed in Chapter 2, 3 and 4) and questionnaires. The data collection activity indicated that qualitative, quantitative and the combination of both should be applied in conducting the research (Zainul Abidin, 2005). Qualitative research was carried out in order to understand meanings, describe and understand experiences, ideas, beliefs and values (Wisker, 2001). The research used a quantitative method which was focused on numbers or statistical evidence to prove the relationship between two variables. As a matter of fact, the quantitative method has been frequently used during the course of the research. However, the qualitative method basically deals with words, describes situations and interprets the relationships between the variables.

Data analysis is concerned with analysing and interpreting collected data (Maxwell, 1996), and includes the activity of making sense of, interpreting, or theorising the data (Schwandt, 1997). Data analysis includes two types of data which are qualitative[136] and quantitative. The data acquired from this research was quantitative. Statistical analysis, such as frequency, Spearman coefficient Correlation, Mann-Whitney etc., (see above) was used to analyse the data. After the data was analysed, it was presented in the form of tables, charts and figures (further discussion can be found in Chapters 6, 7 and 8)

In this research, quantitative data was used in order to evaluate the relationship of the cost and revenue structures and provision of TFs. Quantitative techniques were also used to determine the core and secondary facilities of LCT design. According to Fink (2003), quantitative data involves numbers and qualitative deals with words. The quantitative method has mostly been applied in the research process. This will increase validity and reliability of the research in order to meet the research aims and objectives. Quantitative data was acquired to give significant results justifying the research outcomes and allows non-bias interpretation of the research results. It is also known as the scientific method, which demonstrates the findings of information in the form of graphs and tables that are associated with statistical analysis. The different types of quantitative data that are suitable for the statistical analyses are nominal, ordinal and numerical or interval. Firstly, the nominal data is the data coming from counting responses and placing them into categories. Secondly, the ordinal data is the data involved in ordered and ranked relationships (i.e. Likert scale). Finally, numerical or interval data is the ordinal data, but the categories are ranked on a scale and set at intervals.

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[136] Qualitative analytical techniques were avoided in this research as they include typology, content analysis and matrices.

5.8.1 Questionnaires

A questionnaire[137] is a compilation of questions used to acquire specific data or information from the respondent. According to Zainal Abidin (2005), a questionnaire is a data gathering device that elicits from a respondent the answers or reactions to printed (pre-arranged) questions presented in a specific order. A questionnaire may be divided into two types, open-ended or closed. The open-ended questionnaire allows respondents to answer in any way they choose (Sekaran, 2003). The closed questionnaire is designed to permit only one form of response (Davis and Girdler, 1999) and allow the respondents to make a choice from a set of alternative responses (Sekaran, 2003).

The questionnaires were developed in order to explore, probe and acquire new knowledge or information in a systematic way. Therefore, questionnaires were used several times in this research. The participating respondents (airline and airport management, and passengers) gave feedback to the pre-arranged questions which were presented in a specific order. In the pre-development survey, taking the passengers' questionnaire as an example, the questionnaire was set up to include closed questions in order to gather valuable information from the respondents. In the post development survey, a combination of open-ended and closed questions was introduced. The questionnaires were designed to be effective, approachable and easy to understand, thereby, the reliability and validity of the questionnaire can increase the quality of the research.

Assistance was received on designing the questionnaires through academic contacts, industrial experts and doctoral researchers in a process considered as peer assessment, which increased the validity and reliability of the questionnaires. Feedback and comments from peer groups was necessary to refine the questionnaire before the pilot test could be run on the targeted respondents (airline and passengers). A continuous effort of contact through e-mail and telephone was used to encourage better responses from respondents. In order to increase the response rate, the following techniques were adopted:

- A cover letter of self-introduction, questionnaire purpose, assurance of confidentiality/ privacy and expression of gratitude for their response was provided (Kanuk and Berenson, 1975);
- Instructions on completion of questionnaires were provided and explained;
- Self-designed questionnaires were developed to ensure that they were direct and clear;
- Dedicated persons were employed in order to distribute the questionnaires to passengers during the pre and post development surveys; and
- Follow-up sessions were conducted through e-mails and telephone to the airline respondents to remind them of the survey.

[137] A survey design provides a quantitative or numeric description of trends, attitudes, or opinion of a population by studying a sample of population (Creswell, 2003).

5.9 Pre-and Post Development Surveys: Air Asia passengers

A pre-development survey was conducted in the early stages of the LCT research. The survey was conducted for Air Asia passengers at the main terminal of KLIA, Malaysia[138] after taking into consideration the unavailability[139] of the LCT during the field study. The survey, a minor study, aimed at exploring passenger expectations on the importance and level of the provision of LCT facilities. Quota sampling was selected with the emphasis on ensuring that all parties were adequately represented in the study through which the series of surveys was conducted. Quota sampling also considered a form of proportionate, stratified sampling in which a predetermined proportion of people are sampled from different groups, but on a convenient basis (Cavana et. al., 2001). Survey sampling was based on quota sampling by ensuring that the target group (Air Asia passengers) were adequately represented in the study. The selection of the sample in quota sampling was made by the researchers, who had been given quotas to fill from specified sub-groups of the population. Ultimately, there were 350 responses from Air Asia passengers.

The post development survey was aimed at collecting Air Asia passengers' experiences from those who had used the TFs at KLIA LCT. The aim of the survey was to assess the position of passengers who were willing to trade-off between the provision of specific TFs within a LCT, compared with 'normal' terminals, with a fare reduction (in discrete decrements of 10%, 20%, 30%, and no change). The results also identified the core and secondary facilities that should be retained when the passengers trade-off as a result of a fare reduction. There were 360 respondents who were interested and willing to participate in the survey. Taking advantage of the successful preliminary study on the pre-development survey, quota sampling was again applied to obtain suitable data from the respondents. This survey also ensured that all the subgroups (arriving and departing passengers) were adequately represented in order to explore their expectations on the provision of TFs as part of current LCT design.

Table 5.5 shows that a total of 350 respondents participated in the pre-development survey. There were 267 respondents from departures and 83 respondents from arrivals. Similarly, for the post-development study, there were 264 respondents from departures and 96 respondents from arrivals. The proportion of respondents from departures is higher bearing in mind the additional processing activities in that area, such as check-in, security and retailing. Facilitation in the arrivals area does include baggage reclaim facilities, but there were less retail and processing activities compared with the departure areas.

[138] In comparison, from previous studies by O' Connell & Williams (2005) and Park and Zhang (1999), a total of 281 responses were collected at Irish Airports and 247 responses at KLIA and a sample size for Kimpo International Airport was suggested to be around 80.

[139] The LCT was unavailable because it had not been completed during the period in which survey was conducted.

The data was collected from the LCC passengers at KLIA main terminal (pre-development) on15th October 2005 and KLIA LCT (post-development) on 1st July 2007. The survey locations were in the departure lounge and arrival halls of both the Main Terminal and KLIA LCT. The survey collected the views of passengers on preferred LCT facilities. The survey is intended to be beneficial in setting up appropriate guidelines on ideal LCT facilities. The assistance of Malaysia Airport Technical Services (MAMTS)[140] was highly appreciated.

Table 5.5 Passenger sampling (Author)

Population	Element	Survey	Sample
Air Asia Passengers	**Passengers**	**Pre-Development**	**350 (267: Departure / 83: Arrival)**
		Post-Development	**360 (264: Departure / 96: Arrival)**

A draft of the questionnaire was prepared for the pre-development survey. The questionnaire was divided into two sections common to both departures and arrivals. Each section was divided into two parts. The first part of the questionnaire examined the importance of terminal facilities (TFs) within 'expected LCT design'. The second part of the questionnaire examined age, household income and purpose of travel. This general information was useful in obtaining accurate data on the background of the respondents, which might have a direct correlation with the responses to the questionnaires.

The post-development questionnaire was undertaken at KLIA LCT, Malaysia. The aim of the questionnaire was to evaluate the actual needs of the passengers and their consideration given to the set of preferences of current TFs availability in the LCT. Similar to the pre-development survey, the questionnaire was split into two sections that covered departures and arrivals. The questionnaire focussed on an assessment of the experience of LCC passengers who used the TFs at KLIA LCT. The survey used different levels / rates of discounted fares (in discrete decrements of 10%, 20%, 30% and no change) to measure the willingness of passengers to trade-off between the level of air fares and availability of LCT TFs. Table 5.6 outlines the structure of the pre-and post development questionnaires.

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140 Malaysia Airport Technical Services (MAMTS) had suggested distributing around 250-300 sets of the questionnaires in order to get an adequate level of response from the passengers. They are responsible for management, consultation and survey projects of Malaysia Airports Holding Berhad (MAHB).

Identification of the importance and criticality of TF was traced back to the literature review stage. From the literature, it is known that there are three basic facilities within LCT area: check-in, departure and arrival (baggage reclamation and arrival halls) (Chapter 4), and other facilities that indicate the availability of LCT commercial facilities. Further details of the questionnaires can be found in Appendices 1 to 4. Also, Figures 5.4 and 5.5 show the process for the pre- and post-development surveys.

In order to improve the quality of the research, the questionnaire was pre-tested. A pilot test was distributed to 30 passengers before each of the pre-and-post development surveys. Validity is an important procedure that was used to ascertain that the instrument (questionnaire) is designed to measure the research variables (Gay, 1992). The draft of the pilot study was distributed to targeted passengers indicating response, comments and questions' applicability, validity, relevancy and length. The process was vital to this research because the questionnaire has never been tested before and it is original (self-designed by the researcher). However, the subsequent surveys used the same technique in order to maintain the validity and reliability of the research.

Table 5.6 Pre- and post-development passenger questionnaire (Author)

Question	Pre-Development	Post- Development
Section A		
Q1	Listed several TF elements in LCT development based on literature review. This was to identify issues that are considered important to LCT development. The 'other' option is to allow the respondents to add more issues which, in their opinion, were important to LCT development (Appendix 1 and 2).	To evaluate if a significant relationship exists between air fares and the provision of TFs in the departure and arrival areas for LCT design. This gives a general idea of the trade-off between TFs and air fares (reduced decrements of 10%, 20%, 30% and no change). The questionnaire was also used to determine the core and secondary TFs for LCT design. (Appendix 3 and 4)
Section B		
Q1 to Q7	To identify the demographic background of the respondents to the LCT survey. The responses indicated respondents' age, income, purpose of travel and type of travel (international or domestic). 'Other' option was included in the questionnaire to allow the respondent to provide an alternative response.	

The pilot study questionnaire was administered to selected passengers who used Air Asia services for travelling and were experienced users of KLIA LCT facilities. The questionnaire was presented to the targeted group (25 sets of questionnaires to departing passengers and 5 sets of questionnaires to arriving passengers). The questionnaires received positive responses and comments from passengers. After reviewing the comments that had been made for the pilot test, the final draft of the questionnaire was split into the two sets, departing and arriving passengers' questionnaires.

This technique reduced the questionnaire length leading to an improved response rate from the passengers. The researcher also used a face-to-face interviewing technique to increase the response rate. The instructions on the front page of the questionnaires clearly explained that the respondents' answers would be kept strictly confidential, and that the questionnaires received with feedback would only be used for educational purposes.

5.10 Pre-and-post development survey: Air Asia management

The airline Air Asia Berhad was selected to be a major contributor to the research. The input from airline management on the selection of core and secondary provision of LCT facilities was very important. A specific sampling style was adopted in both the pre-and-post development surveys by selecting the names of respondents from browsing the official website and private contacts that were established during the study. As suggested by Maxwell (1996), the sampling style is suitable if a particular setting or people need to be deliberately selected in order to provide sufficient information to answer specific research questions. The element of the population was therefore identified as a management level that includes a group of individuals at senior management levels of Air Asia. The survey also considered the experience, expectations, ability, expertise and knowledge of airline management on LCT terminal planning. Thus, the validity and reliability of the data can be improved, as well as the needs and expectations of airline management being represented as a whole.

The post-development survey was aimed at evaluating the relationship between airport charges and TFs provision into LCT design as seen from the airline management point of view. As a comparison to the pre-development survey, the survey was undertaken within the LCT at KLIA, Malaysia. It is, therefore, the post development study that will investigate whether the current availability of TFs will satisfy the needs of airlines in terms of selection of core and secondary facilities in LCT design as a function of the airport charges structure. As stated in the previous paragraph, purpose sampling was adopted for the survey, focussing on the judgemental process of elements in their experiences of TFs, within the LCT. A choice of subjects was taken into consideration, for example, decisions by individuals being in the best position to provide information on TFs provision.

5.10.1 The draft and pilot study of the airline management questionnaire

The pre-development study for the airline was aimed at evaluating the airline's expectations towards LCT TFs criticality. It was realised that the viewpoints of airlines towards the selection of LCT TF was vital. Therefore, a draft of the pre-development questionnaire was designed. The questionnaire was divided into two different sections, Sections A and B. Section A examines the respondents' background and Section B evaluates the importance of airport charges and provision of TFs. Table 5.7 summarises the pre-development questionnaire structure.

The post development survey had two purposes. Firstly, to evaluate if a significant relationship existed between airport charges and the provision of TFs in the departure and arrival areas of the LCT. This gives a general idea of the consideration given to TFs and cost and revenue structures. Secondly, it was used to measure the relationship between TF provisions and airport charges structures (in discrete decrements of 10%, 20%, 30% and no change) in order to determine core and secondary TFs for LCT design. The self-designed questionnaire was developed and tested after completion of KLIA LCT. The questionnaire included two sections, A and B. Section A referred to the demographics of the respondents, while section B examined the relationship between cost and revenue structures and airport charges. Table 5.6 shows a comparison between the self-designed pre-and-post development questionnaires.

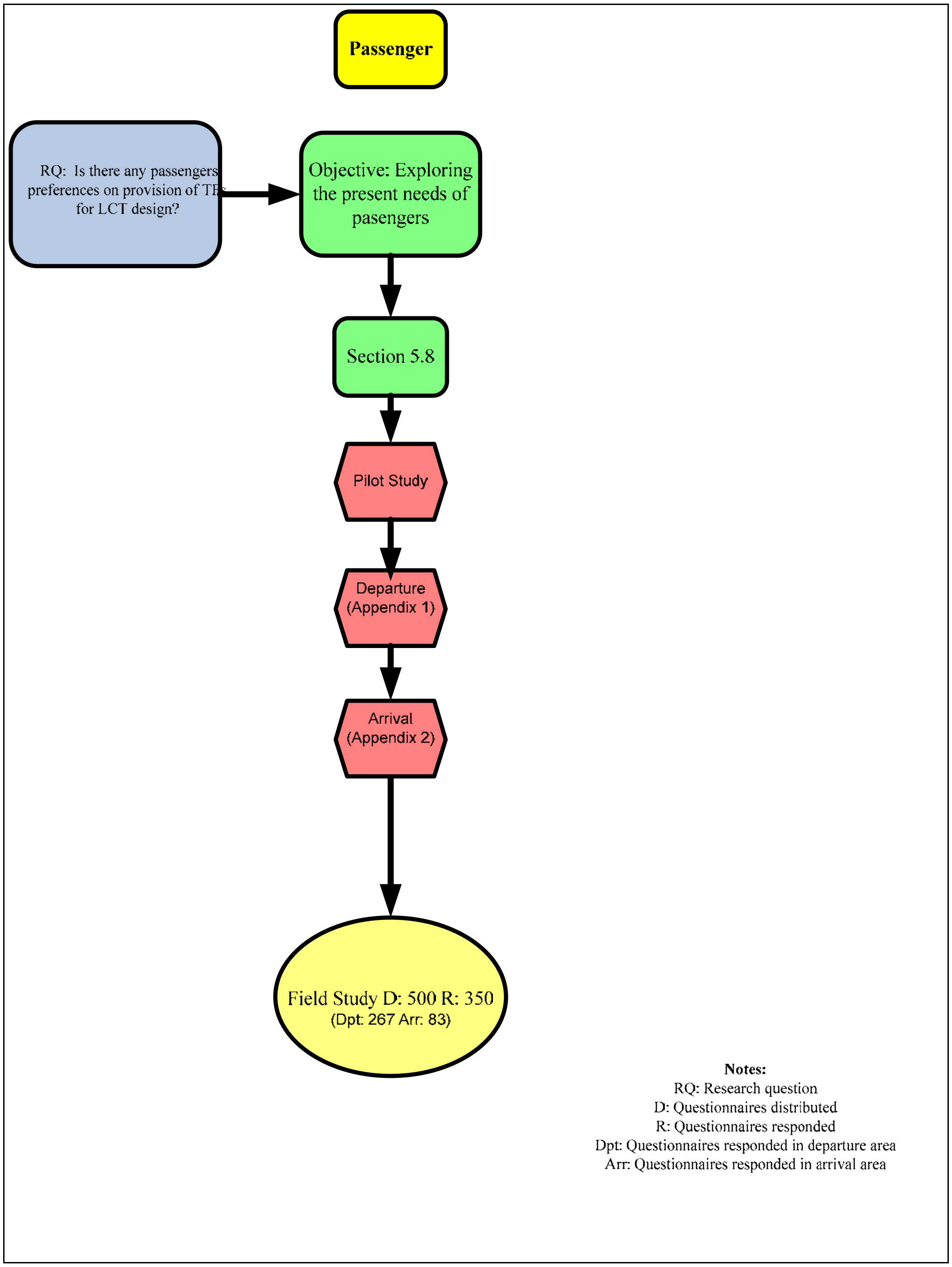

Figure 5.4 Pre-development survey Air Asia passengers at KLIA Main Terminal

The questionnaire was evaluated by peer assessment from fellow academics, and industrial experts at the airline headquarters of Air Asia, involving 5 contributors from the airline. A pilot study was undertaken before the final questionnaire was distributed. The main objectives for conducting the pilot study were to evaluate and refine the research instruments, for example, the questionnaire guidelines that would be used in the main research and to identify whether, or not, there were other important issues that should have been included in the main body of the research. The draft of the pilot study was distributed to the airlines in order to get feedback, constructive comments and validity. The self-designed questionnaires for the airlines had been tested to measure the need for terminal facilities. Finally, the questionnaires were distributed by e-mail to the respondents. Of the total questionnaires distributed, 16 respondents made comments and responses. Figures 5.6 and 5.7 show the structure of the pre-and-post development questionnaires that were distributed to Air Asia management.

5.11 Post development survey: MAHB KLIA

A post development survey was conducted for MAHB management that aimed to evaluate the relationship between the provision of TFs and costs (airport charges, capital investment, operational charges) and revenue (airport revenue) for LCT design. The survey was conducted at the management offices of KLIA. Sixteen respondents were involved in this study that used the questionnaire that aimed to explore airport management experiences and views towards the inclusion of specific LCT facilities.

Table 5.7 Pre- and post-development airline management questionnaire (Author)

Question	Pre-Development	Post- Development
Section A		
Q1	To identify the job function of the respondent in the LCT survey. The job function was classified as one of four types, CEO / Managing Director, General Manager, Senior Manager / Manager and Senior Executive / Executive. 'Other' option was included in the questionnaire to allow the respondent to provide an alternative response.	
Section B		
Q2	Listed several TF elements in LCT development based on the literature review. This was to identify issues that are considered important to LCT development. The 'other' option is to allow the respondents to add more issues which, in their opinion, were important to LCT development (Appendix 5).	To evaluate if a significant relationship existed between airport charges and the provision of TFs in the departure and arrival areas as part of LCT design. This gives a general idea of any relationship between TFs and airport charges (in discrete reduction decrements of 10%, 20%, 30% and no change). The question was also used to determine the core and secondary TFs for LCT design (Appendix 6).

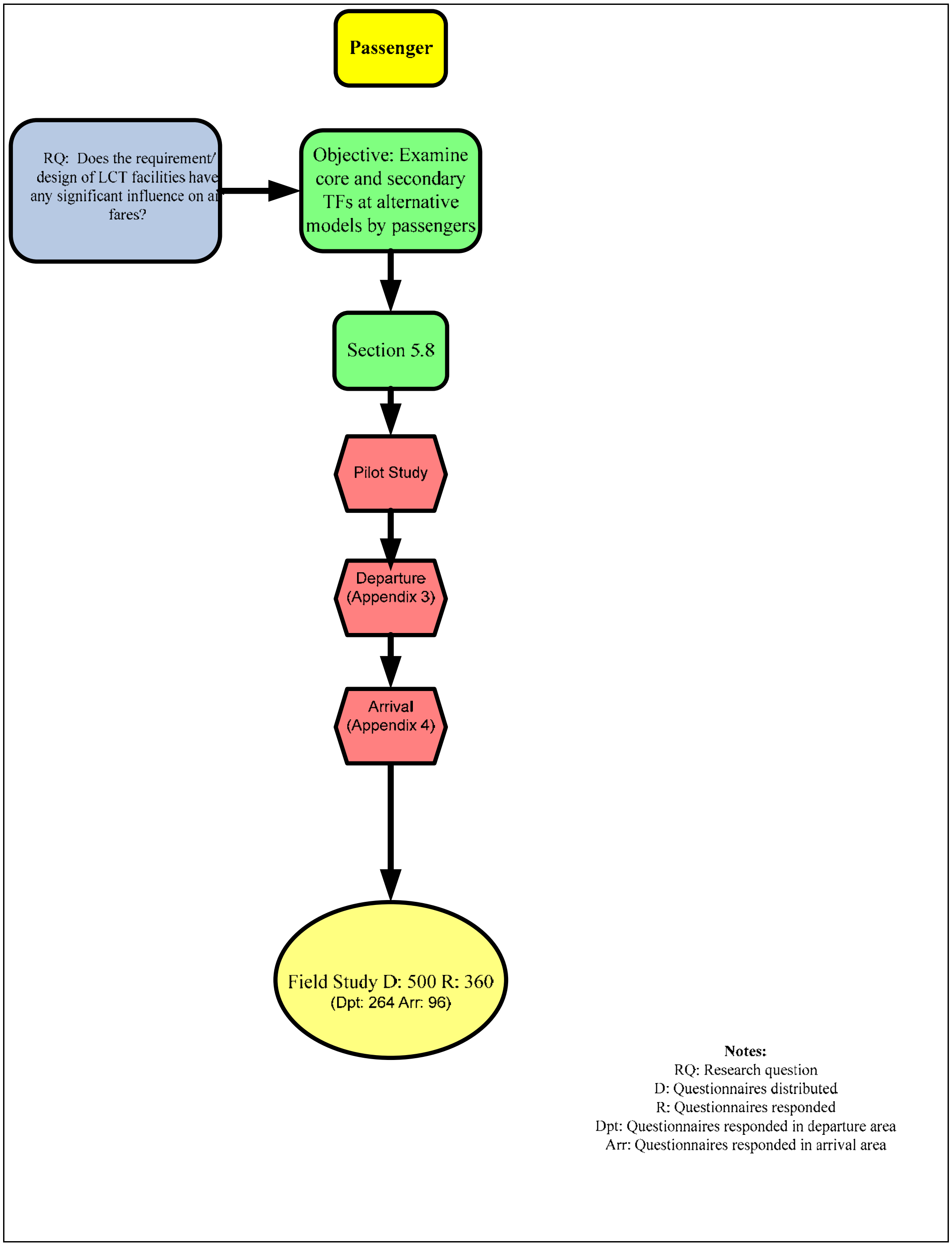

Figure 5.5 Post-development survey, Air Asia passengers at KLIA LCT

5.11.1 The draft and pilot study of the airport management questionnaire

A survey was undertaken to elicit responses from airport management on their experiences of LCT facilities provision. The survey involved different levels of airport management who had had some responsibility for LCT development decision making. The first objective was to determine which TFs should be retained when traded-off against airport charges, operations cost, capital investment and revenue sources in general, and for the provision of specific TFs as part of LCT development from an airport's operator point of view, while considering the effect of terminal design on the cost structure. The second objective was to identify the primary and secondary facilities.

The survey, entitled 'Airport Survey Questionnaire (Post-Development)' was conducted after a pilot survey took place between the researcher and airport management.

The questionnaire included two different sections, A and B. Section A referred to the background of respondents while Section B evaluated the relationship between cost and revenue structures, and LCT facilities. The questionnaire was designed after taking into consideration all of the information acquired through direct contact, email and telephone with airport management. Table 5.8 shows the post development airport management questionnaire.

The questionnaire was designed to be distributed to senior airport management and executives to gather their experiences on the provision of LCT facilities. The questionnaires evaluate the relationship between TFs and cost and revenue structures, as well as demographic profiles. Therefore, it was designed and distributed to staff in managerial and executive positions at MAHB. The questionnaires were distributed, and sixteen participants from various positions in the MAHB gathered in order to discuss their interest in LCT development. Analysis of the returned questionnaires indicated airport management preferences on cost and revenue structures in general, as well as the selection of core and secondary TFs for LCT design. Figure 5.8 shows the processes for the post-development airport management survey.

5.12 Supportive arguments for TFs evaluation

The supportive arguments for the evaluation of TFs are presented from two perspectives. The first perspective deals with the rationality of conducting TFs evaluation, and the second perspective is the relationship between the provision of TFs and the cost and revenue structures linked to LCT design.

The introduction of a basic terminal design concept could significantly reduce the costs associated with LCT development. As stated by O'Leary[141], the construction of an LCT should reduce the airport charges for airlines as well as the capital investment incurred

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[141] Barrett (2004).

by the airports. The elimination or downgrading of facilities such as business lounges, transfer and VIP facilities should be encouraged in LCT design.

Fernandez[142] has also highlighted several points, as stated in Section 3.5, on LCC preferences for TFs to be included in terminal design. However, the core aim of LCTs is to simplify the provision of TFs with fewer TFs included in the design so as to reduce airport charges. In turn, the reduction of these charges may encourage airlines to offer lower air fares to passengers and this, in turn, could then increase the volume of passenger traffic through the LCT. Thus, the following three elements may affect the focus of the research in order to meet research aims and objectives; the role of LCT participants, expectation of TFs, and methodology for TFs evaluation.

Table 5.8 Post-development survey airport management questionnaire (Author)

Question	Post Development
Section A	
Q1	To identify the job function of the respondent in the LCT survey. The job function was classified as one of four types, CEO / Managing Director, General Manager, Senior Manager / Manager and Senior Executive / Executive. 'Other' option was included in the questionnaire to allow the respondent to provide an alternative response.
Section B	
Q2	To measure the significant levels of cost and revenue structures and TFs provision by using the option of Likert scale.
Q3	To evaluate if a significant relationship existed between cost and revenue structures and the provision of TFs in departure and arrival areas as part of LCT design. This gives a general idea of the consideration given to TF and, cost and revenue structures in general. The question was also used to select the core and secondary TFs for LCT design.
Q4	To evaluate any significant factors that may influence the investment, operational costs, airport charges and revenue sources on LCT development (Appendix 7).

142 Co-founder of Air Asia Berhad.

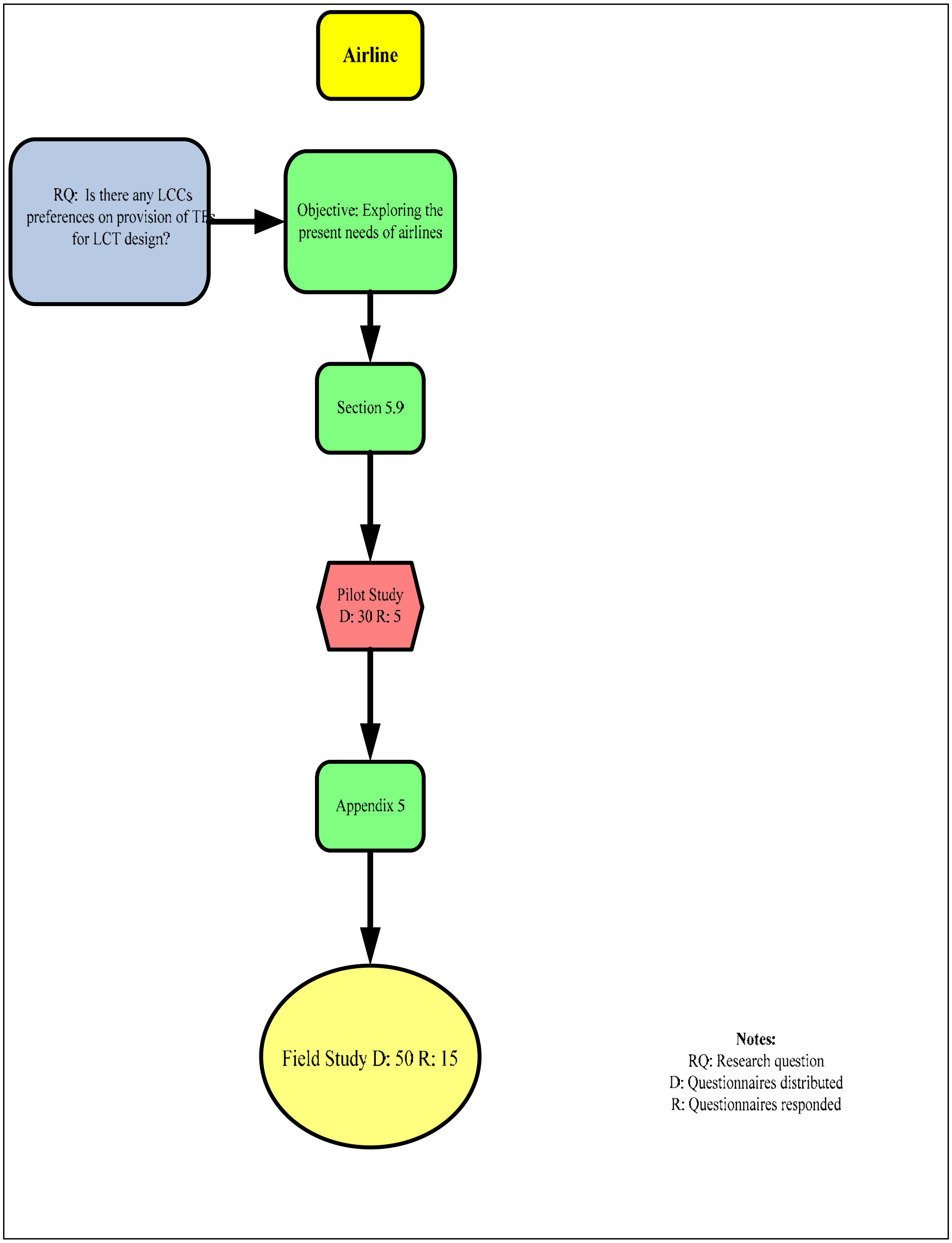

Figure 5.6 Pre-development survey, Air-Asia management

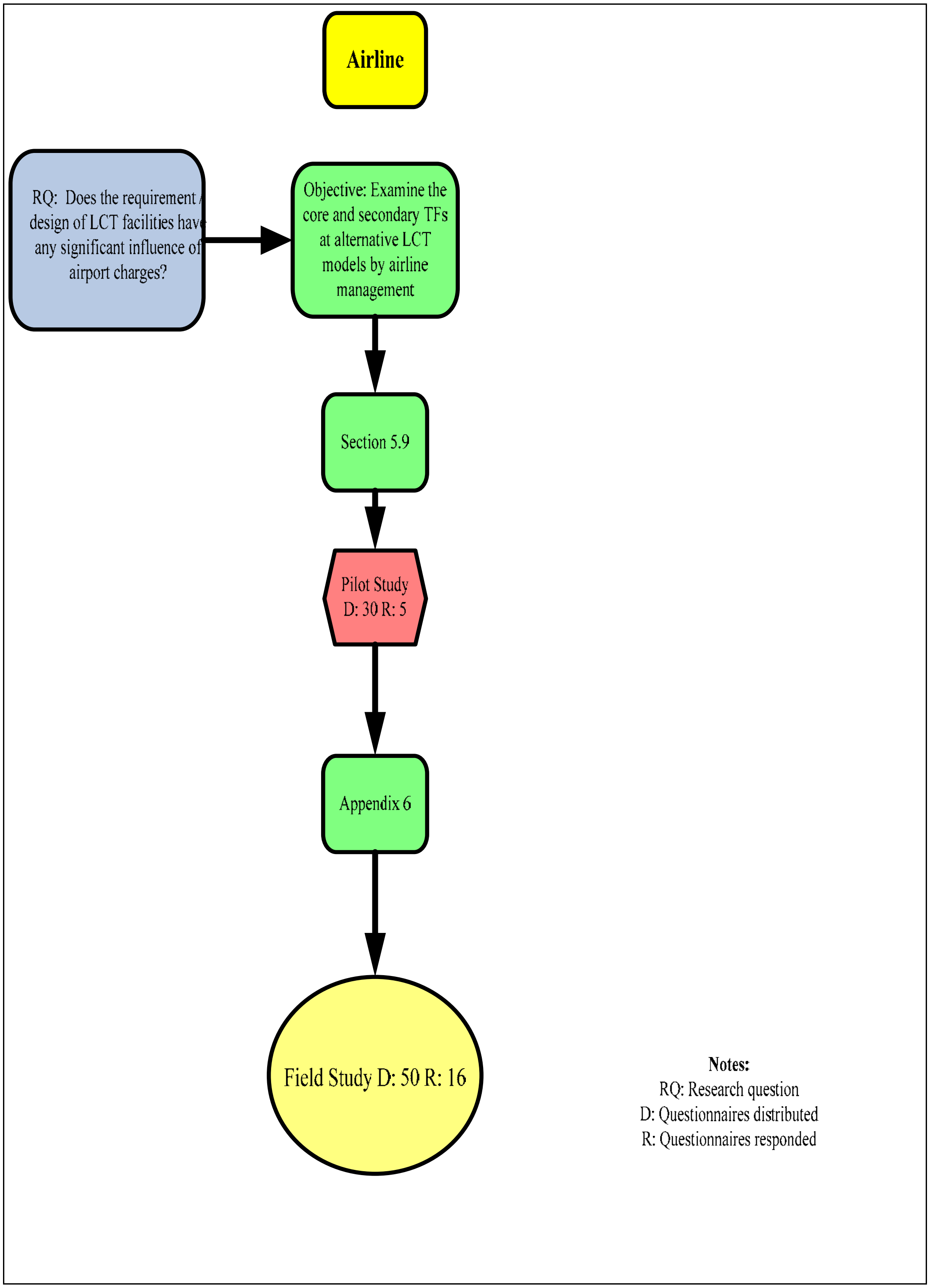

Figure 5.7 Post-development survey, Air-Asia management

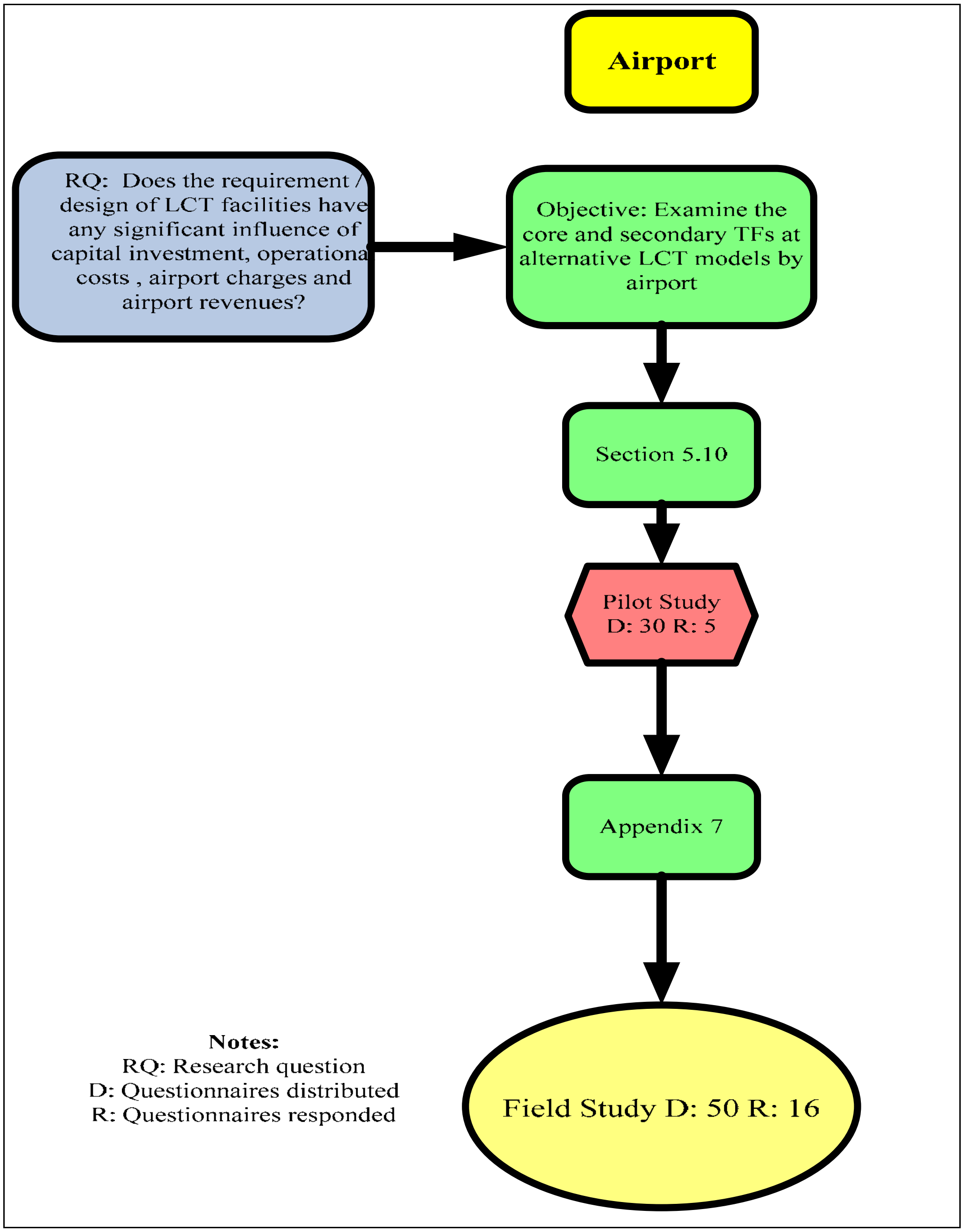

Figure 5.8 Post-development MAHB management survey

a) The Role of LCT Participants

The roles of LCT participants have been identified and categorised into three different groups. They are known as decision maker, influencer and user. The role of the airline as influencer emphasises their preferences for those TFs to be included in the LCT design. The role of the airport as the decider is based on the fact that it is responsible for the decision making process on the design details for provision of TFs as well as having control of the economic resources of airport.

For example, a LCT may have fewer check-in desks, security channels, immigration desks etc. to save space and costs, but this will have an influence of passenger flow patterns and dwell times.

The roles of decider and influencer include a multi-disciplinary group of people with expertise and responsibilities in various aspects of LCT design. The decision makers include persons authorised with decision making powers. They are directly involved in planning and development of LCTs. This group normally has access to money, resources, capability, experience, etc. Besides that, the role as influencer has been identified as a group with knowledge, experience and financial capabilities which may also influence the terminal design.

The passengers' role has been identified as a user. In current LCT design, the passengers' expectations on TF provision in terminal design are generally avoided or ignored. However, airport surveys do check what passengers think and behave in terms of terminal facilities (for example, signage, retail facilities, and retail spend). For recent LCT models, passengers have had no opportunity to give their opinions on TF provision. Therefore, a terminal design process which may take account of the expectations of passengers apparently does not exist in current practice.

As a result, current LCT designs have led to problems such as inconvenience and inefficiency. Therefore, this research tries to bring forward the value of passenger expectations which may increase the efficiency of terminal design. Therefore, the viewpoints of airlines and passengers towards TFs provision were explored through a series of surveys which have been carried out as part of the research. Pre-and-post LCT development surveys were undertaken to acquire data on expected TFs provision from both airlines and passengers. The results of these surveys (passengers, airlines and airport) will be discussed in Chapters 6, 7 and 8, respectively.

Table 5.9 Roles and responsibilities of participants (Kotler, 1980)

Participants	Role	Responsibilities
Airport	Decision maker / Decider	Members of an organisation who have either formal or informal power to select or approve final suppliers.
Airline	Influencer	Members outside the organisation, who directly or indirectly influence buying decisions, define specifications and also provide information for evaluating alternatives.
Passengers	User	Person outside of the organisation who will use the product or service.

The combination of viewpoints for all parties' expectations will offer the opportunity for optimising TFs provision as part of LCT design. That is the main focus of the research in bridging the knowledge gap on LCTs by exploring passenger and airline preferences as well as the airport expectations. Based on the understanding from the literature review, Table 5.9 shows the distinctive roles represented by LCT participants.

b) Expectation of TFs from airline, airport and passengers perspectives

Due to a lack of LCT information, there is a knowledge gap needing to be filled, hence, this is main reason for undertaking the research. The aim of the research is to evaluate the clash of interests between different parties in deciding on the specific facilities to be included in LCT design. By including airline and passenger expectations into LCT design (through a series of surveys), the conflicting interests of the parties involved can be demonstrated through the different questionnaires that have been designed and from the responses.

A pre-development survey was introduced with the aim of exploring the expected provision of TFs as a preliminary research tool that investigated airline, airport and passenger expectations. The following survey, which is called the post-development survey, examined the relationship of cost and revenue structures with the inclusion of TFs into LCT design, as well as revealing the preferences for core and secondary LCT facilities based on airline, airport and passengers' experiences. In addition, the post-development study complemented the pre-development study by acquiring data lacking from the previous study.

In recent LCT development, the airport designers have not included luxury facilities, and the implementation of this design has been supported by Barrett (2004), who stated that an LCT should have only basic TFs in order to reduce costs associated with operation and construction. Nonetheless, the main facilities in the terminal building, such as check-in services, retail, departure lounge and baggage reclaim facilities are important and should be included in terminal design, as well as mandatory government controls such as security.

However, established literature (Barrett, 2004, O' Connell, 2007), have clearly considered that TFs provision should be matched with the airline preferences, while having no evidence to support the interest of passengers in LCT design. Thus, this lack of evidence creates a knowledge gap to fill which drives the motivation to accomplish the research aims and objectives. Therefore, the knowledge gap leads to research novelty and usefulness in contributing new knowledge to the aviation industry.

c) Methodology for TFs Evaluation

To get a better understanding on the research area, selection of research techniques is important for examining the provision of TFs to be included in the LCT design. As discussed in Section 1.2, there are many research techniques which have been applied to airport terminal research. The selection of the correct technique can increase the value of the research. For this reason, the Spearman Correlation Coefficient, Mann Whitney Test and Chi-Square Test were used for the research. These techniques are discussed in detail in Section 5.6. These tests were adopted after considering their relevancy for research which indicates an evaluation of the relationship and sensitivity between the provision of TFs and cost and revenues structures, from the airline, airport and passengers expectations. The Mann Whitney Test is also capable of ranking the provision of terminal facilities into two groups, which are core and secondary facilities for LCT design.

The proposed methodology has been designed to provide a better understanding of the relationship between TFs and cost and revenue structures. The design of adequate TFs provision may vary according to the roles played by airlines, airport and passengers. It seems that there are conflicting interests of TFs provision between the parties involved, hence, there is a relationship between the provision of TFs and cost and revenue structures. The link between them has been established and evaluated in the research in order to determine the core and secondary TFs. The details of the relationship have been summarised in Table 5.10. It shows an interpretation of the cost and revenue structures which have influenced terminal design. The relationship between TFs and cost and revenue structures has been proposed as a result of the literature review of LCT development (Chapter 2, 3 and 4).

5.13 Success Factors for TFs Evaluation of Alternative LCT Models

The success factors for evaluating the provision of TFs are discussed in detail in the following three sub-sections. These include participants' roles, commitment, time allocation and control. These factors are useful for LCT facilities evaluation.

The participants' roles (influencer, decision maker and user) were identified and defined before the surveys were conducted. These roles contributed to mutual understanding in order to meet their distinctive needs. To enable justification of participants' needs and expectations regarding the basic TF design, the sets of surveys were conducted to explore the preferences of airlines and passengers in pre-and post development surveys. The survey results were extensively analysed by SPSS software.

The commitment of airline management, airport management and passengers involved in the surveys to explore the determination of core and secondary facilities was highly appreciated. For example, the participants showed an interest in having advanced technologies as part of LCT design (for example, self-service check-in) in order to reduce congestion at the check-in counter.

Any major survey usually takes a significant time to be completed. Considering that most of the respondents were time constrained, the survey layout balanced time with response rate. Therefore, the research focused only on the provision of basic TFs and, cost and revenue structures in order to achieve maximum response rate.

5.14 Potential advantages for the provision of TFs evaluation

The basic TFs design concept[143] refers to the availability and provision of TFs within the LCT. The TFs in the terminal area have been simplified or downgraded in order to reduce costs associated with terminal development. The basic TF design concept has been considered throughout the whole process for LCT planning, and its basic premise is to evaluate the impact on cost and revenues structures which may influence the provision of TFs in LCT design. Thus, the surveys investigated the decision making process in order to have an ideal LCT basic TFs design concept based on airline, airport and passenger expectations. This is to ensure that potential improvements to the TFs evaluation are made taking into account the views of airlines, airports and passengers.

The basic TFs proposed may have a significant impact on overall cost and revenue structures development. The airport may reduce the cost (for example, capital investment) with construction, investment and operation as well as manpower allocation. The research also examined the impact of cost (airport charges, capital investment, operational costs) and revenue (airport revenue) structures on TF provision.

Thus, in order to investigate the relationship between TFs provision and cost and revenue structures, the series of surveys undertaken have given information on the needs of airlines and passengers to be considered in terminal design. Considering the basic TFs provision to be adopted in LCT design, it is also worth investigating whether the incorporated cost and revenue structures will be beneficial in terms of cost saving for LCT development. The advantages expected from using the proposed evaluation for the provision of TFs are presented in Table 5.11.

5.15Conceptual Framework

The conceptual framework aims to assess the research purpose, and develop and select relevant questions and methods in the research design (Zainul Abidin, 2005). Miles and Huberman (1994) explain the key factors, concepts or variables, and the relationship between them in the theoretical framework design. The theoretical framework also establishes the research aims and objectives on LCT research, thereby designing a research method by proposing an idea of ‘mind mapping’ which will associate the elements, concepts and variables of the research subject. It illustrates a new knowledge which may bring a strong foundation to the research by explaining a visible theory which presents the relationship between research variables. The conceptual framework

[143] The basic terminal concept refers to the set of terminal facilities in the departure and arrival areas. The concept will propose a simplifying or downgrading of terminal facilities in order to reduce the cost associated with LCT development.

is setting the line of supportive argument leading to the rationale of the research. As a result, the conceptual framework developed is capable of demonstrating the work flows, and thereby, the determination of the intended study areas. In addition, the conceptual framework is able to create the research objectives and phases to be fitted into the research context which contributes to a better understanding of the research process by establishing the link between the research objectives and the research activities.

Table 5.10 Cost and revenue structures (IATA, 2004, Updated by Author)

Principles of cost and revenue structures	Cost and revenue principles within aviation industry (IATA, 2004)	Interpretation of TFs and cost and revenue principles within scope of LCT Model
Charging policy and airport charges	Charging policies and charges must be non-discriminatory, bear a direct relationship to level(s) of service offered and relevant costs, be fully transparent and set in consultation with airline industry.	Charging policy should be fair for LCT compared with 'traditional' terminal even though there may be differentiation in allocation of terminal facilities.
Cost associated with operational activities	Robust allocation of indirect costs including overheads and supporting infrastructure costs should be undertaken and results shared with airline industry.	Simplified basic terminal concept could reduce cost of construction and overheads in LCT design.
Airport Revenues	'No frills' facility should not be cross-subsidised from revenue generated from other parts of the business, particularly from the charges to non-beneficiary airlines, passengers, shippers and commercial revenue from the full facility terminal.	Charging for LCT facilities should be comparable with similar charges as used at the 'traditional' terminal. However, there has to be some differentiation of airport charges particularly for Passenger Service Charges (PSCs) as a trade-off for fewer basic facilities included in terminal design.
Costs associated with airport charges and air fares	Security charges must be the same for all passengers regardless of terminal used and level of service.	Security charges would have to be the same, also any government taxes that might be dispersed.
Costs associated with airport charges	Eligibility criteria for use of these facilities should be reasonable and established in consultation within airline industry	Mutual understanding between airport and airline required to provide adequate terminal facilities to satisfy needs of both parties.

The intended theoretical framework for proposing an evaluation of provision TFs is presented in Figure 5.9. The evaluation has been based on consideration of the theoretical framework of the basic TFs design and cost and revenue structures. The basic TFs concept and the success factors to be taken into account when integrating TFs has been reviewed. The model encapsulates the research into LCT study from pre-and post-development aspects. The research proposes that it is important to incorporate the basic TFs design into LCT development from the outset of the research process, which considers the relationship between the basic TFs concept and cost and revenue structures.

Table 5.11 Potential advantages of basic TFs design

1.	Reduce conflicting interests between airlines (minimising aircraft turnaround time) and passengers (increase the level of service in LCT area);
2.	Adapts the basic TF design for operational benefit (introduction of self service kiosks to reduce the congestion at check in area).
3.	Proposes a methodology to evaluate the provision of TFs (more discussion in Chapter 6)
4.	Explores strategic thinking of participants (exclusively for airline and airport participants)
5.	Justifies the basic TF concept in consideration of LCT development (determination of core and secondary provision of TFs for LCT design)

The preferred set of preferences for TFs can be explored through the pre-development survey. The survey involves the commitment of participants to express their views on the needs of basic TFs in departure and arrival areas. They have also demonstrated their interest through their responses. The survey results indicate an evaluation of TFs which should to be included in LCT design. This survey reveals the needs of airlines and passengers. Therefore, it is worthwhile to conduct the survey at an early stage of LCT development.

Integrating the cost and revenue structures into the basic TFs will have a significant effect on the scope of the research. The proposed relationship between cost and revenue structures has been analysed, interpreted and developed to enhance LCT design. Consideration of cost and revenue structures in the provision of TFs has been influenced by expectations of airlines and passengers revealed through the pre-development survey. The survey raises the LCT issues associated with costs and revenues in order to establish the appropriate evaluation of TF provision in alternative LCT models.

By concentrating on the research focus, the aims and objectives have been determined, thereby, also integrating established cost and revenue structures. In the set of designed questionnaires, the cost and revenue structures have been incorporated in the research questions. The process started with the identification and evaluation of the airline, airport and passengers expectations. The result will influence decision maker preferences by highlighting the selection of TFs in terminal design.

The proposed criticality of TF provision can be evaluated through the post-development survey. The determination of core and secondary TFs provision in LCT development is justified taking into consideration cost and revenue structures. The post-development survey has been designed to evaluate TF provision. The criticality of TF provision has been examined against rankings in discrete reduced decrements of 10%, 20%, 30% and no change in airport charges. As a result, they have a significant influence on the research outcomes to determine the core and secondary TFs. Figure 5.9 illustrates the proposed theoretical framework that shows the cost and revenue structures used for evaluating the provision of facilities in terminal design.

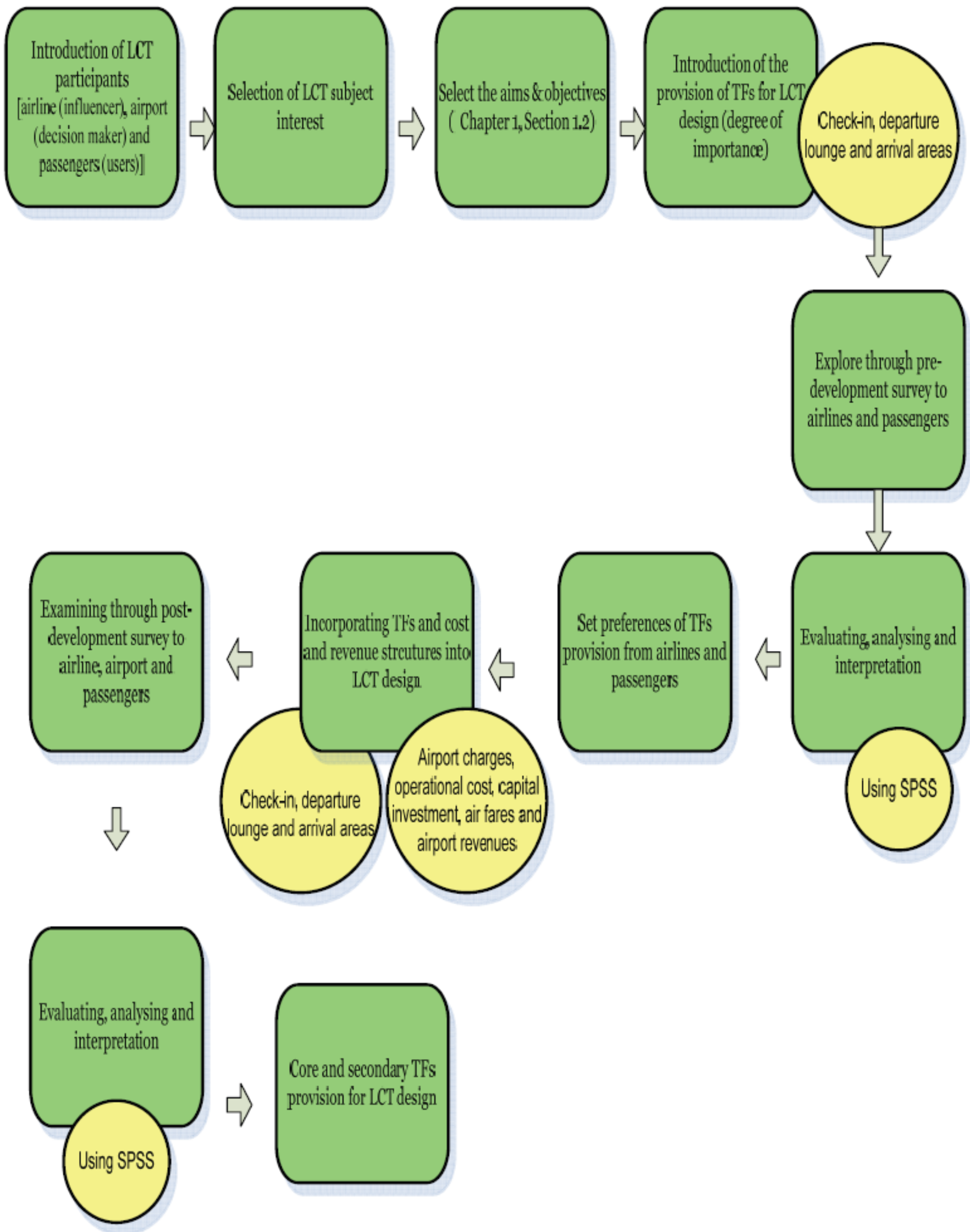

Figure 5.9 Proposed conceptual framework of TFs Design (Author)

5.16Summary

This chapter has outlined the research methodology to give a better understanding of the research activities that have been conducted. The research methodology is a guide on how the validity and reliability of the findings were used to determine the core and secondary TFs to be included in LCT design. The research process includes the identification of the research gap, the research focus, aims and objectives (Chapter 1, Section 1.2), data collection (Chapter 5, Section 5.7) and data analysis (Chapter 6, 7 and 8). Therefore, the adoption of the correct research methodology will lead to use of the appropriate tool or research method being developed in order to have a better understanding of the research activities.

The research methodology describes the population, element, sampling and subject of the research. The sampling decision involves the pre and post development surveys in order to gather data from the airline, airport and passengers. The data collection method indicates the questionnaires are a principal activity of the research process. This includes the literature review and development of self-designed questionnaires. The literature review has been undertaken in order to find the research gap, identify the research problems as well as understanding the current situation in the LCT development. The self designed questionnaires have been developed for the passengers [Appendix (1) to (4)], airline management [Appendix (5) and (6)] and airport management [Appendix (7)]. The pre-development survey includes the distribution of the questionnaires to airline and passengers in order to explore the expected needs of terminal facilities. The selection of core and secondary TFs has been evaluated through the post-development survey, which included the airlines, airports and passengers. The survey included the airline's and passengers' expectations. Airport management expectations towards terminal facilities have also been examined.

The data analysis techniques used in the research have concentrated on quantitative techniques, with the establishment of the relationships between the variables that have been measured. SPSS has been used to analyse the data. Validity and reliability of the research has been taken into account in order to enhance the quality of the output.

This chapter also covers the development of a theoretical framework for the research subject. The development of the theoretical framework begins with a discussion on the rational of a proposed methodology in evaluating the availability of TFs in alternative LCT models and examines the relationship between the provision of TFs and cost and revenue structures. The supportive arguments for TFs evaluation are discussed from two perspectives, the rational of the conducting TFs evaluation and the relationship between provision of TFs and the cost and revenue structures linked to LCT design.

The relationship between the availability of TFs and cost and revenue structures has been linked. The interpretation of the cost and revenue structures principles within the scope of the research has enhanced the value of the research. An inclusion of cost and revenue structures in order to determine the provision of TFs for LCT design has been well defined. Thus, the determination of sufficient TFs in future LCT models should able to reduce the significant costs related to the development (for example, capital investment) as well as enabling an increase in airport revenues. Therefore, the research findings should make a significant contribution to knowledge by setting-up guidelines for TFs in LCTs for airport operators and other parties that may be involved in LCT design.

The basic TFs design concept has been linked to the identification of terminal characteristics discussed in Chapter 2 and 4. The basic design has focused on the provision of TFs which represents the set of TFs included in two different critical areas (departures and arrivals) of LCTs. The success factor in the methodology for the evaluation has been discussed. It includes the participants' roles, commitment and management of the survey.

CHAPTER 6

6 Passengers' Preferences for Terminal Facilities (TFs) in LCT design

6.1 Introduction

This chapter discusses the findings of the two surveys undertaken at Kuala Lumpur International Airport (KLIA), Malaysia, highlighting key aspects, such as passengers' characteristics, income levels, journey purpose, fares and TF provision. An in-depth study was made of Air Asia passengers' responses and identification of the TFs preferred by low cost passengers (LCPs). The aim of this chapter is to determine the primary and secondary TFs in LCT design. Therefore, two surveys, pre- and post-LCT development, were undertaken. The first survey was aimed at measuring the level of importance for the provision of TFs in a future LCT design. After a review of passengers' responses, the second survey was conducted and had two aims: Firstly, to measure passengers' willingness to trade-off TFs in LCT design against a reduction in air fare (in discrete decrements of 10%, 20%, 30% or no change in air fare). The use of a scale in discrete decrements assisted in the evaluation of the trade-off between air fares and TFs provision in LCT design. In addition, it assisted in the design of core and secondary TFs as part of overall LCT design by taking into account the perceptions of individual Air Asia passengers.

6.2 Background of Surveyed Air Asia Passengers

The worldwide growth of Low Cost Carriers (LCCs) is having a significant influence on traffic forecasts for future air travellers with increased pressure from passengers for reduced air fares, while at the same time, the airports are faced with the need to increase efficiency levels in their operations to cater for the anticipated traffic growth that LCCs have generated.

Figure 6.1 shows the actual and forecasted growth drawn up by Air Asia for the period 2004 to 2015. It also shows a steady high growth in both domestic and non-domestic (international) passenger traffic for Air Asia. Except for the traffic forecast in 2007, the passenger traffic forecasts to date was higher from the actual passenger traffic level. For example, 2.8 million (2004), 4.4 million (2005), 5.7 million (2006) and 8.7 million (2007), for international and domestic movements, were recorded. The establishment of new routes by Air Asia contributed about 30% growth of the Malaysian domestic aviation market (O'Connell, 2007) and generated in 2007, for Air Asia, a total of 8.7 million international and domestic passengers. This, in turn, increased passenger traffic at KLIA. The major factors contributing to the high level of passenger traffic in the domestic sector have arisen from pre-planned rationalisation, as Malaysia Airline

System (MAS), the prominent legacy carrier, separately operates 19 domestic trunk[144] routes while Air Asia operates 99 non-trunk routes[145].

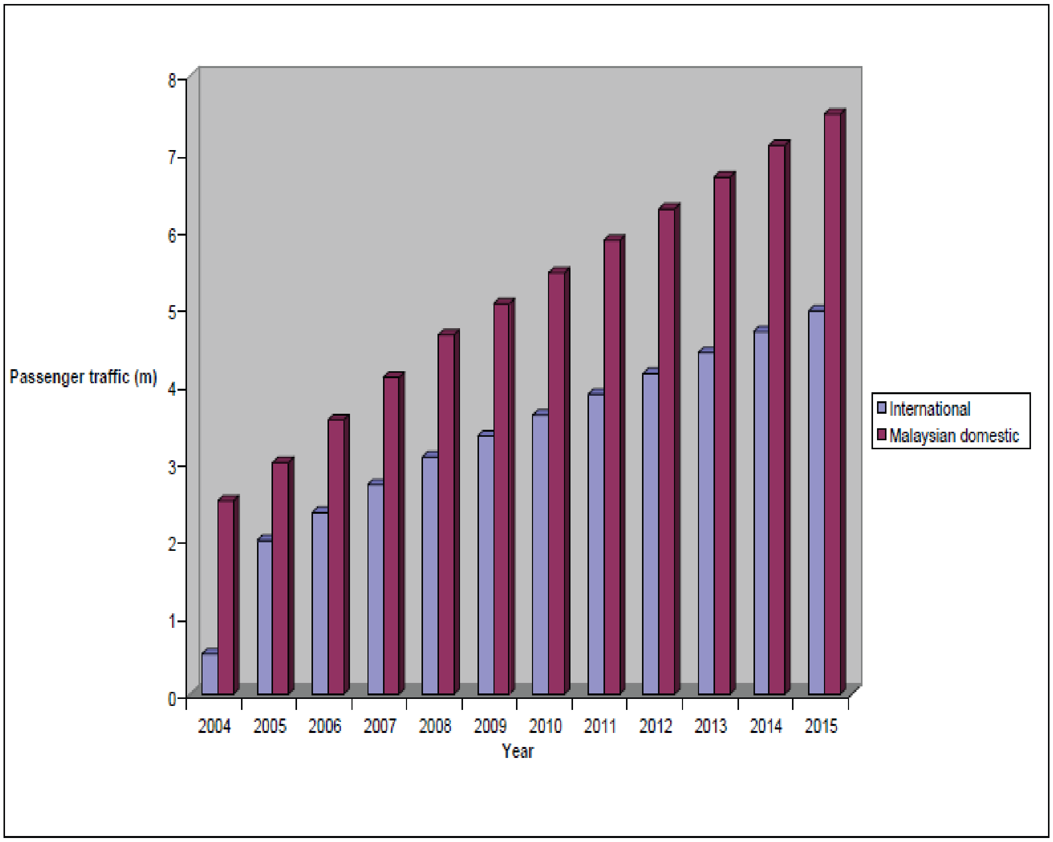

Figure 6.1 Air Asia Passenger Forecast 2004-2015[146]

Air Asia benefited from the planned rationalisation although MAS was improving the profitability of many of their trunk routes and closing unprofitable non-trunk routes. MAS also realised, in total, cost savings of RM130 million (USD34.2)[147] due to savings in fuel costs as a result of network restructuring. The collaboration between the network carrier and LCCs in the rationalisation of domestic routes is making Malaysia recognised as an aviation hub for Southeast Asia. In addition, the variety of services offered by Air Asia on all intra-East Malaysia routes such as Kota Kinabalu and Kuching has significantly increased the volume of traffic through KLIA, Malaysia. However, it also found that the rationalisation of routes between network carriers and LCCs is solely based on the MAS and Air Asia experiences and no other similar system of routes rationalisation exists in the world.

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144 Most profitable routes
145 Source: New Straits Times, Malaysia
146 Source: Strategy and Commercial Planning Division, Air Asia Berhad (2004).
147 USD1= RM3.80

6.3 Research Methodology

Pre- and post-LCT development surveys were used to gather information on the perception of passengers on the provision of TFs in LCT design. In the pre-development survey, a total of 350 sets of questionnaires were used, with 267 in departures and the remaining 83 in arrivals. For the post-development survey, a total of 500 sets of questionnaires were distributed and, by closing date, a total of 360 questionnaires were returned, which shows a 72% response rate. Of these, 264 sets of questionnaires were from departing passengers and 96 questionnaires were from arriving passengers. The questionnaires were distributed to the passengers while they were waiting to board flights or pick-up baggage in the arrival hall. SPSS was used to process the data including coding, counting, analysis and results presentation.

6.4 General Results: Demographics (Age, Level of Income and Purpose of Travel)

6.4.1 Respondent age

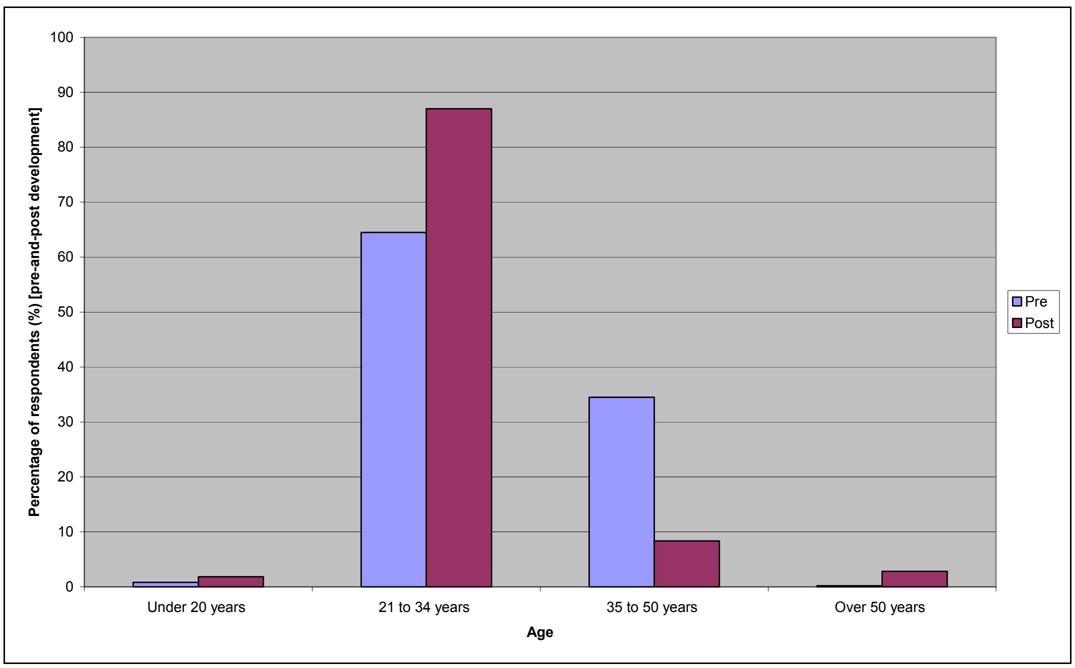

Figure 6.2 Proportion of passengers by age in pre- and post-development survey (Main Terminal and LCT, KLIA)

Figure 6.2 shows the proportion of respondents by four age groups: Below 20 years, 21 to 34 years, 35 to 50 years and over 50 years old. In the pre-development survey, 64.5%

of respondents, which includes 47.4% and 17.1% in the departures and arrivals areas respectively, were aged 21 to 34 years old. This indicated that young people were potentially the highest users of LCCs. The second highest age rank was between 35 and 50 (34.5%) with 26.5% and 8.0% of departing and arriving passengers, respectively, who used the KLIA main terminal facilities. Noting the percentage of young travellers, this is reasonable to assume that young people who used Air Asia were attracted by its promotional campaign on low fares. The survey was randomly distributed among the passengers and showed that the highest response rates from young travellers indicated that they have their own incomes and prefer to travel. However, about 0.20% and 0.01% of respondents (departing and arriving passengers), aged over 50 years, were using Air Asia to travel. Most of the aged over 50 years group travelled with their family including young people aged between 21 to 34 years or 35 to 50 years. The lower response rates from those aged below 20 years and over 50 years could influence the research findings.

Similar to the pre-development survey, results for the percentage of respondents by age who used KLIA LCT are shown in the post-development survey (Figure 6.2). About 87% of respondents were aged 21 to 34 years, departing (63.1%) and arriving (23.9%) passengers, respectively, all of whom being on Air Asia flights. The higher percentage of departing passenger responses was due to the larger number of TF's in departures than arrivals.

6.4.2 Passengers' Income

Passengers' income levels were included as an important variable which was positively correlated to passengers' purchasing power. Taking the lower income level passengers as an example, most of the passengers are more sensitive to the rate of discount offered, as low cost travellers are more interested in the fare discounts that LCCs offer, which are 50% to 75% below the normal scheduled fares (Section 3.5.3).

Figure 6.3 shows the proportion of respondents by level of income who participated in the two different surveys[148] (pre-and-post development). In both surveys, the income levels were grouped into 6 bands: up to RM12,000 (USD 3,500), RM12,001 (USD3,501) to RM24,000 (USD7,000), RM24,001 (USD7,001) to RM36,000 (USD10,000), RM36,001 (USD10,001) to RM48,000 (USD13,000), RM48,001 (USD13,001) to RM60,000 (USD17,000) and over RM60,000 (USD17,001). The pre-development survey showed that about 20.3% of departing and 5.8% of arriving passengers were in the RM48,001 to RM60,000 band, and 20.5% of departing passengers were earning more than RM60,000 per year. It would appear that the higher income level passengers preferred to make use of the terminal facilities[149] in the Main Terminal Building (MTB) at KLIA.

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148 It should be re-iterated that the apparent discrepancy between departures and arrivals is due to more departure responses that arrival responses.

149 There are no differences in Air Asia services at the Main Terminal Building and Low Cost Terminal of KLIA, Malaysia.

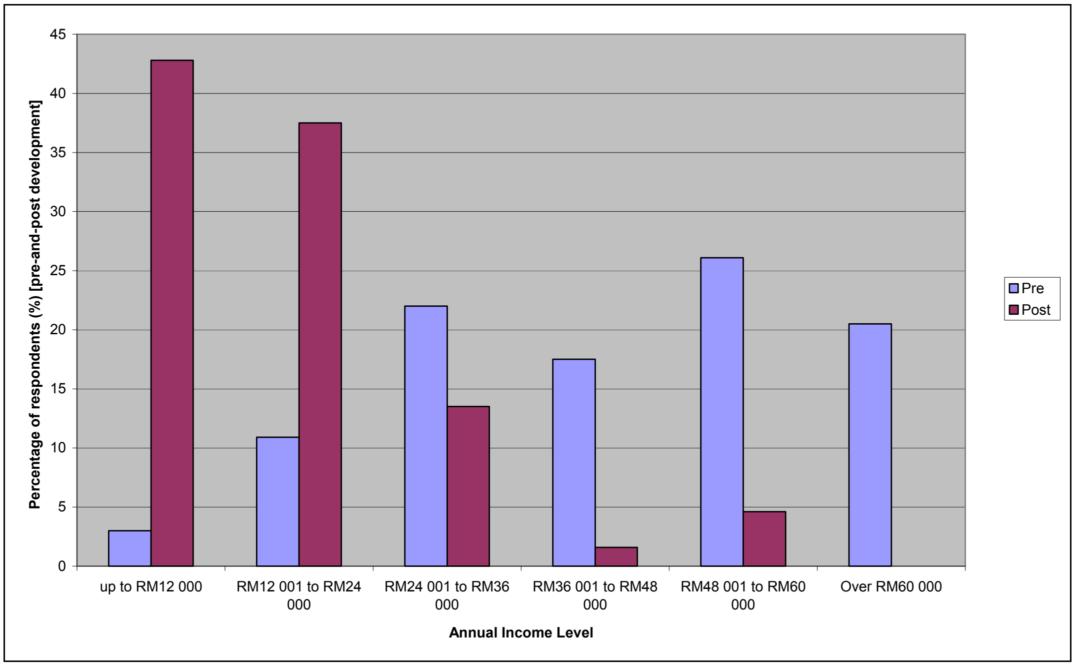

Figure 6.3 Percentage of passengers by income levels in pre- and post-development survey (Main Terminal and LCT, KLIA)

From the second survey, as Figure 6.3 shows, the higher income levels (RM48,001 to RM60,000) for departing and arriving passengers reduced to 2.6% and 2.0% respectively, as shown by the lower number of responses that in income band. It clearly indicates that most of the passengers in the RM48,001 to RM60,000 income band preferred the main terminal, as the provision and variety of TFs is more than in KLIA LCT. Difficulties faced in accessing the TFs provided in the LCT, restrictive surface transport access options, and lack of fast train connection between the main terminal buildings and the LCT could have influenced the percentage of higher income passengers using the LCT[150]. In the same Figure 6.3, it should be noted that lower income passengers, within the RM12,001 to RM24,000 income band, are the largest group making use of the LCT. The proportionate increase of lower income band travellers shows an increase in leisure travellers, who are highly sensitive to price levels, for example, lower income groups and students made use of the Air Asia services, mostly for domestic travel.

The results indicate that high income passengers do not make use of the LCT as they are not attracted to the air fare offers. These passengers may be attracted by other incentives such as convenience and service level standards similar to those currently offered at the

150 The business and higher level income passengers (RM48,001 to RM60,000) are less interested in using KLIA LCT because of the inconvenience of surface transport access. However, Malaysia Airport Berhad, as the operator of KLIA LCT, proposed to expand the Express Rail Link (ERL) between the MTB and LCT, for use of the passengers, to reduce the journey time to the LCT.

KLIA main terminal. The survey also showed that most of the lower income passengers are interested in switching from Malaysia Airlines to Air Asia if sufficient TFs are provided at LCT KLIA. Although Air Asia and MAS operate similar routes, most of lower income passengers (up to RM12,000, and RM12,000 to RM24,000) preferred to use the KLIA LCT. This is due to benefits offered by Air Asia such as discounted air fares. As a result, the lower income passengers are prepared to accept the basic provision of TFs at the KLIA LCT. Further discussion on route competition and development can be found in Chapter 7, Section 7.2.

6.4.3 Purpose of Travel

Figure 6.4 shows the proportions, by travel purpose, for business and leisure passengers in the departure area of KLIA main terminal and LCT. As expected, in the pre-development survey, about 79.4% of leisure passengers, which comprise 48.5% (domestic) and 30.9% (international), using Air Asia services, have made use of KLIA main terminal facilities. In the post-development survey the leisure passengers group was 84.4% [domestic (33.3%) and international (51.1%)] of the overall population. As they are attracted by promotions launched by Air Asia, leisure passengers seem interested in the price discounts offered. In the post-development survey, in terms of business passengers, it was interesting to note that only about 6.7% and 8.9% of domestic and international passengers respectively, made use of the LCT. However, in the long term, a steady growth of business passengers in the low cost sector might be expected as perhaps company policies of using low cost services for travelling becomes more commonplace.

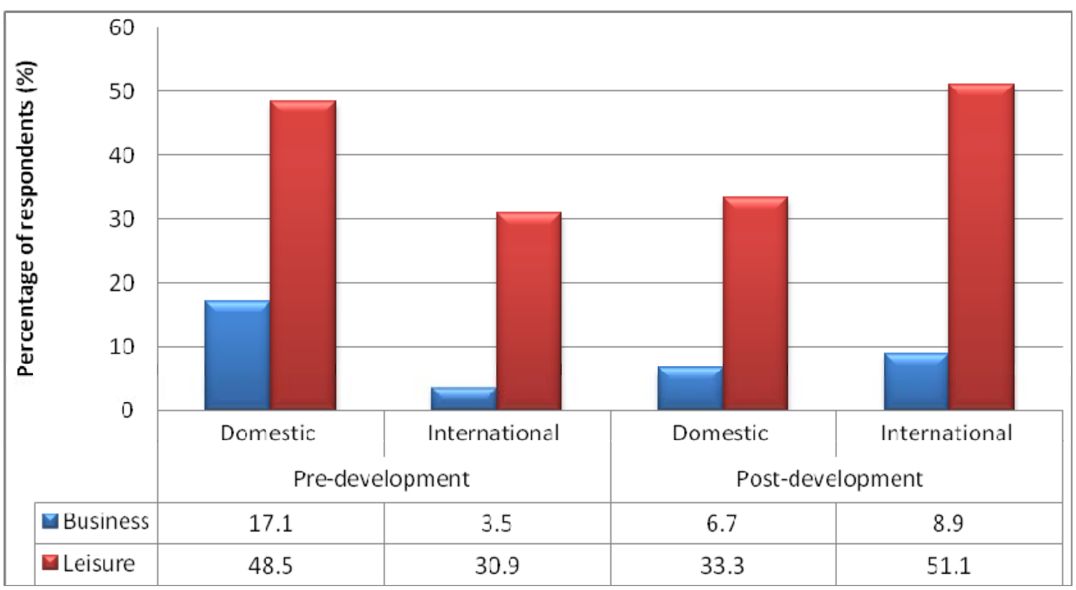

Figure 6.4 Percentage of passengers by purpose of travel in departures, pre- (Main Terminal) and post-development surveys (LCT)

The survey results show that leisure passengers are the major users of Air Asia services as they seem interested in using a low cost service and were thus being attracted by the lower fares offered. However, the percentage of business travellers making use of Air Asia services is steadily declining, possibly due to reasons such as the distance of the KLIA LCT from the MTB, congested TFs, and poor rail and road surface access.

6.5 Passengers expectations for terminal facilities in LCT design

When Air Asia, as a major LCC in Malaysia, generated a significant increase in passenger traffic in early 2004, the airline began to request adequate TFs for its passengers. As discussed in Chapter 3, the basic TFs needed are considered essential for a reduction in airport charges. The basic terminal concept proposed should be mutually agreed between the airport authorities and airlines in order to increase efficiency in terminal processes. However, current LCT designs appear to have a different set of TFs standards to cater for increased passenger traffic. Noting the examples of Warsaw Airport, Poland, and Coventry Airport, UK, the terminals there have been established with fewer TFs leading to reduced airport charges and investment costs.

In the case of Southeast Asian LCTs, taking the example of KLIA LCT, the development of this terminal appears to have more TFs, so a reduction to lower investment cost is to be compared with European LCTs, after considering lower LCT construction costs. The UK remains one of the more expensive places in the world to build (fifth after Denmark, Switzerland, Ireland and Sweden), with costs 20% higher than France and Germany, and more than double of many Eastern European states. The low construction costs in Eastern European countries, such as Serbia and Hungary, are still almost twice those of Indonesia, Malaysia and Taiwan, while costs in Africa (for example, Ghana and South Africa) are running at around 25% of those in the UK.[151]

The current design of KLIA LCT is different from that of other LCTs developed over the world. Various commercial activities which are stimulated by the volume of passenger traffic to LCT may generate additional revenues to airport. However, the current LCT design appears to have difficulties in meeting the standard of requirements (for example, high delays in check-in processing) for low cost passengers through efficient provision of TFs. Therefore, the KLIA LCT is experiencing delays and fails to deliver an acceptable service standard, mostly at peak times. The airlines (Air Asia) also fail to maintain scheduled operating times. This in turn creates congestion in the terminal area.

Regarding passenger needs for the provision of TFs, the pre-development survey was conducted to reveal the facilities, in terminal design, deemed most important by the passengers. An evaluation of TFs to be included in terminal design was considered by establishing an ordinal scale rank-ordering the categories in a meaningful way. This scale helped to determine the percentage of respondents who consider interaction with

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151 http://www.echarris.com/uploadeddocuments/Publications/6870_Global_Building_

others as most important, and those who consider using a number of different skills as most important (Sekaran, 2003). In this survey, the use of scales of 1 (Most Important), 2 (Important), 3 (Moderate), 4 (Less Important) and 5 (Not Important) provide responses in a Comparative Scale[152]. Respondents were asked to indicate their preferences for the provision of TFs by ranking the levels of importance they attached to five distinct TF groups of interest to the study.

6.5.1 Passengers expectations for the provision of terminal facilities in the LCT check-in, departure lounge, baggage reclamation and arrival hall and commercial area

Figure 6.5 provides an indication of what proportion of low cost passengers, in terms of importance levels, ranked their preferences for expected TFs in the LCT departure area. In the check-in area, which has check-in facilities[153] for boarding passengers, about 4.6% of leisure passengers prefer to have a Flight Information Display System (FIDS) as the most important facility in the check-in area. Figure 6.5 also shows that the leisure passengers rated the following facilities to be most important: way-finding (10.0%), seating (30.0%), self-service check-in kiosks (14.9%), a sufficient number of check-in counters (13.4%), no hold baggage check-in (14.3%), pre-departure check-in (12.6%) and trolleys (9.4%).

As for business passengers' perceptions (Figure 6.6), FIDS is nominated as the most important facility to be included in terminal design (11.4%) while other facilities, for example, way-finding (3.3%) and self-service check-in (3.7%), are also considered as important. Noting the seating as an example, the availability of this facility is seen as of high importance, for example, leisure passengers are interested in having more seating facilities in the check-in area. The current LCT faces huge problems caused by airline delays, therefore, the demand for seating availability is high. Fast track, no baggage check-in and pre-departure check-in are also in great demand although these facilities are not available in the current LCT.

In terms of business passengers' expectations (Figure 6.7), about 3.1%, 4.3% and 4.9% of this group agreed that the FIDS can be considered as most important, important and moderately important, respectively. In the departure lounges, the leisure passengers (Figure 6.8) selected FIDS as the most important facility; about 16.9%, 17.4% and 14.6% of leisure passengers agreed that this facility is considered to be most important, important and moderately important, respectively.

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152 Comparative scales provide a benchmark or a point of reference to assess attitudes towards the current object, event or situation. Rating scales are used to measure most behavioural concepts (Sekaran, 2003).

10 Fast track, no-baggage check-in and pre-departure check-in are not currently available at KLIA LCT.

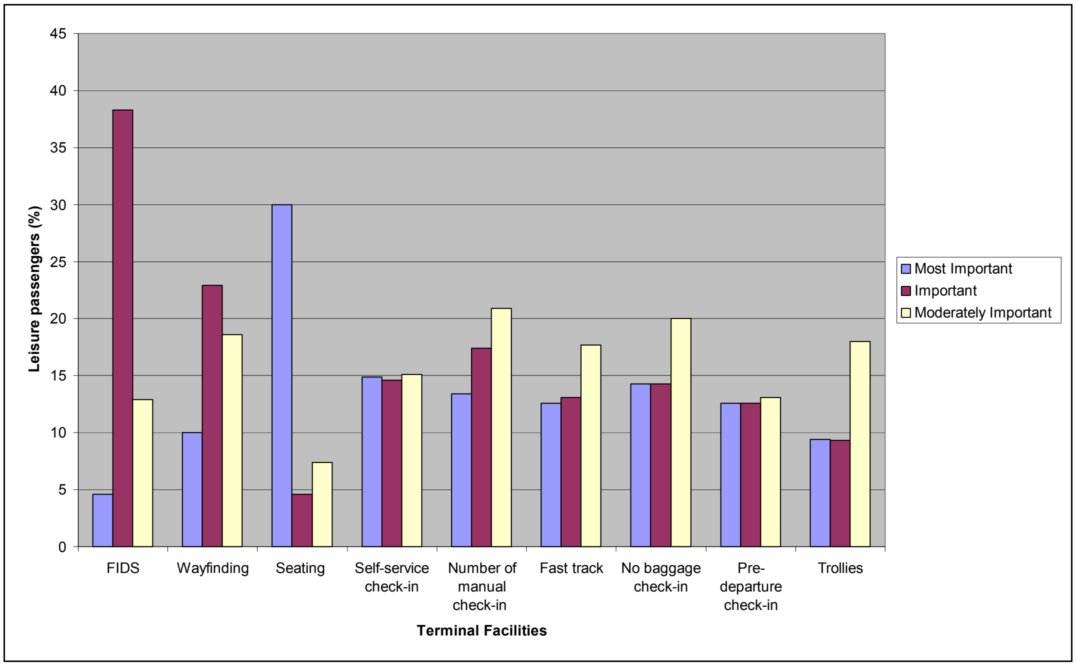

Figure 6.5 Importance of terminal facilities in check-in area (Leisure passengers' preferences)

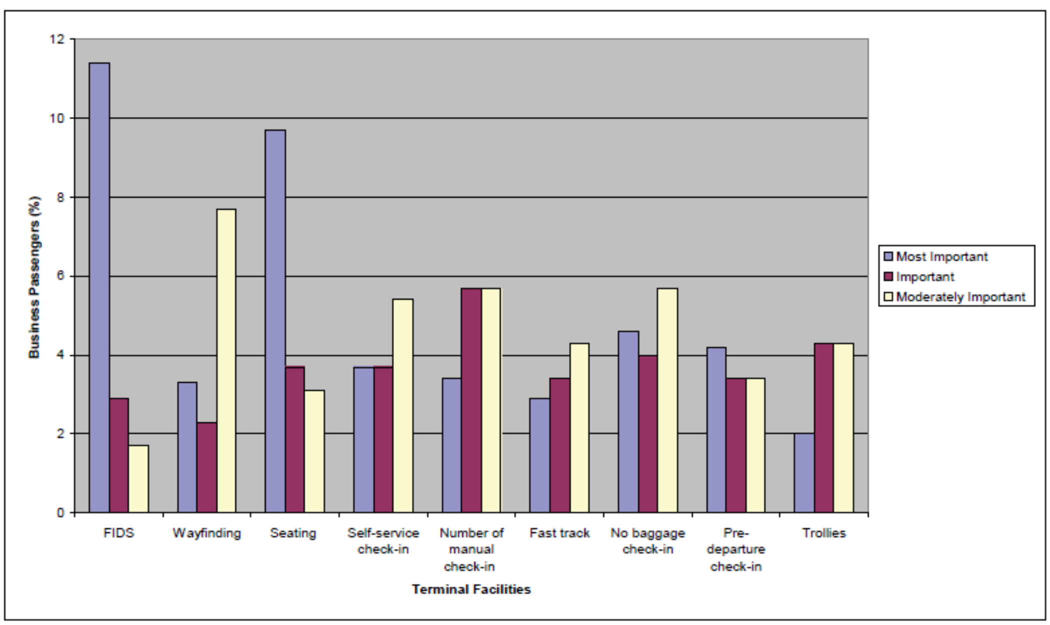

Figure 6.6 Importance of terminal facilities in check-in area (Business passengers' preferences)

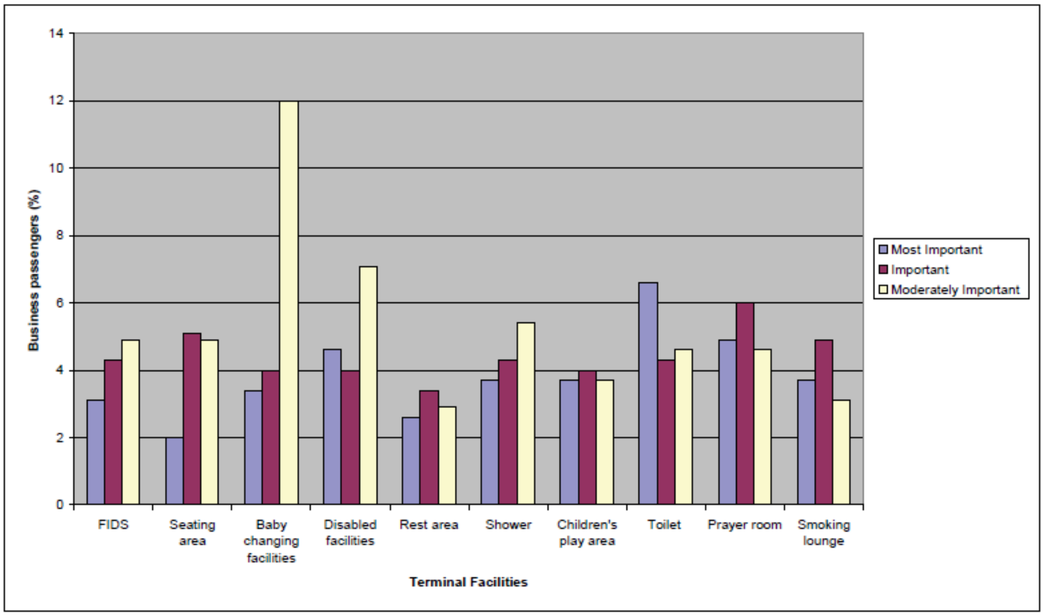

Figure 6.7 Importance of terminal facilities in departure area (Business passengers' preferences)

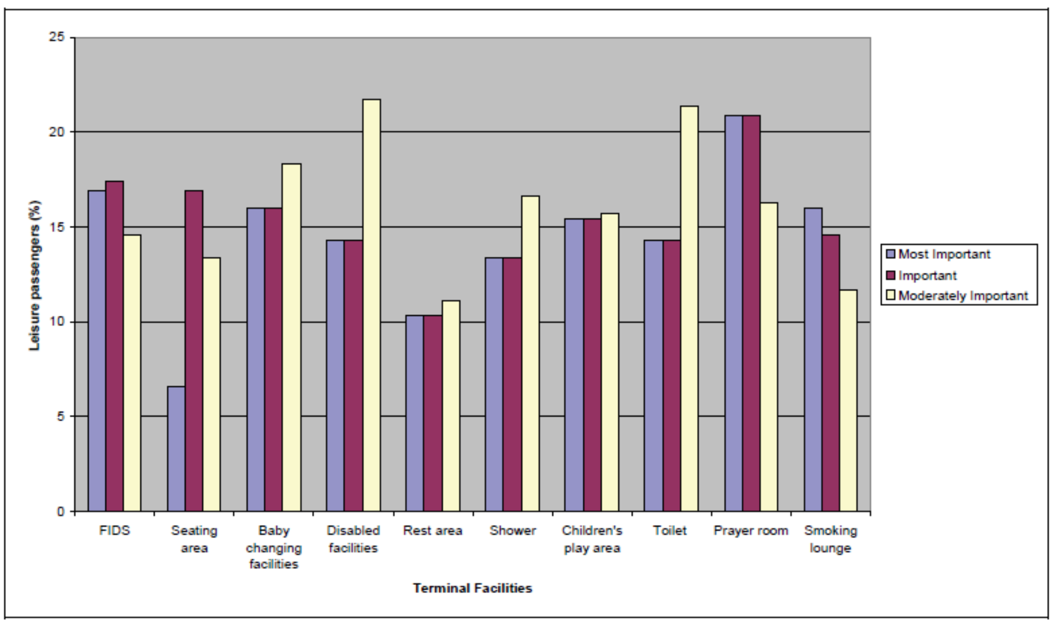

Figure 6.8 Importance of terminal facilities in departure area (Leisure passengers' preferences)

The high preference for FIDS may be due to the fact that business and leisure passengers need to have simple and reliable boarding information after taking into account the time restrictions for passengers to arrive at the airport and plan their activities within the terminal before catching their flights.

It is also worth considering that the following facilities should be available in the LCT departure lounge area[154], for example, children's play areas and prayer rooms should be located there[155]. Respondents in both groups agreed that the children's play area is the most important TFs as this received a positive response from 3.7% of the business and 15.4% of the leisure passengers. Considering the cultural influence on terminal design, the airport authorities should take account of the need for a prayer room being available in the departure lounge area, as 20.9% of the leisure passengers expected to have this facility there. Although the demands for FIDS, children's play area and prayer room are classified as most important, leisure passengers also showed their interest in having seating (6.6%), showers (13.4%) and rest areas (10.3%) included in the terminal design.

Figures 6.9 and 6.10 show that 2.0% of business passengers and 6.6% of leisure passengers expressed their interest in the availability of left luggage counters in the arrival hall (after customs check). Many of the travellers are using the terminal as a connecting point or for transfer from domestic and international routes. It seems that the need for a left luggage counter to be close to the arrival hall can reduce the amount of time to retrieve the baggage as the passengers would like the opportunity to visit the city during their transit time. In leisure passengers expectations, other facilities such as lost and found counter (0.9%), trolleys (1.1%) and baggage information display (3.4%) are considered as being sufficiently important to be included in terminal design.

Figures 6.11 and 6.12 show the specific TFs in the commercial area to be included in LCT design from the perceptions of business and leisure passengers. Of the total respondents, 8.9% and 28.3% of leisure and business passengers, respectively, agreed that seating provision was most important, and almost 4.9% and 2.0%, respectively, ranked the facility as 'important' and 'moderately important'.

In terms of commercial facilities[156], it was noted that leisure passengers (Figure 6.12) prefer to have self-vending machines, as the survey received about 16.0% responses supporting this. The availability of self-service vending machines is a convenience, considering that the facility does not use a lot of space, it is easy to manage, and simple. In the survey, business passengers also responded positively; having self-service machines was selected by 4.9% of respondents. This gives an indication that these machines should be prominently located in the arrival and departure areas of KLIA LCT after considering the advantage of reduced space requirements.

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[154] Rest areas and showers are not currently available at KLIA LCT.

[155] Leisure passengers wish to have the more toilets and prayer rooms compared with the design of KLIA LCT where these facilities were limited in order to reduce the amount of capital investment.

[156] A post office is not currently available at KLIA LCT.

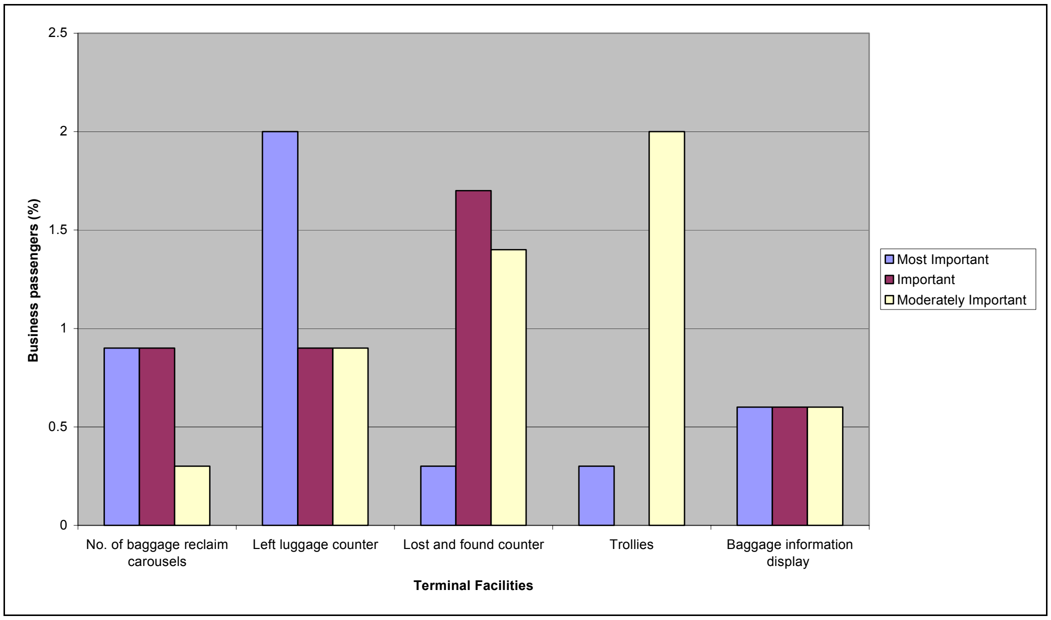

Figure 6.9 Importance of terminal facilities in baggage reclamation and arrival areas (Business passengers' preferences)

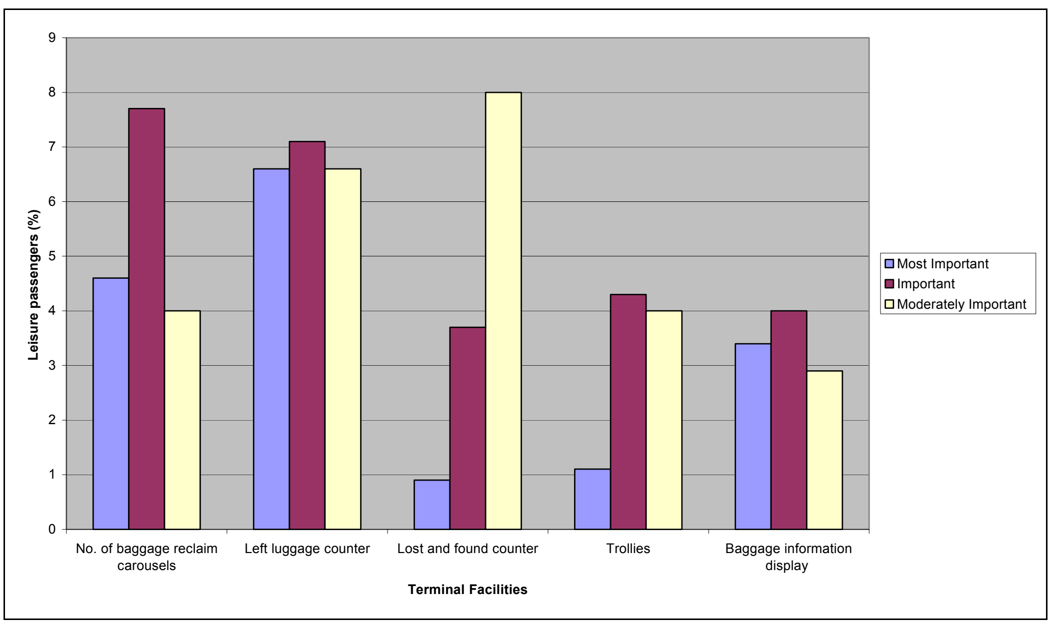

Figure 6.10 Importance of terminal facilities in baggage reclamation and arrival areas (Leisure passengers' preferences)

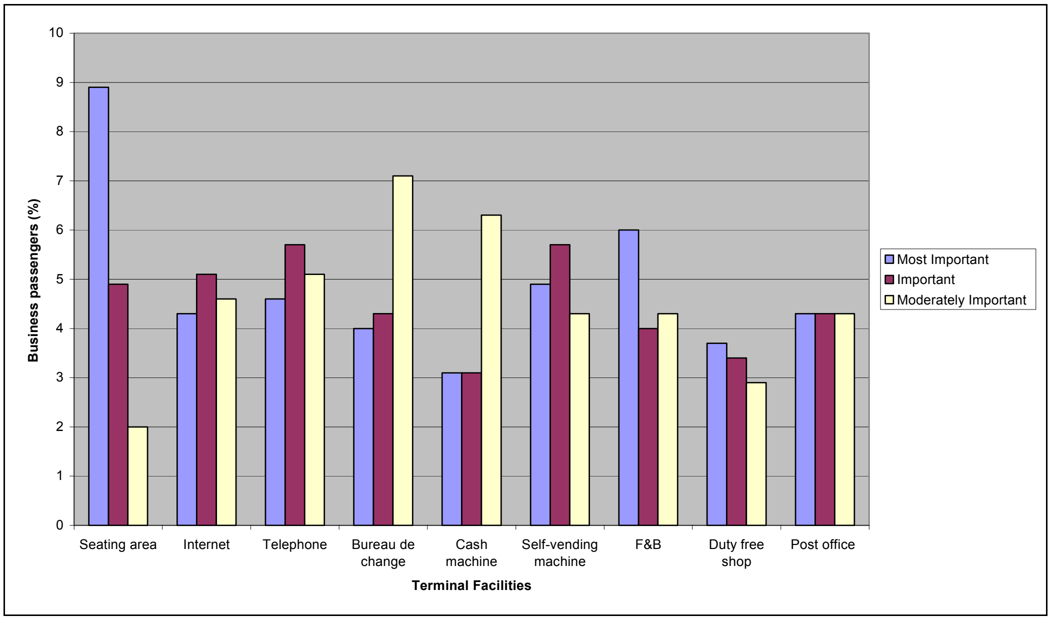

Figure 6.11 Importance of terminal facilities in commercial area of departure lounge (Business passengers' preferences)

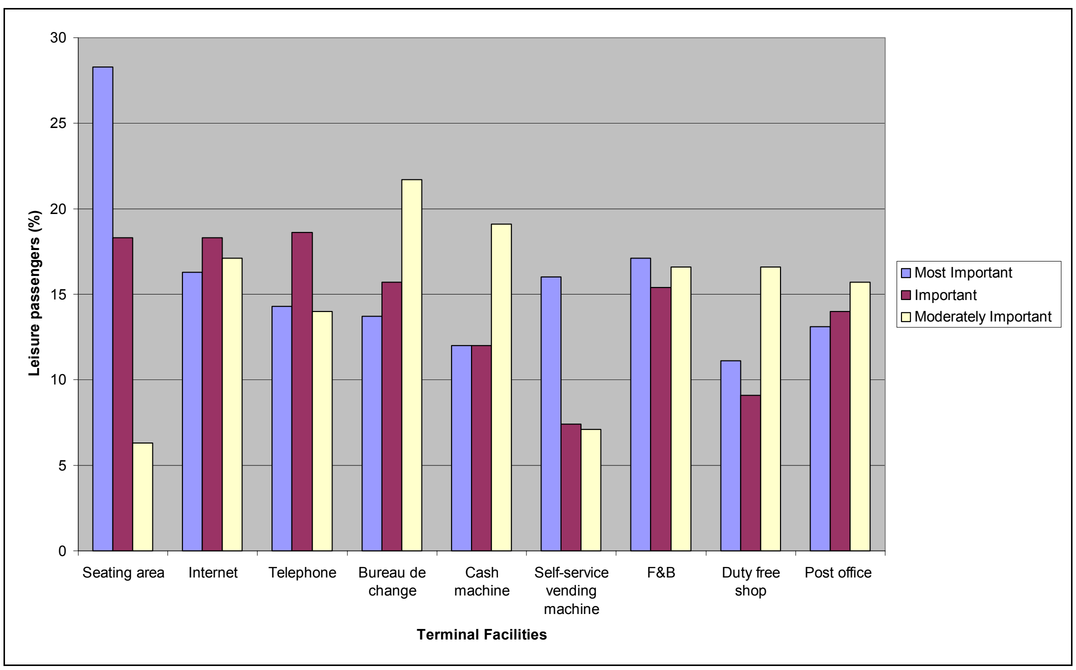

Figure 6.12 Importance of terminal facilities in commercial area of departure lounge (Leisure passengers' preferences)

6.5.2 Passengers preferences for terminal facilities in the check-in, departure lounge, baggage reclamation and arrival hall

In the check-in area, business passengers (Figure 6.13 and Table 6.1) make use of the following facilities: manual check-in counter (10.6%), self-service check-in machine (9.7%), seating (7.2%), FIDS (6.4%) and airline ticketing counter (6.1%). Manual check-in counters are currently available in order for Air Asia to cope with the requirement of highly efficient terminal processes. This facility caters for the increasing number of low cost passengers, and the number of check-in counters is important for airline operations. There are 72 manual check-in counters at KLIA LCT. Toilet facilities are in great demand. At present, the provision of these facilities is limited as they are shared between departure and arrival halls.

As Figure 6.14 and Table 6.1 show, leisure passengers mainly use the following facilities: manual check-in desk (56.1%), café or restaurant (55.6%), airline ticketing counter (53.3%), self-service check-in kiosks (52.8%) and FIDS (51.9%) all of which the respondents rated as highly important. It is also worth considering that the following facilities are widely used by leisure passengers: seating (51.4%), information counter (50%), bureau de change (48.9%), prayer room (47.2%) and air conditioning (45.8%). The use of these facilities is probably influenced by the fact that the provision of a full range of TFs is limited as the result of space restrictions. Taking self-service check-in kiosks, as an example, about 52.8% leisure passengers use this facility at the current KLIA LCT. Air Asia is aggressively introducing self-service kiosks to speed-up terminal processes and achieve cost reductions by reducing the number of manual check-in counters.

Seating and toilets were used most by business passengers (Figure 6.15), with response results of 11.1% and 10.6% from post-development survey. The highest preference for seating may be due to the limitation of seating availability in the departure lounge of KLIA LCT. The availability of toilets is important to business travellers. However, at KLIA LCT the airport planners restricted this facility due to space limitations. None of the business passengers prefer baby changing facilities. Nevertheless, Figure 6.16 shows that the leisure passengers preferred café or restaurant (50%), self-vending machine (41.7%) and seating (40.6%) in the departure lounge area.

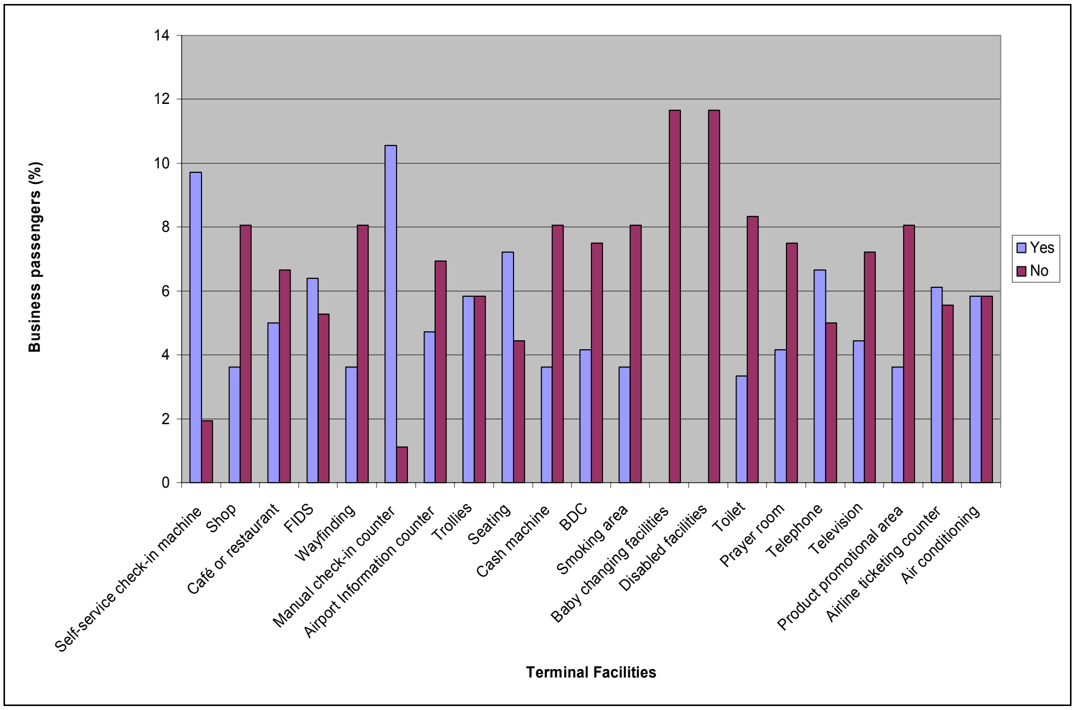

Figure 6.13 Business passenger preferences for check-in facilities at KLIA LCT

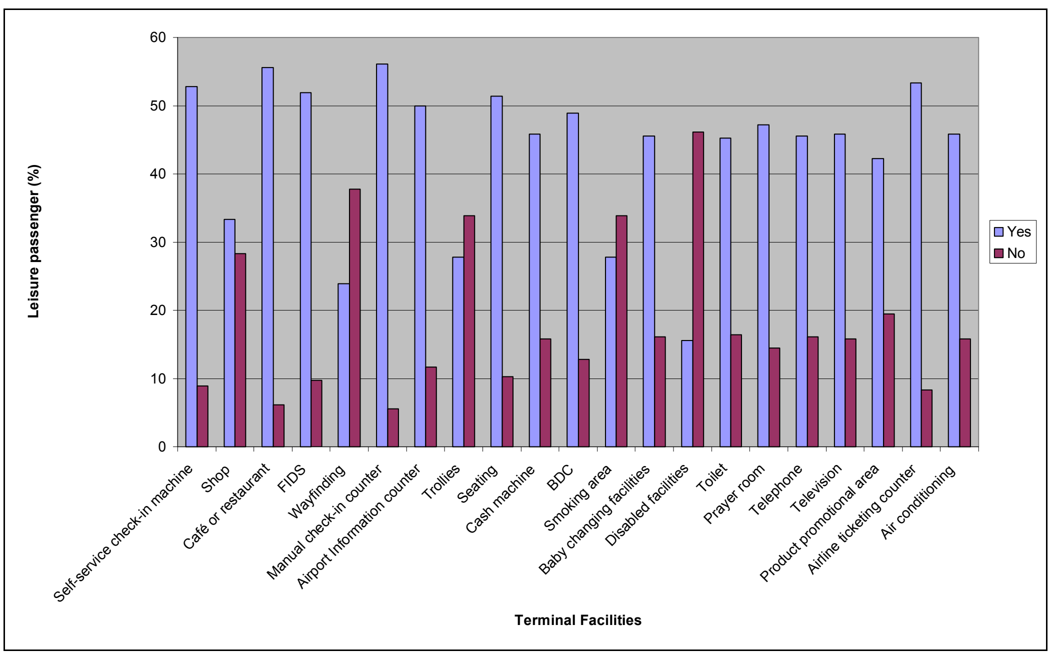

Figure 6.14 Leisure passenger preferences for check-in facilities at KLIA LCT

Table 6.1 Business and leisure passenger ranking of check-in facilities

Business passengers		Leisure passengers	
Rank	Terminal Facilities	Rank	Terminal Facilities
1	Manual check-in counter	1	Manual check-in counter
2	Self-service check-in machine	2	Café or restaurant
3	Seating	3	Airline ticketing counter
4	FIDS	4	Self-service check-in machine
5	Airline ticketing counter	5	FIDS
6	Air conditioning	6	Seating
7	Café or restaurant	7	Airport information counter
8	Airport information counter	8	Bureau de change
9	Television	9	Prayer room
10	Telephone	10	Air conditioning

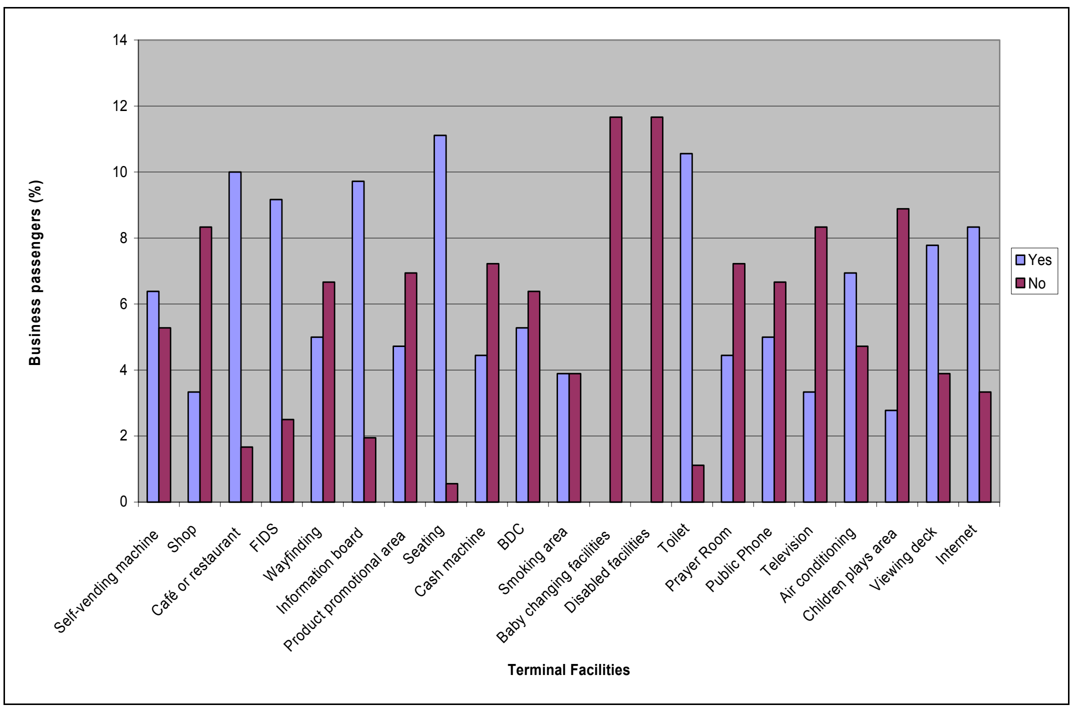

Figure 6.15 Business passenger preferences for departure lounge facilities at KLIA LCT

About 36.1% of the passengers made use of baby changing facilities. The other facilities evaluated such as air conditioning (34.7%), shop (30.6%), toilets (30%), bureau de change (27.5%) and disabled facilities (16.7%), were moderately rated by leisure passengers. Table 6.2 shows the ranking of departure lounge facilities by business and leisure passengers.

From Figure 6.17, business passengers rated FIDS (3.6%) as being important in the baggage reclamation area and arrival halls. The availability of hotel reservation desks (2.5%) was also ranked as important by business passengers. Other facilities such as seating (3.3%), air conditioning (3.1%), and an airport information desk (2.7%) were selected as essential for inclusion in future LCT designs. Leisure passengers (Figure 6.18) indicated a preference for the availability of shops (18.9%), baggage reclamation signage (12.8%), airline information desks (16.1%), and self-vending machines (14.7%). The availability of these facilities is linked to terminal convenience as they increase the level of service at KLIA LCT. Table 6.3 shows the rankings of baggage reclamation and arrival hall facilities by business and leisure passengers.

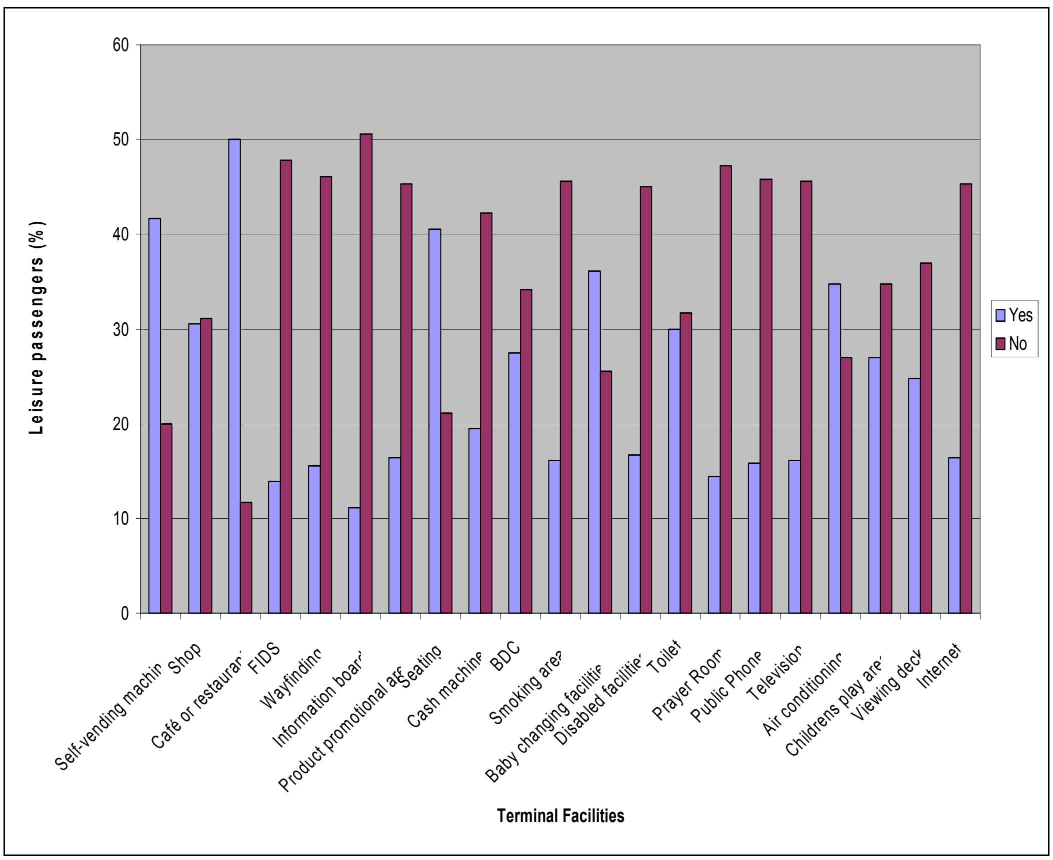

Figure 6.16 Leisure passenger use of departure lounge facilities of KLIA LCT

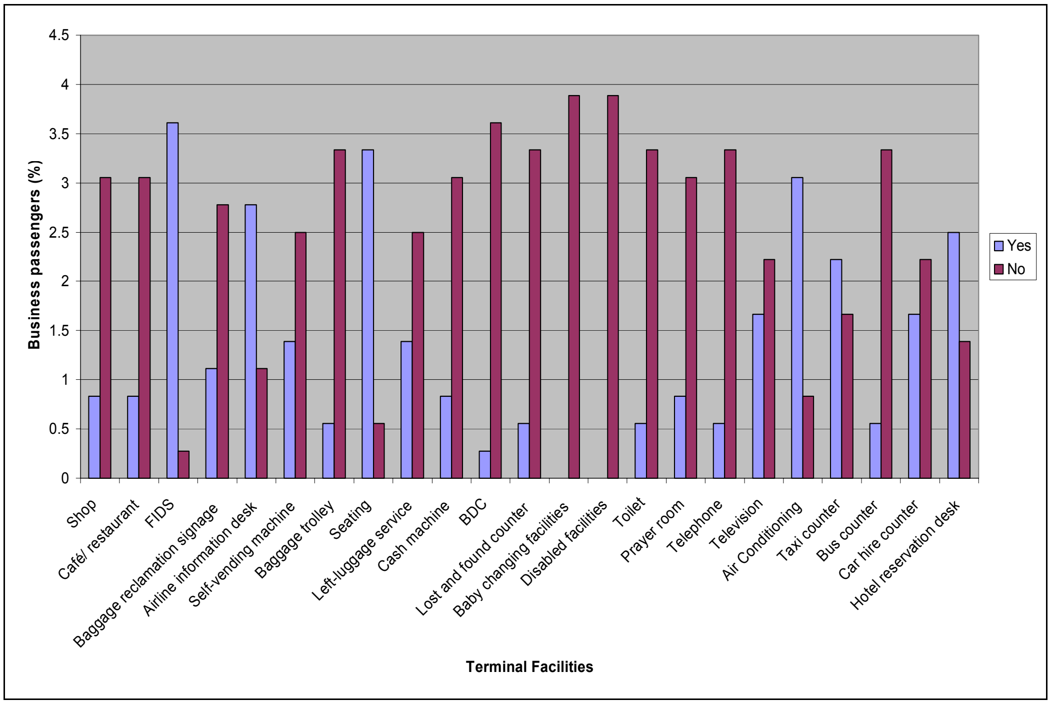

Figure 6.17 Business passenger use of baggage reclamation and arrival hall facilities of KLIA LCT

Table 6.2 Business and leisure passenger ranking of departure lounge facilities

Business passengers		**Leisure passengers**	
Rank	**Terminal Facilities**	**Rank**	**Terminal Facilities**
1	Seating	1	Café or restaurant
2	Toilets	2	Self-vending machine
3	Café or restaurant	3	Seating
4	Information board	4	Baby changing facilities
5	FIDS	5	Air conditioning
6	Internet	6	Shop
7	Viewing deck	7	Toilets
8	Air conditioning	8	Bureau de change
9	Self-vending machine	9	Cash machine
10	Bureau de change	10	Disabled facilities

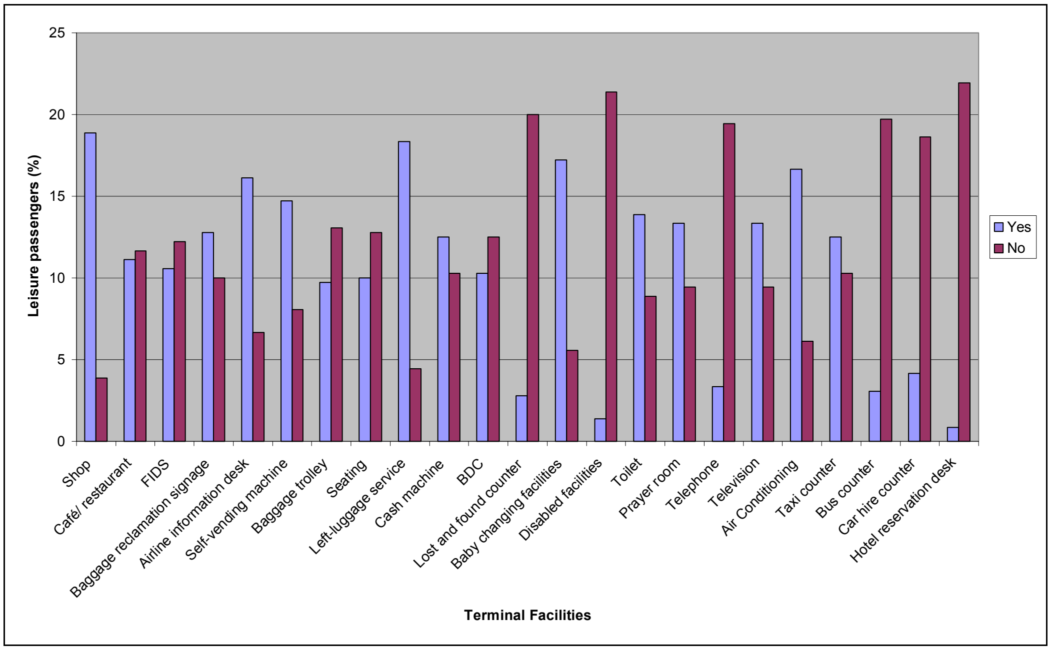

Figure 6.18 Leisure passenger use of baggage reclamation and arrival hall of KLIA LCT

Table 6.3 Business and leisure passenger ranking of baggage reclamation and arrival hall facilities

Business passengers		Leisure passengers	
Rank	**Terminal Facilities**	**Rank**	**Terminal Facilities**
1	FIDS	1	Shops
2	Seating	2	Left luggage service
3	Air conditioning	3	Baby changing facilities
4	Airline information desk	4	Air-conditioning
5	Hotel reservation counter	5	Airline information desk
6	Taxi counter	6	Self-vending machine
7	Car hire counter	7	Toilet
8	Self-vending machine	8	Prayer room
9	Left luggage service	9	Television
10	Baggage reclamation signage	10	Taxi counter

6.6 Cross-price elasticity dynamics and flexibility effect on preferences of passengers for TFs from change in fare[157]

This section has two aims, firstly, it measures the relationship of the provision of TFs in LCT design to each fare decrement (10%, 20%, 30% or no change in fare), and secondly, the degree of these relationships. In this survey, each passenger was asked to express their reactions to the experience of using the TFs in the LCT. The closed questions had two sections, departures and arrivals. In the departures section, the question was specifically asked to reveal what TFs are correlated in the check-in and boarding areas. The arrivals section was used to evaluate the TFs provision at baggage reclamation and in the arrival hall. The inclusion of commercial facilities in the questionnaire was to measure passengers' preferences to have those facilities included in the LCT design. Since meaningful interpretations on survey outcomes are considered important, selected cases were used with the Spearman correlation coefficient to rank by scale[158] the importance of the level of TFs. Passenger preferences for the adequate provision of TFs were shown in tabular form, and were proved by statistical correlation between the stated preferences of business and leisure passengers.

6.6.1 Cross-price elasticity and its effect on the preferences of Air Asia business and leisure passengers for TFs in check-in area

Table 6.4 shows correlation values (ρ)[159] representing the ranking of TFs by Air Asia business and leisure passengers, if the fare is reduced by 10%. The Table shows the statistical correlation of the Air Asia business and leisure passengers at 10% sensitivity level. There were strong correlations between the rankings of the TFs, regardless of the purpose of travel, while Table 6.4 shows the Spearman rho (ρ) coefficient. It shows that the responses of the two groups of travellers are sensitive to their interest in having those TFs if the fare is reduced by 10%. With the seating correlation (Business, 0.981, Leisure, 0.703) as an example, both business and leisure passengers expressed their strong interest in having this facility included in LCT design.

Table 6.5 shows that the ranking indicates which TFs are low importance, moderate importance and high importance, if the fare were reduced by 20%. Not all TFs were found to be necessary at 20% discount. From Table 6.5, the analysis shows that seating (0.743) and airline ticketing counter (0.811) are noted as being necessary, the correlation being among the highest in the business passengers' rankings. It shows that these facilities are seen as most important, although the terminal designers had limited them in the current LCT area. Table 6.5 also shows that, of the TFs preferences for the leisure passengers, they selected the manual check-in counter (0.603), information counter (0.823), trolleys (0.701), cash machine (0.726), prayer room (0.774), telephone

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157 With reference to Section 5.6, the justification of independent and dependent variables has been clearly defined.

158 Scale was used to tap preferences between two or among more objects or items (Sekaran, 2003)

159 r or ρ are used interchangeably, http://www.mnstate.edu/wasson/ed602spearcorr.htm

(0.726) and airline ticketing counters (0.725) as important. The results show a strong correlation for leisure passengers at a 20% fare reduction.

Referring to Table 6.6, if the fare was reduced by 30%, the business passengers gave the highest rank (Table 6.6) to the following TFs: self-service check-in (0.781), airline ticketing counter (0.754) and telephone (0.811). The respondents expressed a preference to have a self-service check-in kiosks and this was strongly correlated between business and leisure passengers (Business: 0.781, Leisure: 0.866). The same survey shows leisure passenger preference correlation values for café or restaurant (0.863) which is strongly correlated and of high importance.

Table 6.7 shows the correlations for business and leisure passengers who prefer to pay 'no-change' low cost fares and would not trade-off a reduction in fare for a reduced provision of TFs. The results show that there are different preferences in the TF 'wishes' as self-service check-in kiosks has a strong correlation (Business: 0.881, Leisure: 0.765). Business passengers who fly with the LCCs seek the following TFs: manual check-in counter (0.679), café or restaurant (0.911), information counter (0.795), trolleys (0.775), prayer room (0.814), television (0.792) and telephone (0.937). In terms of leisure passenger preferences, the following facilities were considered to be of high importance: self-service check-in kiosks (0.765), FIDS (0.783), manual check-in (0.802), information counter (0.928), trolleys (0.933), seating (0.777), cash machine (0.679), bureau de change (0.742), airline ticketing counters (0.902) and air conditioning (0.898).

To summarise, in the analysis of both business and leisure passengers, it was found that leisure passengers are more demanding in the provision of TFs facilities and regard the fare as being the reason for experiencing frequent delays in check-in services. With a restriction in the provision of TFs in the current LCT design, both business and leisure passengers wish to have more facilities to be included, but with no reduction in air fares. If the management of MAHB wishes to increase the efficiency of processing activities in the departure area, while at the same time continuing to reduce the LCT operational delay (for example, reducing long queues for check-in services), they can perhaps be able to identify the exact needs of passengers for TF provision in LCT design, that have been shown in Tables 6.4 to 6.7.

6.6.2 Cross-price elasticity and its effect on preferences by Air Asia business and leisure passengers for TFs in the departure lounge

The analysis was then repeated for the LCT departure lounge. The questionnaire was revised taking into account TFs normally located in the departure lounge. Table 6.8 shows the correlation values for the provision of TFs for Air Asia passengers, if the fare is reduced by 10%. This table shows that the leisure passengers have chosen fare as an important variable which influences their interest in the provision of specific TFs as part ofLCT design.This group expressed their highest preferences for self-service vending machines (0.724), seating (0.661), baby-changing facilities (0.765), disabled facilities (0.932), television (0.721) and air conditioning (0.594), all to be included in the terminal design. Table 6.8 also shows that business class passengers wish to have FIDS (0.960), information boards (0.706), bureau de change (0.777), toilets (0.918), and internet (0.748), as these TFs are highly correlated with ρ values of more than 0.590 (Table 5.3).

With a 20% reduction in air fare, there is noticeable change in overall TFs correlation values to 0.590 for both business and leisure passengers. In Table 6.9, seating (0.687), baby changing facilities (0.819), disabled facilities (0.732), television (0.721) and air conditioning (0.612) are strongly correlated at 20% reduction of air fares, for leisure passenger preferences. Table 6.9 also shows that, overall, both business and leisure passengers require similar facilities, statistically represented by a low correlation by the ρ-value ($\rho<0.00$) and their close correlation. In this case, it follows that for the specific groups of leisure and business passengers, fare is an important factor in TFs requirement at a 20% reduction in air fare.

The situation changes when the fare is reduced by 30%. Table 6.10 shows the differences in correlation values for business passengers in their preferences for TFs in LCT design, in ascending order: café or restaurant (0.756), seating (0.816) and toilets (0.865). Table 6.10 also shows that specific TFs are rated as not being linked to the reduction of air fares at 30% level, as shown by low ρ values, by leisure passengers [for example, FIDS (0.301), way-finding (0.435), information board (0.197) and promotional area (0.003)].

Data collected from Air Asia passengers revealed that both business and leisure passengers' TFs requirements are broadly similar, and it is apparent that the rankings indicate that a higher reduction of leisure passengers' fares as the being most essential attribute in order to determine the adequacy of TFs provision to be included in the design for the departure lounge.

The passengers responses shown in Table 6.11 below, showed a preference for specific TFs with 'no-change' fares. Table 6.11 shows that leisure passengers are more sensitive, as signified by the slightly higher ρ-value, than business passengers. At normal low cost fares, the strongest correlation of the ρ-value shows that the leisure passengers had a preference for the following TFs: self-vending machines (0.744), shops (0.818), café and restaurant (0.724), seating (0.945), baby changing facilities (0.742), disabled facilities (0.851) and toilets (0.713). In contrast, business passengers had stated preferences for the following TFs: café or restaurant (0.816), bureau de change (0.712), disabled facilities (0.992) and toilets (0.971), showing that air fare is an important indicator to assess the inclusion of TFs in the departure area.

Table 6.4 Correlation of TF preferences by Air Asia business and leisure passengers (purpose of travel and fare), at 10% fare reduction, for all TFs located in the check-in area

No	Terminal Facilities	Business Passengers			Leisure Passengers		
	Importance	Low	Moderate	High	Low	Moderate	High
1	Self-service check-in kiosk			0.630		0.450	
2.	Shop	0.006			0.037		
3.	Café or restaurant	0.015			0.003		
4.	FIDS			0.675	0.345		
5.	Way-finding	0.119			0.012		
6.	Manual check-in counter			0.671			0.655
7.	Information counter			0.636			0.942
8.	Trolleys	0.201				0.555	
9.	Seating			0.981			0.703
10.	Cash machine	0.282			0.347		
11.	BDC			0.770			0.792
12.	Smoking area	0.185				0.452	
13.	Baby changing facilities	-			0.006		
14.	Disabled facilities	-			0.018		
15.	Toilets	0.189			0.385		
16.	Prayer room	0.255					0.767
17.	Television		0.526		0.055		
18.	Product promotional area	0.001			0.047		
19.	Airline ticketing counter	0.387				0.539	
20.	Telephone	0.127					0.792
21.	Air conditioning	0.387					0.792

Table 6.5 Correlation of TF preferences by Air Asia business and leisure passengers (purpose of travel and fare), at 20% fare reduction, for all TFs located in the check-in area

No	Terminal Facilities	Business Passengers			Leisure Passengers		
	Importance	Low	Moderate	High	Low	Moderate	High
1	Self-service check-in kiosks			0.655		0.567	
2.	Shop	0.186			0.126		
3.	Café or restaurant	0.349				0.446	
4.	FIDS	0.400			0.229		
5.	Way-finding	0.036			0.126		
6.	Manual check-in counter			0.734			0.603
7.	Information counter	0.216					0.823
8.	Trolleys	0.390					0.701
9.	Seating			0.743		0.534	
10.	Cash machine	0.363					0.726
11.	BDC		0.421			0.590	
12.	Smoking area	0.149			0.276		
13.	Baby changing facilities	-			0.179		
14.	Disabled facilities	-			0.052		
15.	Toilets		0.569		0.235		
16.	Prayer room	0.363					0.774
17.	Television	0.048			0.017		
18.	Product promotional area	0.054			0.119		
19.	Airline ticketing counter			0.811			0.725
20.	Telephone		0.505			0.443	
21.	Air conditioning	0.236				0.527	

Table 6.6 Correlation of TF preferences by Air Asia business and leisure passengers (purpose of travel and fare), at 30% fare reduction, for all TFs located in check-in area

No	Terminal Facilities	Business Passengers			Leisure Passengers		
	Importance	Low	Moderate	High	Low	Moderate	High
1	Self-service check-in kiosks			0.781			0.866
2.	Shop	0.186				0.432	
3.	Café or restaurant	0.349					0.863
4.	FIDS		0.400			0.504	
5.	Way-finding	0.036			0.117		
6.	Manual check-in counter		0.534		0.019		
7.	Information counter		0.412		0.183		
8.	Trolleys	0.339			0.166		
9.	Seating		0.443		0.299		
10.	Cash machine	0.363			0.021		
11.	BDC		0.421		0.001		
12.	Smoking area	0.149			0.001		
13.	Baby changing facilities	-			0.031		
14.	Disabled facilities	-			0.228		
15.	Toilets	0.021			0.021		
16.	Prayer room		0.569		0.030		
17.	Television		0.581		0.026		
18.	Product promotional area	0.048			0.096		
19.	Airline ticketing counter			0.754	0.206		
20.	Telephone			0.811	0.193		
21.	Air conditioning		0.405		0.192		

Table 6.7 Correlation of TF preferences by Air Asia business and leisure passengers' (purpose of travel and fare), no-change in fare, for all TFs located in check-in area

No	Terminal Facilities	Business Passengers			Leisure Passengers		
	Importance	Low	Moderate	High	Low	Moderate	High
1	Self-service check-in kiosks			0.881			0.765
2.	Shop	0.136			0.038		
3.	Café or restaurant			0.911	0.182		
4.	FIDS	0.191					0.783
5.	Way-finding	0.001			0.342		
6.	Manual check-in counter			0.679			0.802
7.	Information counter			0.795			0.928
8.	Trolleys			0.775			0.933
9.	Seating	0.330					0.777
10.	Cash machine	0.279					0.679
11.	BDC	0.211					0.742
12.	Smoking area	0.144				0.466	
13.	Baby changing facilities	-			0.054		
14.	Disabled facilities	-			0.017		
15.	Toilets	0.097			0.134		
16.	Prayer room			0.814	0.119		
17.	Television			0.792	0.290		
18.	Product promotional area		0.591		0.112		
19.	Airline ticketing counter		0.462				0.902
20.	Telephone			0.937	0.292		
21.	Air conditioning		0.427				0.898

Leisure class passengers scored the highest positive correlation and Table 6.8 shows that the leisure passengers are more sensitive to a 10% reduction in air fares.

In conclusion, the analysis of business and leisure passengers on their preferences for TFs indicates that there is some similarity in their needs for specific TFs, mostly at a 30% air fare reduction as the tests show a weak correlation on the provision of TFs in the departure area. However, Table 6.11 shows the strongest correlation which signifies that fare variation is a suitable tool to assess the adequacy of TFs in the departure lounge area.

6.6.3 Cross-price elasticity and the effect on preferences of Air Asia business and leisure passengers for specific TFs in baggage reclamation area and arrival hall

Table 6.12 shows the correlation values for business and leisure passenger ranking of TFs in the LCT arrival area, if the air fares were reduced by 10%. Table 6.12 shows the relationship between air fares and the following TFs: shop, café or restaurant, FIDS, baggage reclamation signage, information desk, left luggage counter, cash machine, bureau de change, lost and found counter, baby changing facilities, disabled facilities, toilet, taxi counter, bus counter, car hire and hotel reservation counter. Table 6.12 also shows that leisure passengers' preferences are strongly linked to the reduction of air fares by 10% by nominating these facilities as being important for inclusion in terminal design. Therefore, the availability of the following facilities: baggage reclamation signage (0.891), cash machine (0.797), baby changing facilities (0.827), disabled facilities (0.727), toilets (0.810), prayer room (0.944), air conditioning (0.764) and taxi counter (0.701) are seen as important at the 10% discounted air fare. However, baggage reclamation signage (0.948), seating (0.718) and air conditioning (0.891) are shown to be highly correlated at a 10% reduction in air fares by business passengers' preferences.

Table 6.13 shows the correlation values for TFs when fare is discounted at 20%. Leisure passengers are more fare sensitive as they need to have adequate TFs to speed up processes in LCT areas. Table 6.13 also shows the low and moderate correlation values within the business passenger sample for their TF preferences. For example, the availability of shops, business passengers preferred them less (0.073) than leisure passengers (0.517).

Table 6.8 Correlation of TF preferences by Air Asia business and leisure passengers (purpose of travel and fare), at 10% fare reduction, for all TFs located in the departure lounge

No	Terminal Facilities	Business Passengers			Leisure Passengers		
	Importance	Low	Moderate	High	Low	Moderate	High
1	Self service vending machine		0.431				0.724
2.	Shop	0.035			0.066		
3.	Café or restaurant	0.003			0.027		
4.	FIDS			0.960		0.441	
5.	Way-finding	0.345			0.363		
6.	Information board			0.706		0.413	
7.	Product promotional area		0.398		0.157		
8.	Seating	0.291					0.661
9.	Cash machine		0.570		0.318		
10	BDC			0.777	0.244		
11	Smoking area		0.570			0.498	
12.	Baby changing facilities		-				0.765
13	Disabled facilities		-				0.932
14	Toilets			0.918		0.433	
15	Prayer Room		0.452			0.401	
16	Public Phone	0.231			0.120		
17	Television	0.214					0.721
18	Air conditioning		0.424				0.594
19	Children's play area	0.314				0.444	
20	Viewing deck		0.540		0.091		
21	Internet			0.748		0.501	

Table 6.9 Correlation of TF preferences by Air Asia business and leisure passengers (purpose of travel and fare), at 20% fare reduction, for all TFs located in departure lounge

No	Terminal Facilities	Business Passengers			Leisure Passengers		
	Importance	Low	Moderate	High	Low	Moderate	High
1	Self service vending machine	0.242				0.424	
2.	Shop		0.406			0.410	
3.	Café or restaurant		0.557			0.500	
4.	FIDS	0.376			0.271		
5.	Way-finding	0.287			0.019		
6.	Information board	0.383			0.052		
7.	Product promotional area	0.473			0.128		
8.	Seating	0.226					0.687
9.	Cash machine	0.273			0.067		
10	BDC		0.551		0.092		
11	Smoking area	0.001				0.498	
12.	Baby changing facilities	-					0.819
13	Disabled facilities	-					0.732
14	Toilet			0.759	0.211		
15	Prayer Room	0.263			0.073		
16	Public Phone	0.315			0.058		
17	Television		0.405				0.721
18	Air conditioning			0.890			0.612
19	Children's play area	0.203			0.039		
20	Viewing deck		0.505		0.088		
21	Internet	0.263				0.524	

Table 6.10 Correlation of TF preferences by Air Asia business and leisure passengers (purpose of travel and fare), at 30% fare reduction, for all TFs located in the departure lounge

No	Terminal Facilities	Business Passengers			Leisure Passengers		
	Importance	Low	Moderate	High	Low	Moderate	High
1	Self service vending machine	0.262			0.007		
2.	Shop	0.123				0.424	
3.	Café or restaurant			0.756		0.491	
4.	FIDS		0.450		0.301		
5.	Way-finding	0.008				0.435	
6.	Information board	0.002			0.197		
7.	Product promotional area	0.003			0.003		
8.	Seating			0.816			0.728
9.	Cash machine		0.482		0.010		
10	BDC	0.120			0.004		
11	Smoking area	0.001			0.004		
12.	Baby changing facilities	-				0.527	
13	Disabled facilities	-				0.551	
14	Toilet			0.865	0.011		
15	Prayer Room	0.371			0.008		
16	Public Phone	0.124			0.011		
17	Television	0.362			0.011		
18	Air conditioning		0.513				0.801
19.	Children's play area	0.148				0.512	
20	Viewing deck	0.311			0.006		
21	Internet		0.564			0.426	

Table 6.11 Correlation of TF preferences by Air Asia business and leisure passengers (purpose of travel and fare), at 'no-change' fare, for all TFs located in the departure lounge

No	Terminal Facilities	Business Passengers			Leisure Passengers		
	Importance	Low	Moderate	High	Low	Moderate	High
1	Self service vending machine		0.492				0.744
2.	Shop		0.416				0.818
3.	Café or restaurant			0.816			0.724
4.	FIDS		0.542		0.012		
5.	Way-finding	0.009			0.045		
6.	Information board	0.001			0.023		
7.	Product promotional area	0.365				0.525	
8.	Seating	0.016					0.945
9.	Cash machine	0.105					0.612
10	BDC			0.712			0.631
11	Smoking area		0.442				0.604
12.	Baby changing facilities	-					0.742
13	Disabled facilities	-					0.851
14	Toilets			0.971			0.713
15	Prayer Room			0.641	0.101		
16	Public Phone		0.582		0.008		
17.	Television		0.412		0.234		
18	Air conditioning		0.493				0.665
19.	Children's play area	0.254					0.645
20	Viewing deck	0.002			0.014		
21	Internet		0.587				0.617

When the fares are reduced by 30% (Table 6.14), a large proportion of business passengers have less interest in the inclusion of specific TFs in LCT design. The major preferences are for an information counter (0.717) and air conditioning (0.881) to be included in the terminal design. It was also noted that, apart from the information counter and air conditioning, most of the TFs are seen as of moderate or low importance in terms of terminal design. Table 6.14 also shows that leisure passengers require the following TFs, albeit at a fare level of 30% reduction: way finding (0.715), baby changing facilities (0.742), disabled facilities (0.868) and toilets (0.742).

Table 6.15 shows significant changes in the correlation values of passenger preferences for TFs in terminal design, if the fare is not discounted. There is also a noticeable change in the correlation for the business class passengers. Business passengers expressed a preference to have FIDS (0.869), baggage reclamation signage (0.938), information desk (0.856), left luggage counter (0.726), television (0.735), taxi counter (0.729), car hire (0.642) and hotel reservation counter (0.593) included in the terminal design.

Table 6.15 also shows that there is strong correlation in the ranking of TFs by leisure passengers shown by ρ-values of more than 0.700 ($\rho>0.700$). Noting FIDS (0.900), baggage reclamation signage (0.990), information desk (0.958) and left luggage service (0.795) as examples, leisure passengers' preferences are that these facilities should be included. The results signify that leisure passengers wish to have more facilities to be included in LCT design, as they expect to have more comfortable and faster terminal services at the LCT than currently experienced. This shows the unique interests of leisure passengers in using the LCT facilities, with air fares as an important factor in facility preferences.

Table 6.12 Correlation of TF preferences by Air Asia business and leisure passengers (purpose of travel and fare), at 10% fare reduction, for all TFs located in the baggage reclaim area and arrival hall

No	Terminal Facilities	Business Passengers			Leisure Passengers		
	Importance	Low	Moderate	High	Low	Moderate	High
1	Shop	0.113				0.425	
2.	Café/ restaurant	0.275			0.196		
3.	FIDS	0.072			0.080		
4.	Baggage reclaim signage			0.948			0.891
5.	Airline information desk	0.367			0.339		
6.	Self-vending machine	0.386			0.245		
7.	Trolleys	0.214			0.234		
8.	Seating			0.718	0.294		
9.	Left-luggage service		0.572			0.587	
10	Cash machine	0.384					0.797
11	BDC	0.095				0.439	
12.	Lost and found counter	0.060			0.336		
13.	Baby changing facilities	-					0.827
14	Disabled facilities	-					0.727
15	Toilet	0.308					0.810
16	Prayer room	0.317					0.944
17	Telephone	0.043			0.065		
18	Television	0.364			0.389		
19	Air Conditioning			0.891			0.764
20	Taxi counter	0.307					0.701
21	Bus counter	0.143			0.008		
22	Car hire counter	0.242				0.504	
23.	Hotel reservation counter		0.406		0.077		

Table 6.13 Correlation of TF preferences by Air Asia business and leisure passengers (purpose of travel and fare), at 20% fare reduction, for all TFs located in the baggage reclaim area and arrival hall

No	Terminal Facilities	Business Passengers			Leisure Passengers		
	Importance	Low	Moderate	High	Low	Moderate	High
1	Shop	0.073				0.517	
2.	Café/ restaurant	0.311			0.266		
3.	FIDS	0.378			0.246		
4.	Baggage reclamation signage			0.784		0.560	
5.	Airline information desk		0.545			0.590	
6.	Self-vending machine			0.971			0.702
7.	Trolleys		0.487			0.550	
8.	Seating		0.450		0.028		
9.	Left-luggage service	0.306			0.236		
10	Cash machine	0.327					0.898
11	BDC		0.392			0.463	
12.	Lost and found counter	0.299				0.429	
13.	Baby changing facilities	-				0.513	
14	Disabled facilities	-					0.913
15	Toilets	0.327					0.715
16	Prayer room		0.393		0.317		
17	Telephone	0.335			0.119		
18	Television		0.487				0.769
19	Air Conditioning	0.327					0.880
20	Taxi counter	0.223			0.183		
21	Bus counter	0.169			0.016		
22	Car hire counter	0.150				0.512	
23.	Hotel reservation counter		0.504		0.004		

Table 6.14 Correlation of TF preferences by Air Asia business and leisure passengers (purpose of travel and fare), at 30% fare reduction, for all TFs located in the baggage reclaim area and arrival hall

No	Terminal Facilities	Business Passengers			Leisure Passengers		
	Importance	Low	Moderate	High	Low	Moderate	High
1.	Shop	0.027				0.546	
2.	Café/ restaurant	0.312			0.026		
3.	FIDS	0.382				0.487	
4.	Baggage reclaim signage		0.464				0.715
5.	Airline information desk			0.717		0.507	
6.	Self-vending machines	0.344			0.253		
7.	Trolleys		0.394		0.288		
8.	Seating	0.210			0.041		
9.	Left-luggage service		0.516			0.528	
10	Cash machine	0.220				0.570	
11	BDC	0.072			0.133		
12.	Lost and found counter	0.018			0.150		
13.	Baby changing facilities	-					0.742
14	Disabled facilities	-					0.868
15	Toilets	0.315					0.742
16	Prayer room	0.253				0.438	
17	Telephone	0.107				0.431	
18	Television	0.179				0.419	
19	Air Conditioning			0.881		0.452	
20	Taxi counter	0.095				0.467	
21	Bus counter		0.508			0.462	
22	Car hire counter	0.030				0.413	
23.	Hotel reservation counter		0.500		0.001		

6.7 Determination of core and secondary facilities according to passengers' preferences for LCT facilities model

As referred to Chapter 5, Section 5.6.2, the following hypotheses were developed to achieve the research objectives:

1. **Null Hypothesis (Ho):** Preferences of the TFs used in LCT design are considered as being secondary, less significant from business and leisure passengers' points of view, and an indirect effect on the structure of air fares [160].
2. **Alternative Hypothesis (H_1):** Preferences of the TFs used in LCT design are considered as being primary, highly significant from business and leisure passengers' points of view, and have a direct effect on the structure of air fares[161]

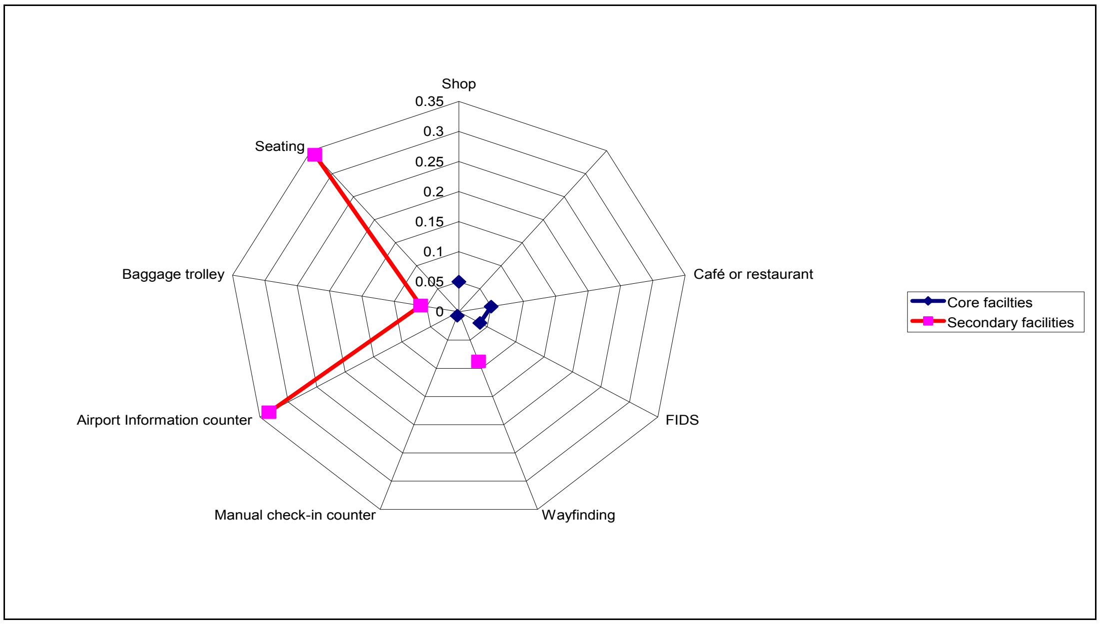

Figure 6.19 A working example of core and secondary TFs

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160 Secondary facilities are included if test results show that the ρ value is more than 0.05 (ρ>0.05). The TF have been identified as the least important facilities. There is no significant difference between business and leisure passengers' preferences on the provision of TFs at check-in, departure lounge and arrival areas and air fares.

161 Core facilities are included if results show that the ρ value is less than 0.05 (ρ<0.05). The TFs are identified as the most important facilities. There is a significant difference between business and leisure passengers' preferences on the provision of TFs at check-in, departure lounge and arrival areas and air fares.

In order to get a better understanding on the research output, Figure 6.19 shows a working example of the selection of core and secondary TFs for LCT design. Shops [convenience shop] (0.050), café or restaurant (0.050), FIDS (0.037) and manual check-in desks (0.007) are ranked as core facilities as the results shows the ρ values do not exceed 0.05. The results show that these facilities are important to be included in the terminal design for both business and leisure passengers. The results are rejected for the following facilities as the ρ values are more than 0.05: way-finding (0.088), airport information counter (0.334), baggage trolleys (0.059) and seating (0.341). These TFs are classified as secondary facilities for LCT design.

Figures 6.20a and 6.20b show the response to service processing facilities (check-in before going through immigration and security) from the survey of 264 passengers in the departure areas. Air conditioning (0.011), airline ticketing counter (0.003), information counter (0.034), bureau de change (0.046), café or restaurant (0.050), FIDS (0.037), sufficient manual check-in counters (0.007), seating (0.034), self-service check-in kiosks (0.027), telephone (0.028) and toilets (0.004) are considered to be core facilities to be provided in the check-in area of LCT. The result is accepted with a significant alpha of less than or equal to 0.05. This means that the alternative hypothesis is accepted. The hypothesis states that there is a highly significant relationship between purpose of travel (business and leisure passengers) and TFs**.** The result shows that the purpose of travel has influenced the decision by passengers on their preferences for the provision of specific service processing facilities. For example, self-service check-in is important to reduce queuing and waiting time and its introduction would be useful to decrease the dependency on manual check-in, especially during peak hours.

The following facilities: baby changing facilities (0.881), trolleys (0.059), cash machines (0.965), disabled facilities (0.101), prayer rooms (0.124), product promotional area (0.698), shops (0.051), smoking area (0.881), television (0.657) and way-finding (0.088) were classified as secondary facilities because they have been shown to be less important for both leisure and business passengers. The null hypothesis was accepted as the ρ-values for each TF show that the value is greater than the significant alpha of 0.05. The results show that there is less significant relationship between the purpose of travel and provision of service processing TFs and that the requirements of passengers toward these facilities are ambivalent. For example, most of the respondents identified that there was less need for trolley availability, included in the terminal design, to be used for the transport of baggage from car parking, drop-off or landside area to the check-in counter.

Within the departure lounge (Figure 6.21a), from the survey of both business and leisure passengers' expectations, they show great interest in having air conditioning (0.015), bureau de change (0.041), café or restaurant (0.010), cash machine (0.033), FIDS (0.012), information counter (0.031), internet (0.018), seating (0.001), self-vending machine (0.023), shops (0.050) and toilets (0.021). The results accept the alternative hypothesis with significant ρ-value of less than 0.05. This shows that there is a highly significant relationship between purpose of travel and provision of the above TFs. Seating is the most important and should be included in the LCT design, but the area available for seating may be subject to space restrictions. Figure 6.21b shows that baby changing facilities (0.105), children's play area (0.061), disabled facilities (0.148), prayer rooms (0.308), product promotional area (0.331), telephone (0.106), smoking area (0.110), television (0.057), viewing deck (0.101) and way-finding (0.114), while still important, are seen to be of less importance for the departure lounge, and therefore should be classified as secondary facilities for design purposes. The results show that there is a less significant relationship between these TFs and air fares, based on business and leisure passenger expectations.

Figure 6.22a shows that air conditioning (0.046), information counter (0.025), baggage reclamation signage[162] (0.050), car hire counter (0.045), FIDS (0.007), hotel reservation counter (0.025), left-luggage service (0.006), seating (0.026), self-service vending machines (0.028), shops (0.026), taxi counter (0.010), television (0.049) and toilets (0.044) are very important and should be included to the baggage reclaim and arrival area.

The alternative hypothesis has been accepted and at the same time the null hypothesis was rejected at a significant alpha of 0.05. The respondents indicated their preferences for these facilities in order to have a better level of service within the LCT. The results (Figure 6.22b) also show that baby changing facilities (0.521), trolleys (0.542), bureau de change (0.149), bus counter (0.866), café or restaurant (0.685), cash machine (0.133), disabled facilities (0.740), lost and found counter (0.096), prayer room (0.561) and telephone (0.916) are less important. Passengers classified them as secondary facilities and, for example, were less concerned about an airport information counter in the arrival hall being included as part of LCT design

For example, passenger preferences (Figures 6.20, 6.21, and 6.22) of the important TFs within the LCT have shown a need for café or restaurant (check-in: 0.050, departure lounge: 0.010), self-service vending machines (departure lounge: 0.023) and shops (departure lounge: 0.050) to be included in the check-in and departure areas. These are considered as being core facilities for inclusion.

At an airport, a convenience shop offers various types of food (breakfast), travel-related items (maps and travel books), toiletries, hygiene products and financial services (money orders and wire transfer services), if necessary. Therefore, the availability of the convenience shop in the departure lounge retail area of the LCT is very important. The availability of self-service vending machines in the departure terminal area is also highly important. Self-service vending machines are useful in reducing waiting or queuing time in the shops. Most of respondents agreed that it would be beneficial to have food and beverage outlets in the terminal design. However, the design should be simple and the price of products should be cheaper compared to 'normal' terminals.

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[162] Signage is a visual instrument of organising and defining messages to make an area self-navigable. The need for this consistency applies to signs within the arrival hall to the baggage reclaim area.

In the arrivals area, the view-point of passengers was that TF provision was less important for the café and restaurant (0.685), the results showing ρ-values more than 0.05. Therefore, the null hypothesis is accepted.

Based on the same set of survey results, passengers consider the bureau de change (Arrival: 0.149) to be less important but acceptable as a secondary facility in terminal design. The factors which may influence these decisions are based on space limitations within LCT areas and international passengers can easily access these facilities in the main terminal building of KLIA. Most of the travellers are on holiday trips, and the availability of a bureau de change is still relevant because of the increasing number of international travellers. It shows that there is a less significant relationship between purpose of travel and provision of bureau de change, but it is considered as a secondary facility in LCT terminal design.

6.8 Summary

The major factor contributing to the high level of passenger traffic in the domestic sector has been the planned rationalisation, as Air Asia operates 99 former non-profitable MAS routes (Section 6.2). As the air traffic growth at KLIA increases, Air Asia passengers using the airport have expressed preferences for the provision of specific TFs that will increase service standards and are cost effective. Efficiency in terminal operations is important to reduce costs, increase service standards and maximize the utilisation of airport resources.

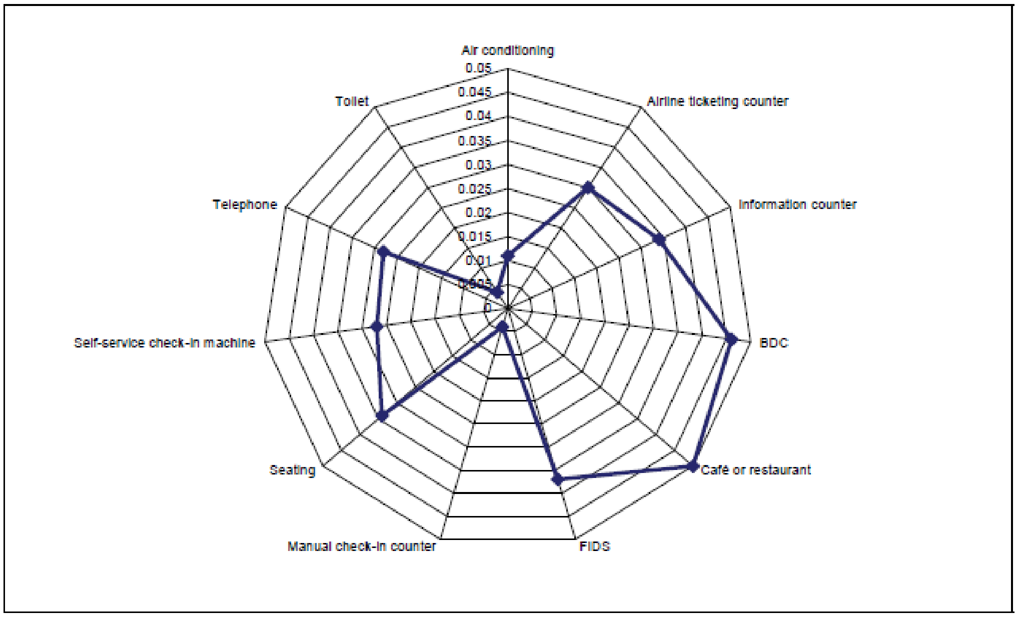
The survey reveals that the perceptions of business and leisure passenger expectations have a role as users (Chapter 5) in the current LCT design. Analysis of the pre-development survey confirmed that a total of 64.5% of respondents were aged 21 to 34, which indicates that young people are potentially the highest users of LCCs for travel. Indeed, the second survey validated the earlier data, after noting that 87.0% of the respondents were aged 21 to 34 years. The 21-34 years age group preferred to use KLIA LCT for travel because of the benefits of discounted air fares while older travelers are seeking the more comfortable experience of KLIA main terminal.

In terms of passenger income levels, analysis of the pre-development survey shows that about 20.3% of departing and 5.8% of arriving passengers were in the RM48,001 to RM60,000 range and 19.7% of departing passengers were earning more than RM60,000. Young travelers have a lower income (up to RM24,000 per annum) and they are clearly prepared to save, or work during their travels, to significantly increase their spending power. Young travelers are influenced by website advertising, and holiday packages offered by Air Asia.

Table 6.15 Correlation of TF preferences by Air Asia businss and leisure passengers (purpose of travel and fare), at no-change fare, for all TFs located in the baggage reclaim area and arrival hall

No	Terminal Facilities	Business Passengers			Leisure Passengers		
	Importance	Low	Moderate	High	Low	Moderate	High
1.	Shop			0.671			0.633
2.	Café/ restaurant	0.303			0.343		
3.	FIDS			0.869			0.900
4.	Baggage reclaim signage			0.938			0.990
5.	Airline information desk			0.856			0.958
6.	Self-vending machines	0.391				0.476	
7.	Trolleys	0.239			0.290		
8.	Seating	0.208			0.268		
9.	Left-luggage service			0.726			0.795
10	Cash machine		0.488				0.631
11	BDC	0.083			0.107		
12.	Lost and found counter	0.051			0.074		
13.	Baby changing facilities	-					0.682
14	Disabled facilities	-					0.682
15	Toilets	0.331					0.682
16	Prayer room	0.030			0.277		
17	Telephone	0.104			0.097		
18	Television			0.735			0.653
19	Air Conditioning		0.401			0.574	
20	Taxi counter			0.729			0.669
21	Bus counter	0.158			0.164		
22	Car hire counter			0.642		0.513	
23.	Hotel reservation counter			0.593		0.421	

a) Core facilities



b) Secondary facilities

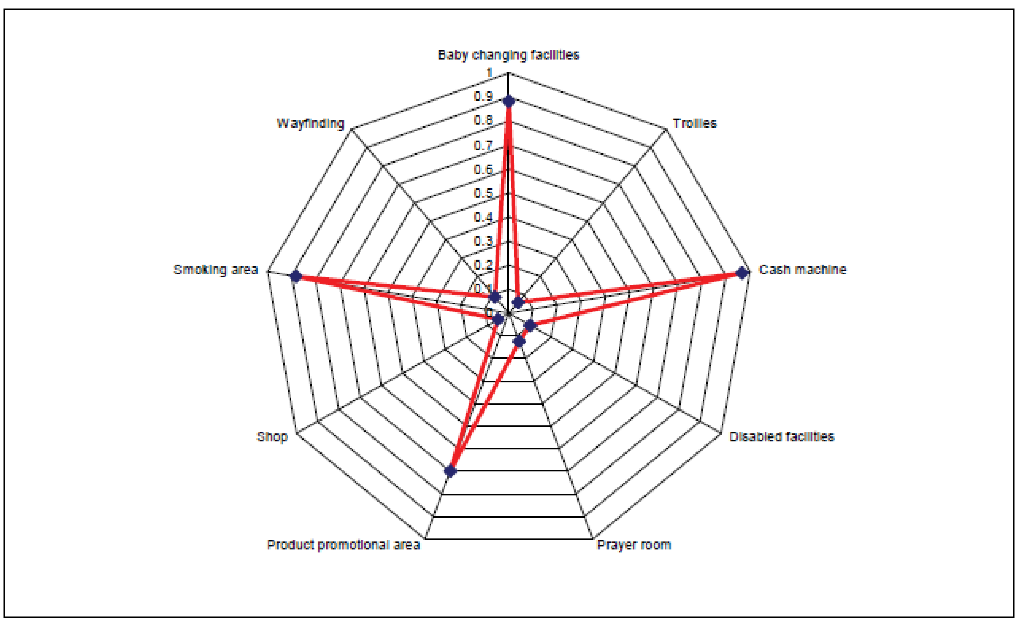
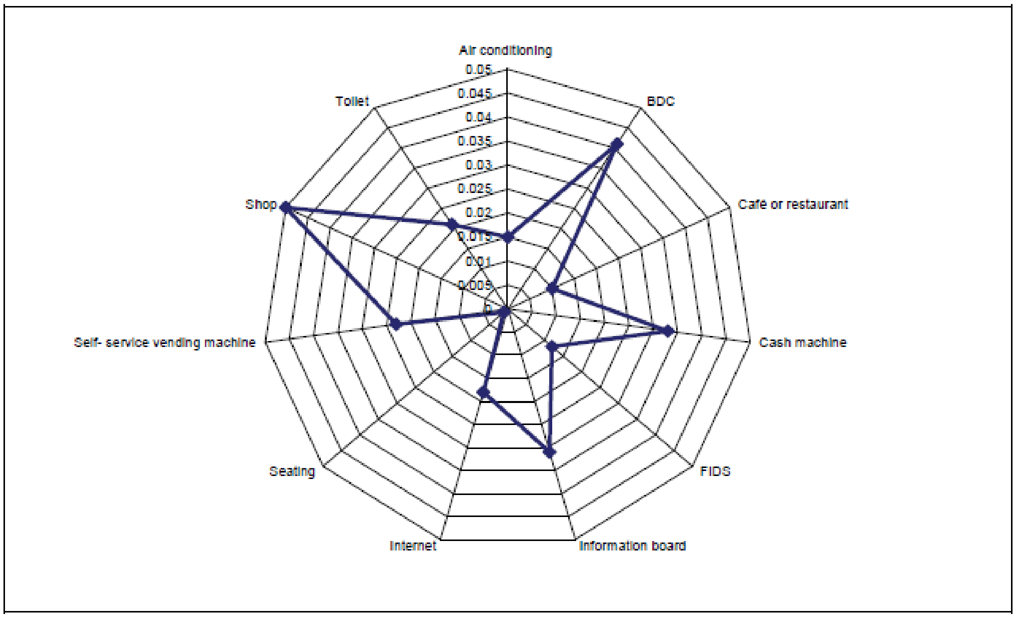


Figure 6.20 TFs in Check-in area

a) Core facilities



b) Secondary facilities

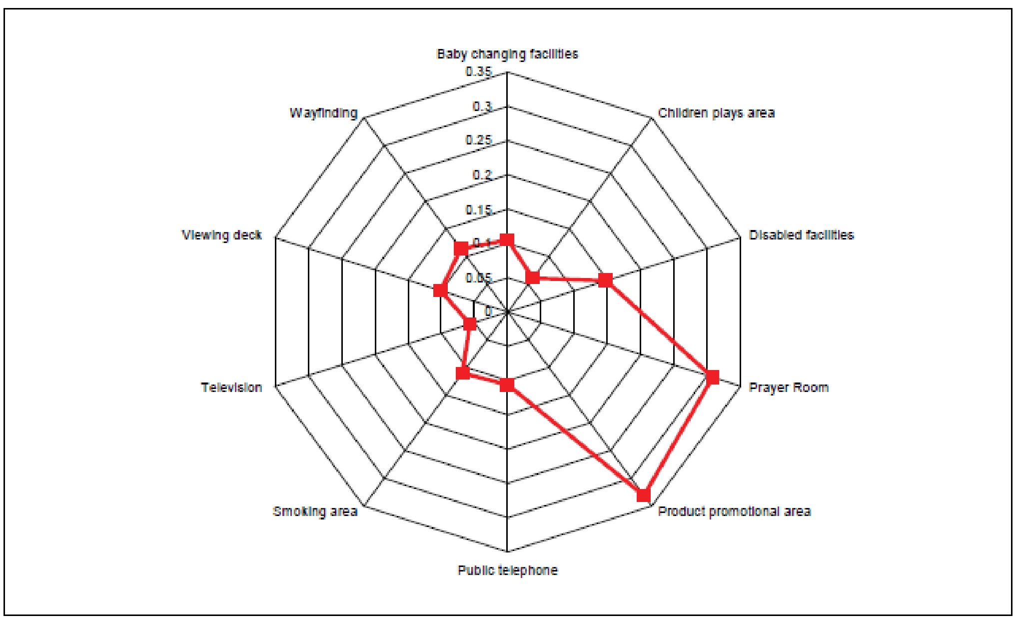
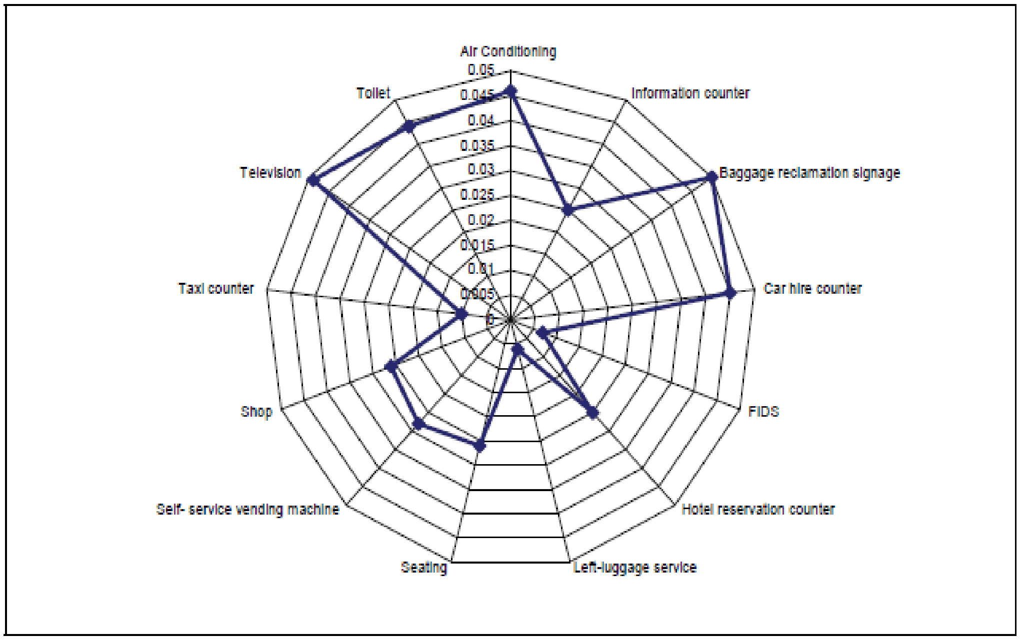


Figure 6.21 TFs in departure lounge

a) Core facilities



b) Secondary facilities

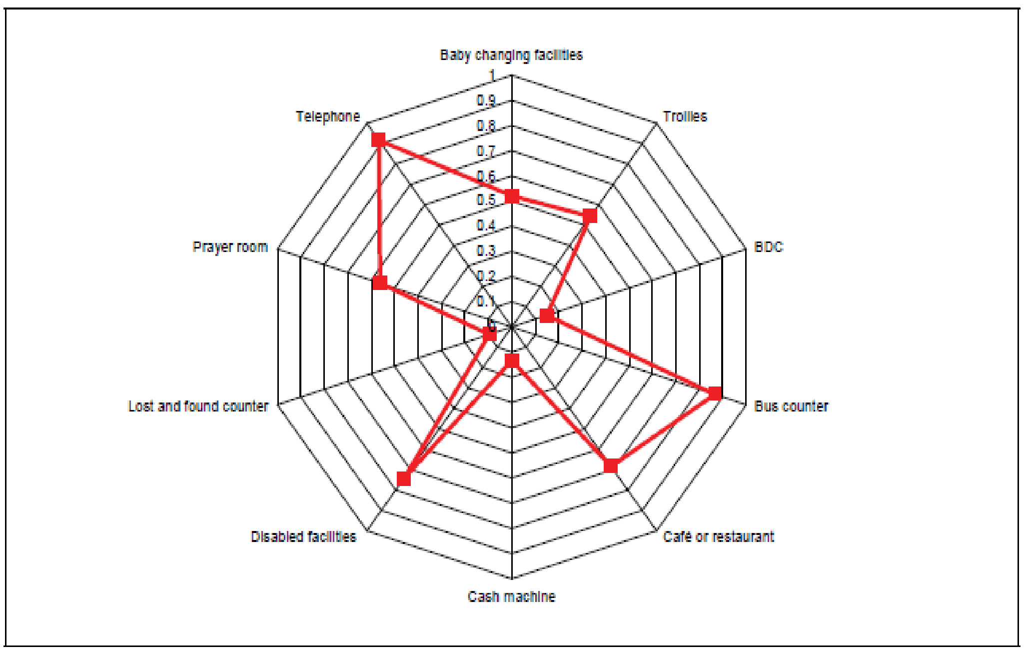


Figure 6.22 TFs in Baggage Reclaim and Arrival Areas

The pre-development survey showed that even business and leisure passengers with a higher income are interested in using Air Asia services for their journeys. However, analysis of the post-development survey results showed a reduction in higher income passengers showing a their reluctance to use KLIA LCT, due to the inadequate transport access. Therefore, the lower income passengers within the RM12,001 to RM24,000 income level constitute the largest group making use of the KLIA LCT for travel.

In the pre-development survey, about 79.4% of leisure passengers [48.5% (domestic) and 30.9% (international)], using Air Asia services, have made use of KLIA main terminal facilities. In the post-development survey the leisure passengers' percentage was 84.4% [domestic (33.3%) and international (51.1%)] of the overall population. The survey confirmed that the business passengers are less likely to use KLIA LCT, for example, the percentage declining from 17.1% to 6.7% of domestic passengers.

The pre-development survey captured the business and leisure passengers' preferences for TFs in LCT design (Section 6.5). Table 6.16 shows a summary of the most important results of business and leisure preferences from the pre-development survey.

In terms of sensitivity of business and passengers preferences between air fares and the provision of TFs, the results were classified as being of low importance, moderate importance and high importance (Section 6.6). The analyses confirmed that the following facilities: self-service check-in kiosk and airline ticketing counters can be classified as of high importance, after the Spearman Correlation test showed that the ρ values (rho) exceeded 0.590. There were significant changes in the correlation values of passengers' preferences for TFs in terminal design if the fares were reduced by 10%, 20% and 30%. The results indicated that the preferences of both business and leisure passengers are vary with a reduction in air fares. The results further show that there is a significant relationship between the willingness to trade-off provision of TFs with air fares. However, both business and leisure passengers preferred to have more facilities included in the LCT design, at the 'no-change' fare levels. Table 6.17 shows the provision of TFs that can be classified as highly needed by both business and leisure passengers at a fare reduction of 30%[163]. The results show that air fares can be used as a variable to gauge low cost passengers' preferences for the provision of TFs in the check-in hall, departure lounge, baggage reclamation area and arrival halls. The results also show that most leisure passengers are very sensitive to air fare change.

The research confirms that the TFs could be classified into core and secondary groups (Section 6.6, Figures 6.20, 6.21 and 6.22) and Appendix 8 (Tables 1, 2 and 3), as the research hypotheses shows that there are significant results when the ρ value is less than 0.05 ($\rho<0.05$).

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163 Table 6.17 shows an example of the trade-off between the provision of TFs and air fares for LCT design, at a fare reduction of 30%. Further results can be found in Section 6.6.

The research also examined the relationship between passenger perception of TFs and purpose of travel. The viewpoints of passengers are important in that they may be influenced by reason for travel (business and leisure) and air fares. Airport designers should take into consideration these elements in LCT design and the advantages of reducing the development costs. The research shows that purpose of travel and air fares are important to represent the 'customer made interest in LCTs' as well as having a significant role in including passenger values in LCT design. This will be beneficial to the airport planner in order to provide adequate TFs for passengers, while at the same time reducing construction costs after taking into account the consideration of passengers' preferences. Chapter 7 will discuss airline preferences towards the provision of terminal facilities and airport charges.

Table 6.16 Importance of specific Terminal Facilities for LCT design (Business and Leisure passengers' preferences)

Terminal Facilities	Business Passengers (%)[164] (Section 6.4)	Leisure Passengers (%) (Section 6.4)
Check-in area		
FIDS	11.4	4.6
Way-finding	3.3	10
Seating	9.7	30
Self-service check-in	3.7	14.9
Number of manual check-in	3.4	13.4
Fast track	2.9	12.6
No baggage check-in	4.6	14.3
Pre-departure check-in	4.2	12.6
Trolleys	2	9.4
Departure Lounge		
FIDS	3.1	16.9
Seating area	2	6.6
Baby changing facilities	3.4	16
Disabled facilities	4.6	14.3
Rest area	2.6	10.3
Shower	3.7	13.4
Children's play area	3.7	15.4
Toilets	6.6	14.3
Prayer room	4.9	20.9
Smoking lounge	3.7	16.0
Baggage reclamation and arrival areas		
No. of baggage reclaim	0.9	4.6
Left luggage counter	2	6.6
Lost and found counter	0.3	0.9
Baggage cart availability	0.3	1.1
Baggage information display	0.6	3.4
Commercial Area		
Seating area	8.9	28.3
Internet	4.3	16.3
Telephone	4.6	14.3
Bureau de change	4	13.7
Cash machine	3.1	12
Self-vending machine	4.9	4.9
F&B	6	17.1
Duty free shop	3.7	11.1
Post office	4.3	13.1

[164] Results of the most important terminal facilities for LCT design, by business and leisure passengers' preferences, from the pre-development survey. Further details can be found in Section 6.4.

Table 6.17 Correlation of the preferences of Air Asia business and leisure passengers at 30% fare reduction

Terminal Facilities	Business Passengers (%)	Leisure Passengers (%)
Check-in area		
Self-service check-in kiosks	0.781	0.866
Café or restaurant	-	0.863
Airline ticketing counter	0.754	-
Telephone	0.811	-
Departure Lounge		
Café or restaurant	0.756	-
Seating	0.816	0.728
Toilets	0.865	-
Air conditioning	-	0.801
Baggage reclamation and arrival hall		
Baggage reclamation signage		0.715
Airline information desk	0.717	-
Baby changing facilities	-	0.742
Disabled facilities	-	0.868
Toilet	-	0.742
Air conditioning	0.881	-

CHAPTER 7

7 Requirements by a Low Cost Carrier (Air Asia) for LCT Facilities

7.1 Introduction

The preferences of a typical Low Cost Carrier (LCC) for the provision of TFs at KLIA LCT, Malaysia, were included as part of the research. Airport planners have carefully studied the Low Cost Terminal (LCT) facilities requested by the LCCs. The inclusion of the 'right' TFs has a significant influence on airport development and capital investment costs, as the airport planners have allocated such investment to meet with the LCCs' requirements. As investment costs increase so will the pressure for increasing airport charges and, in turn, airport charges have an influence on airline operational costs.

This Chapter discusses the results from questionnaires submitted to Air Asia Berhad, one of the most prominent LCCs in Asia. The questionnaire included key aspects, such as respondents' background, variation in airport charges (reduced in discrete decrements of 10%, 20%, 30% or 'no-change') and the provision of TFs.

This Chapter, therefore, has three purposes. Firstly, to indicate the level of importance of TFs based on LCC perceptions and expectations. Secondly, the willingness to discuss a trade-off between the provision of TFs and the level of airport charges (reduced in discrete decrements of 10%, 20%, 30% or 'no-change' charge). Finally, to determine the core and secondary TFs in LCT design by taking account of LCC preferences, in order to develop LCT design guidelines.

7.2 Background of the Surveyed Airline

LCC Air Asia has become a major competitor to the network carrier Malaysian Airline System (MAS), which had previously monopolised most of the profitable routes in the Malaysia domestic market (for example, Kuala Lumpur-Johor Bahru, Kuala Lumpur-Penang). In the domestic market, a rationalisation programme has been put in place by the Malaysia Government in order that Malaysian Airline System (MAS) could reduce its losses as the national carrier. Therefore, MAS has concentrated on flights to a few selected destinations while Air Asia operates the remaining domestic routes. MAS are allowed to operate flights only to premier domestic destinations such as Penang, Kuching, Kota Kinabalu, Alor Star and Langkawi. The rationalisation seems the best way for both parties to leverage on their strengths as MAS is focused on high-yielding international and domestic flights while Air Asia can further develop no frills services.

MAS have introduced a new marketing effort geared towards managing its inventory of seats more efficiently as well as costs. At an average seat-factor of 70 %, MAS is able to recover costs by offering 30% of the unsold seats at discounted prices to passengers. Measures taken by MAS to attract passengers include refreshments on board, convenient schedules, 20kg free baggage allowance, assigned seats, etc. MAS have also increased customer flexibility by offering both promotional low fares and normal fares for the same journey. MAS has also increased the number of routes offered between Malaysia and selected cities in China, South Asia and Australia. In order to compete with Air Asia, MAS offers the following:

- Two additional routes between Australia and Malaysia
- Two routes between South Asia and Malaysia
- Five routes between China and Malaysia
- Twenty-two ASEAN routes
- Twenty-one Malaysia domestic routes

As part of the rationalisation programme, Air Asia is responsible for managing over 96 non-trunk routes including 19 domestic routes, which were acquired when a large number of domestic sectors were transferred to Air Asia in 2006 from MAS. Figure 7.1 shows examples of the routes developed for Air Asia services in domestic sectors (intra-Malaysian), after the rationalisation programme.

Air Asia operates from 6 bases in 3 countries: Malaysia (Kuala Lumpur, Johor Bahru, Kuching and Kota Kinabalu), Thailand (Bangkok), and Indonesia (Jakarta). The success of Air Asia operations began after the establishment of Senai Airport, Johor Bahru, as a second hub for the LCC operations in Malaysia, to provide alternative services for passenger traffic then using the neighbouring Singapore International Changi Airport. In 2003, Air Asia added Singapore to its list of destinations but the proposal was rejected by the Civil Aviation Authorities Singapore (CAAS) as the entrance of Air Asia to the Singapore market was seen to have a negative influence on air traffic growth and competition with Singapore Airlines. However, at present, Air Asia X (one of subsidiaries of the Air Asia group) has been successful in gaining permission to operate daily flights from Singapore after negotiations between Air Asia and CAAS. To date, Air Asia drives the air traffic growth of most Asian countries on routes granted to Air Asia, linking Mainland China, Philippines, Indonesia, Vietnam, Cambodia, etc. Figure 7.2 (a) and (b) shows examples of new route development by Air Asia and Air Asia X.

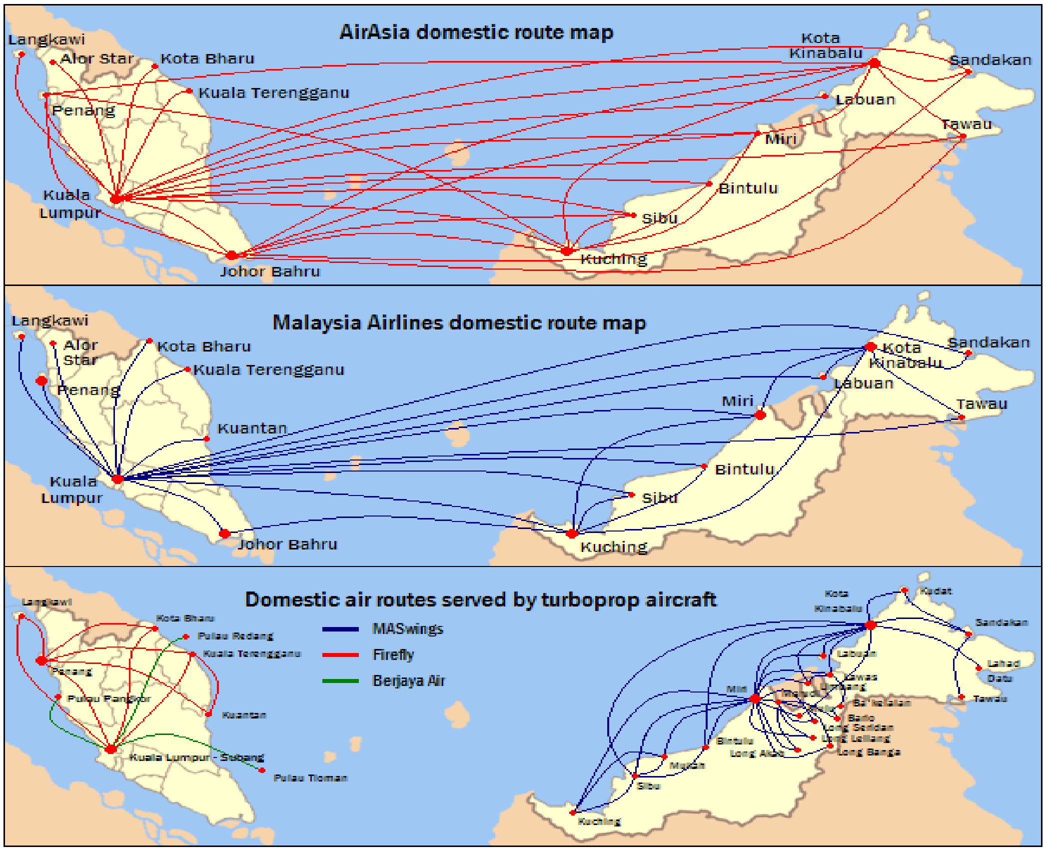

Figure 7.1 Air Asia and MAS domestic routes map[165]

7.3 Research Methodology

As previously discussed in Chapter 5, two surveys were conducted which were pre-and post-development. Air Asia Berhad (AAB) granted permission for a managerial and executive survey to be carried out at KLIA, Malaysia, being the headquarters for Air Asia. The surveys (pre– and post-development) of airline staff was made in view of their potential role in influencing the selection of TFs in LCT design (Chapter 5). The pre-development survey aimed to explore the importance of TFs by measuring airline preferences.

The post-development survey evaluated the interest of LCCs to trade-off between the provision of TFs and airport charges. The respondents were grouped into two levels, managers[166] and executives[167]. A total of 15 and 16 responses from the pre- and post-

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165 Source: http://www.nationmaster.com/encyclopedia/Malaysia-Airlines.

166 Airline manager refers to a person that is responsible for the planning, administration and operations of assigned programs, capable in managerial, financial and supervisory functions, and knowledgeable about airline business. The airline managers (i.e. managers and senior managers of Air Asia) were involved directly on the LCT planning and development.

development surveys, respectively, were received representing a 37.5% and 40%[168] response rate from the survey conducted. The results were processed by SPSS.

Figure 7.3 shows the proportion of management and executives of Air Asia respondents from the two series of surveys. In the pre-designed questionnaire, the four groups of managerial levels were ranked into: Managing Director, General Manager, Senior Manager or Manager, Senior Executive or Executive. However, in this survey, two different groups of airline management participated, managers and the executives. In the pre-development survey, 10 out of 15 respondents came from the managerial levels and the remaining 5 from executive levels. In the post-development survey, responses by the managers and executives were 11 and 5 out of 16 respondents, respectively. Taking consideration of managers as decision makers representing 10 out of 15 and 11 out of 16 of respondents, respectively in the pre-and post- development surveys, their responses can reasonably be interpreted as representing the airline interests as a whole.

7.4 Airline preferences for the provision of LCT facilities

As discussed in Chapter 3, Section 3.5, increases in airport charges[169] worldwide has encouraged airlines to seek to reduce their operational costs[170]. LCCs keep costs low, one way being by minimising the turnaround time of 25 minutes, a result of an increase in efficiency of terminal processes. Increased efficiency can be vital to enable coping with the growth of the low cost passengers. The need for advanced technologies allows the terminal processes to be faster and efficient, for example, the adoption of self-service kiosks and online check-in. The LCCs have fully implemented ticketless travel and unassigned seats in order to reduce operational costs. Therefore, taking Air Asia as an example, they have introduced web check-in, offering the facility to check-in online, and self-print out boarding passes, exclusively for domestic travellers and for those passengers requiring hold baggage check-in. In addition, a facility such as X-press Boarding has also been introduced, enabling passengers to pay to get boarding priority.

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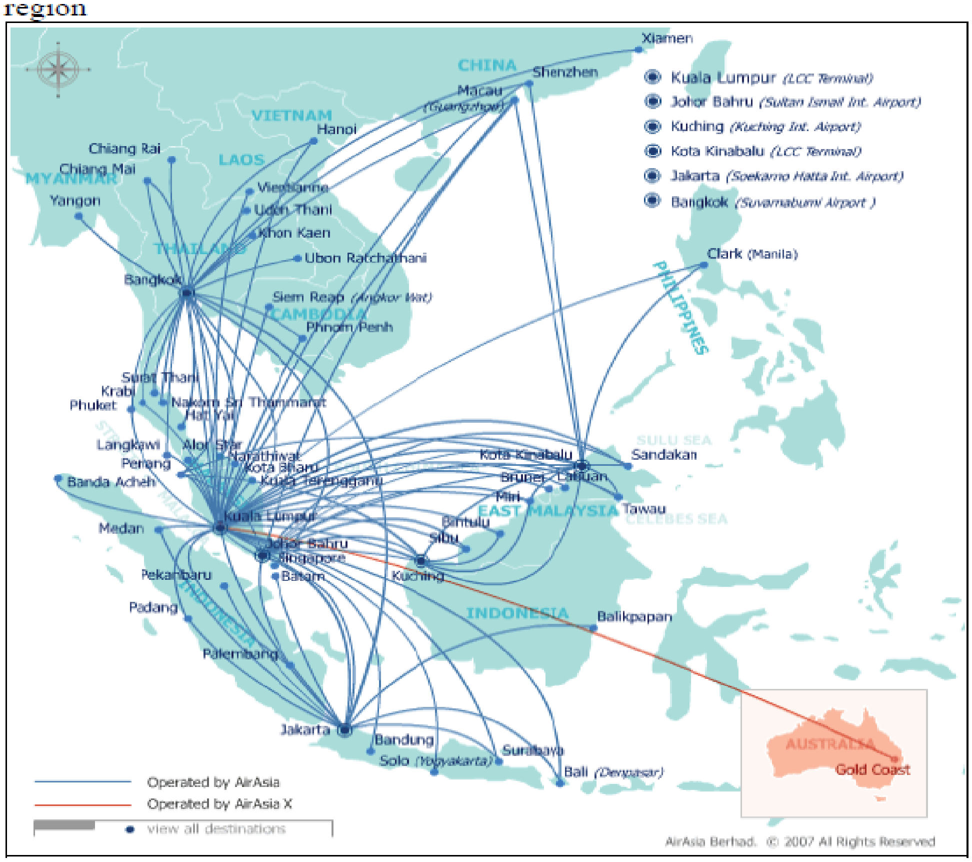
167 Airline executive refers to the person that responsible for making decisions that affect airline policy and are responsible for the success or failure of the airline business. Airline executives are directly involved on the terminal planning and development (commercial, planning and operations).

168 40 set of questionnaires were distributed to the respondents for the pre- and post-development surveys.

169 London Heathrow (LHR) airlines face a 50% increase between 2008 and 2013 and, in France the government approved a 27% increase in airport charges at Charles de Gaulle for 2006-2010 (Bisignani, 2007).

170 Airport charges generally represent a relatively small part of an airline's operating costs. However, airport charges are most significant for the LCCs as the carrier operates short sectors, which means that they pay airport charges more frequently. Airport charges for the LCCs are around 8-9% of total operating costs but this proportion would be higher if it were not for fee discounts (Graham, 2003).

a) An example the routes development of Air Asia and Air Asia X in Asia Pacific region



b) An example the new routes development of Air Asia X

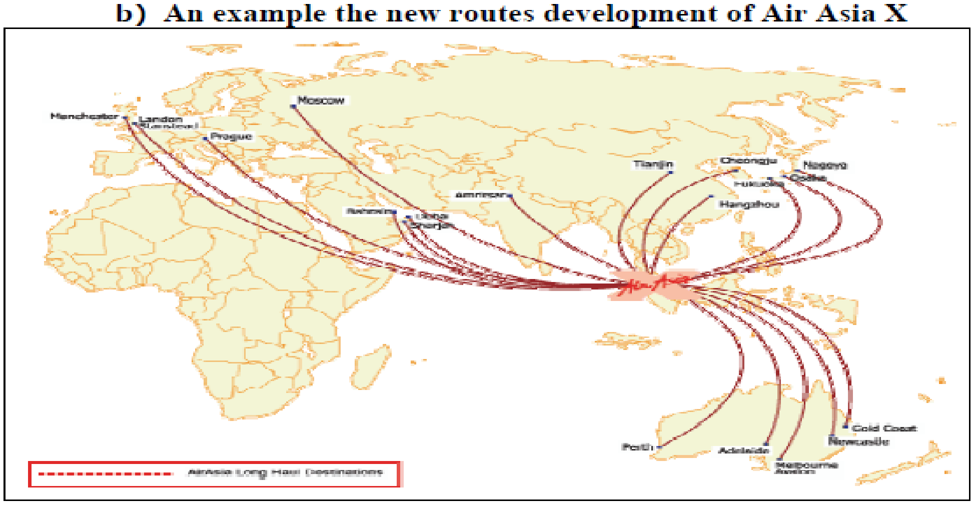


Figure 7.2 New route development by Air Asia[171] and Air Asia X[172]

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171 http://airlineroutemaps.com/East_Asia/Air_Asia.shtml
172 http://airlineroutemaps.com/East_Asia/Air_Asia_X.shtml

7.5 Pre- and Post-Development Survey Responses

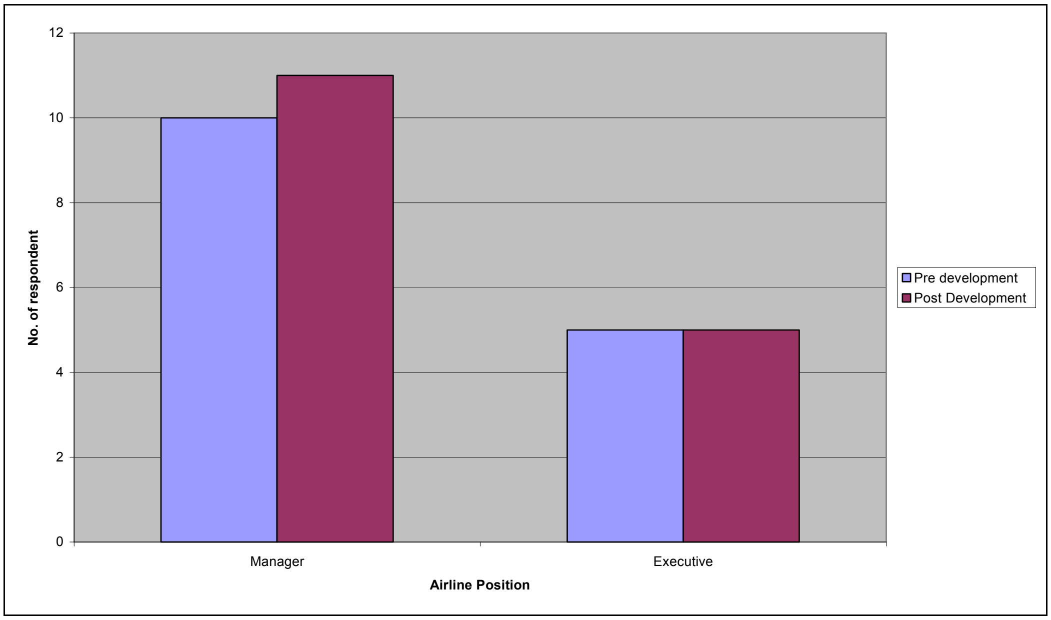

Figure 7.3 Airline Management Roles of Respondents

Passenger traffic at KLIA is projected to increase sharply and Air Asia requested a dedicated LCT in order to minimise turnaround time. The increase in traffic can be classified as both international and domestic, therefore, highly efficient TFs, coupled with significant increases in air traffic growth in the future, dictates a re-evaluation of the current TFs used to process the passengers in the LCT. From the LCCs' perspectives, the provision of TFs must be seamless and at minimum cost in order to provide an efficient service in the LCT.

Therefore, specific and basic TFs have been requested by LCCs in anticipation of the development of a seamless, reduced cost LCT design. In the case of Air Asia, the pressure on Malaysia Airports, as a service provider, to accommodate Air Asia needs in LCT design has proved to be interesting. Therefore, this research is intended to bring a comprehensive understanding of LCC preferences in LCT design, which is important to both the industry and the travelling public.

The following paragraphs discuss the degree of importance of TFs in LCT design in accordance with the LCC point of view. This includes an examination of the rank-orders of the categories on an ordinal scale to explore the exact needs of LCCs in their preferences of TFs in the LCT area, ranked as (1: Very Important, to 5: Not Important). The ordinal scale was used as a classification of scale values in terms of ranking order, with the inclusion of 'most important' or 'moderately important' TFs in the LCT design.

Figure 7.4 indicates the percentage of LCC manager and executive preferences for TFs in terms of importance in LCT design. Air Asia has a preference for adequate check-in facilities, as they support efficient terminal processes before immigration and security clearances. In the check-in area, for example, there is significant interest in the use of self-service kiosks, with the benefits of faster terminal processes and the need to minimise queue lengths, and the results show that self-service kiosks are the most important facility for inclusion in terminal design.

Figure 7.4 also shows that four managers rated the following facilities in ascending order of importance: manual check-in and no baggage check-in, respectively. Two of executives rated the following as very important: sufficient number of manual check-in counters, no-baggage check-in and pre-departure check-in. As shown, given the example of self-service check-in kiosks, the availability of these facilities agreed by 6 respondents is due to the need to reduce the queuing length in the check-in area as well as successfully speeding up check-in processes, mostly at peak hours.

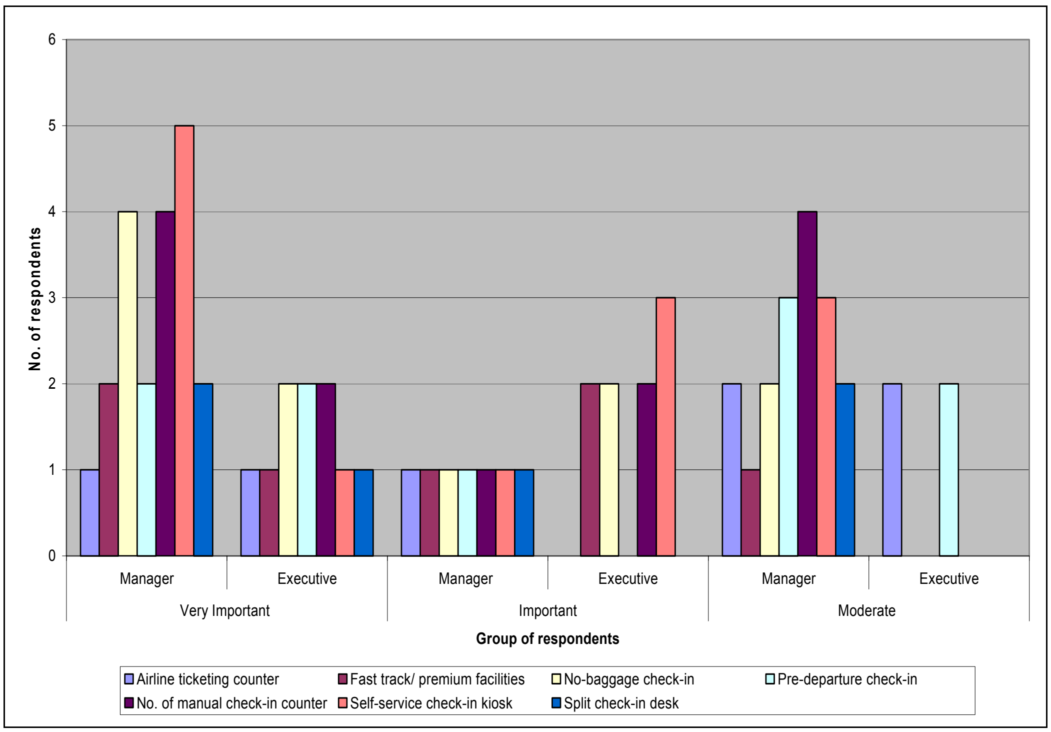

Figure 7.4 TFs in check-in area

It is apparent from Figure 7.5 that the availability of airline shop[173] is more important for the airline operations. This is because of the opportunity to generate additional income for LCCs as passenger traffic through the LCT increases. Figure 7.5 shows that six of the managers agreed that an airline shop should be included in LCT design as well as generating more income for LCCs but not to airport revenue. Regarding the availability of airline offices in the same building as operational activities, six of the

173 In order to generate commercial revenues, Air Asia has launched a shop in the departure lounge of KLIA LCT. A takeaway concept has been adopted for the shop as the food and drinks are allowed to be taken on board flights.

managers and executives considered the facility as being very important. The provision of a café or restaurant received a positive response of four of the managers and executives, as being very important. It should be noted that the reason for those facilities being considered as most important is because of the terminal location which is far from the main terminal building (MTB) and other shops in the surrounding area, as well as the inadequacy of transport systems between the two terminals.

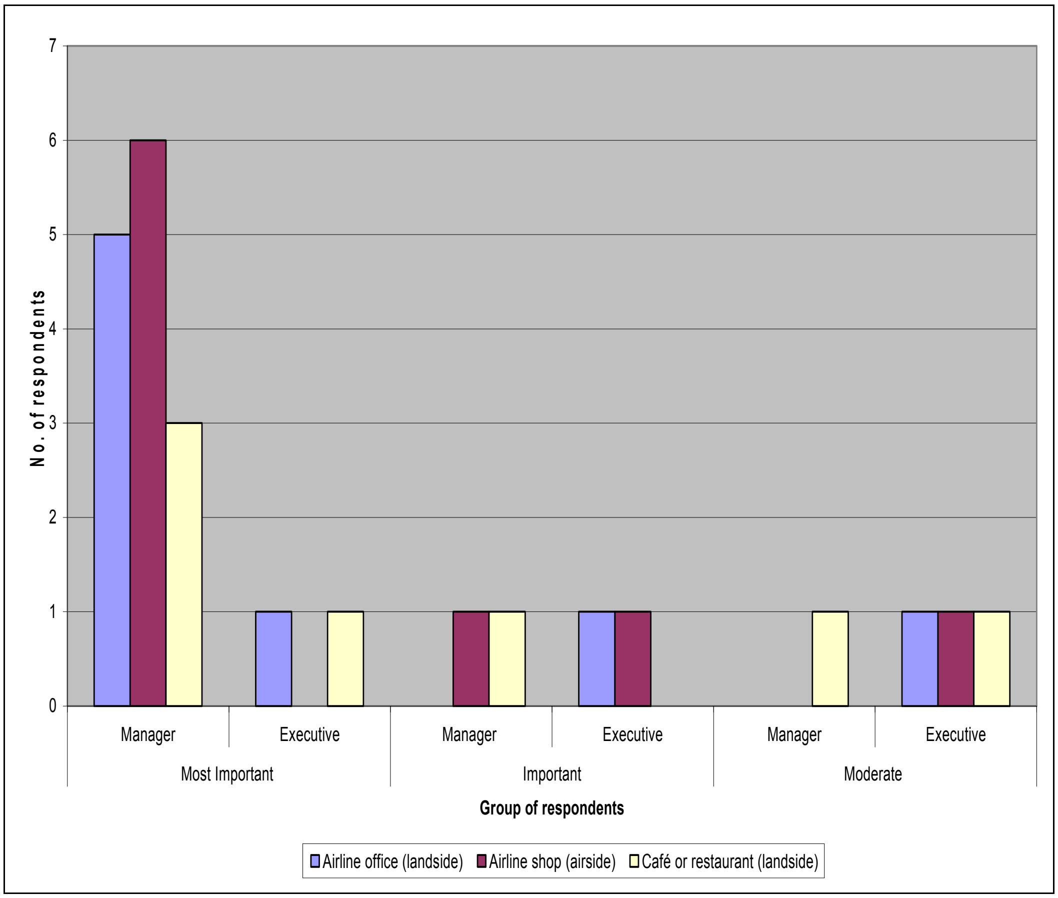

Figure 7.5 TFs in landside and airside commercial areas

Figure 7.6 shows the preferences for TF provision in the departure lounge area. As shown, the preferences for TFs in the departure lounge area vary for both managers and executives. Seven of the managers and executives agreed on the availability of the contact stands for LCT design as most important. The survey indicated that contact stand suitability for a specific airport situation, based primarily upon traffic levels and physical constraints can reduce the operational costs. Other facilities evaluated: flight boarding counter, VIP lounges, boarding pass control machine[174] and air-bridge could also be considered as being potentially important. However, a preference for boarding pass control machine received a low response, as only one respondent regarded having these facilities available in the LCT area as being very important.

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174 The facility is also recognised as a boarding pass check.

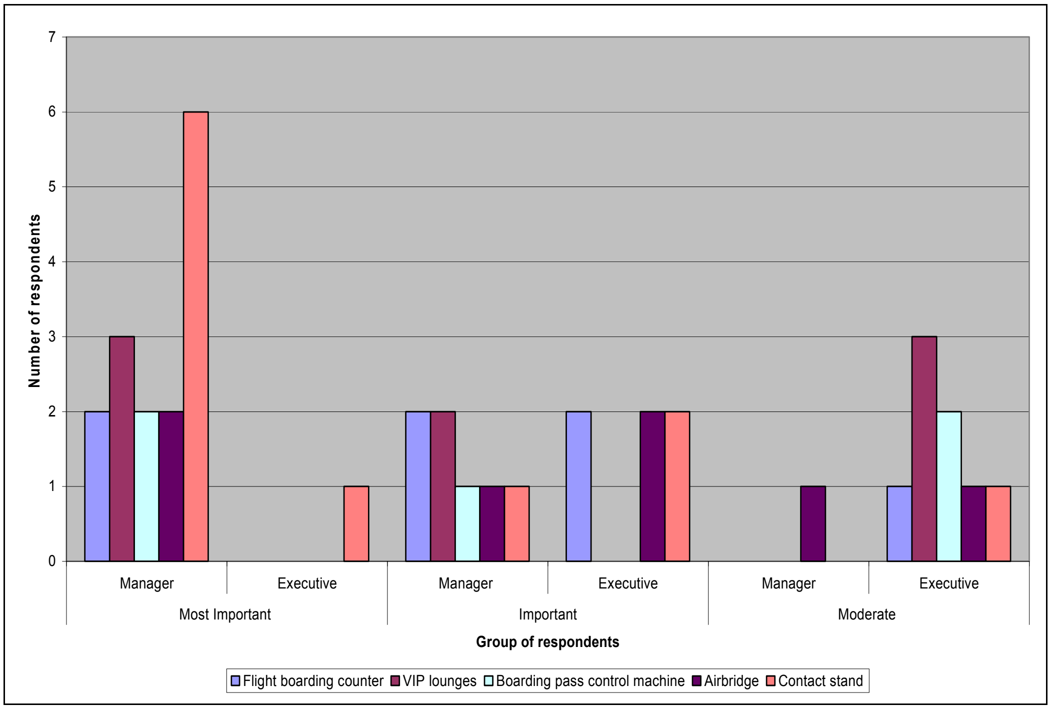

Figure 7.6 TFs in departure lounge area

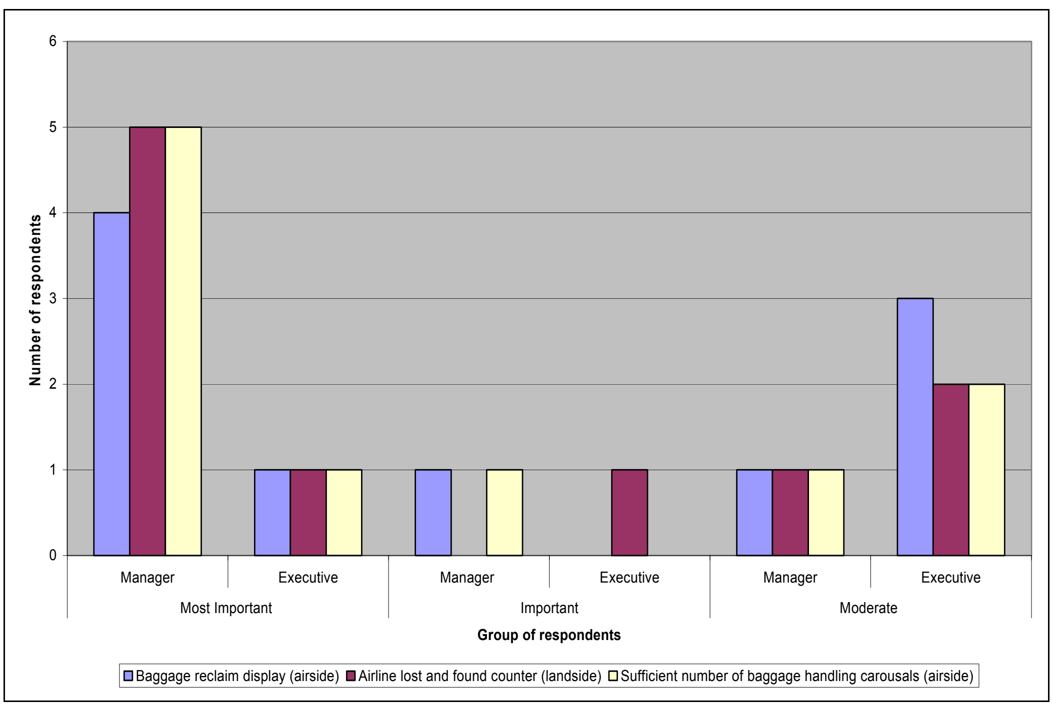

Figure 7.7 TFs in baggage reclaim and arrival hall

Figure 7.7 shows that an airline lost and found counter and a sufficient number of automatic baggage handling carousels are significant for LCT design, as the results showed that a total of six managers and executives agreed on having these facilities available and considered them as being most important. The respondents were also asked to comment on the inclusion of an airline lost and found counter, due to an increase in missing baggage which may cause low cost passengers to demand that the airport authorities allocate such a facility inside the terminal area. Figure 7.7 also shows that about only one out of fifteen respondents consider this as important and three respondents agreed on the availability of an airline lost and found counter as being of moderate importance.

In terms of LCCs' expectation (Figure 7.8), it is shown that five respondents consider the information desk as being most important. Figure 7.8 also shows that both managers and executives agreed on considering the inclusion of restrooms, lighting, air conditioning, disabled facilities, flight information display system (FIDS) and prayer room as being the most important facilities in LCT design. With regard to air conditioning, it received the highest number of responses since hot weather conditions in Malaysia may well influence the preference for air conditioning as being the most important facility.

In terms of importance, it is also worth considering the following facilities, as the responses show that FIDS should also be included there. The respondents in both groups agreed that the FIDS are an important TF as it received a strong positive response from the managers and executives. Although FIDS is classified as important, both managers and executives also showed their interest in having carpeting, prayer rooms and information counters to be included in the terminal design.

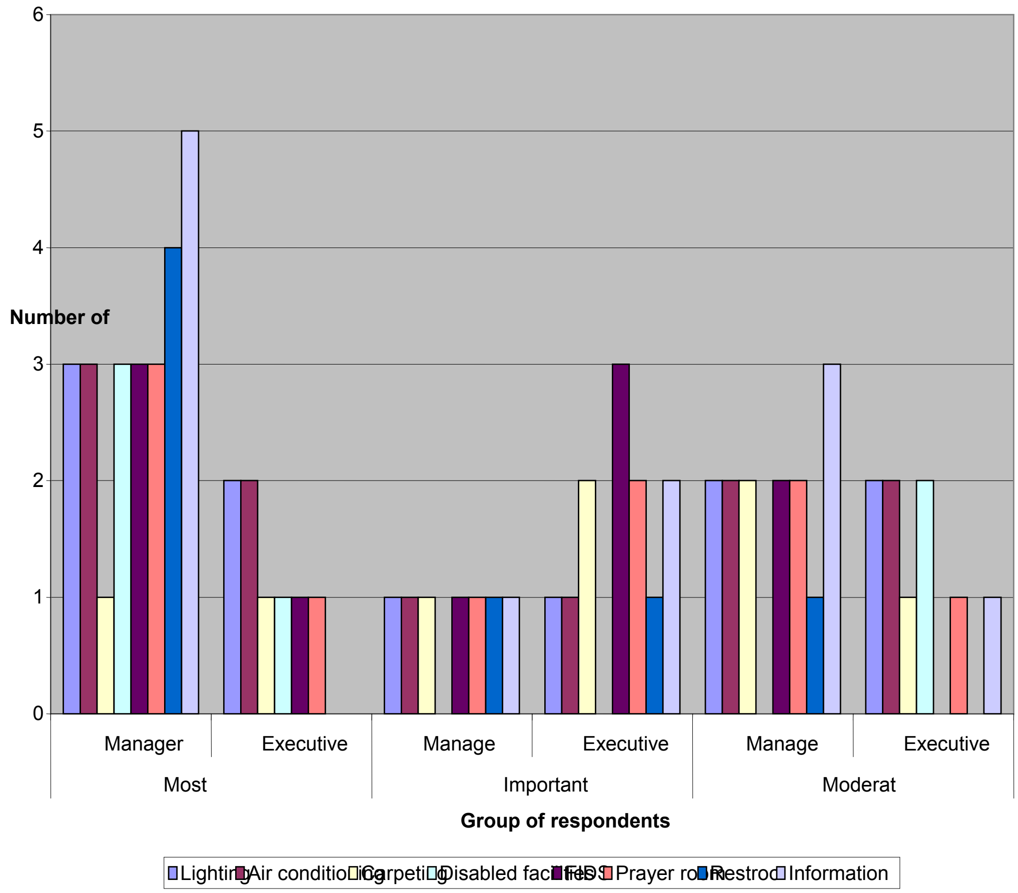

Figure 7.8 Other TFs[175]

7.6 Cross-price elasticity dynamics and the flexibility effect on the preferences of LCCs for TFs from variations in airport charges

This section has two aims. Firstly, it measures the relationship of the provision of TFs in LCT design to each reduced decrement in airport charges (10%, 20% etc.) and, secondly, the degree of these relationships. In this survey, the managers and executives expressed preferences for the provision of specific TFs in the LCT. The open-ended questions (with inclusion of the discrete decrements of 10%, 20%, 30% or 'no-change' in charges) were used to determine the correlation between charges and facilities in the three major parts of the LCT: check-in, departure lounge and arrival areas. The analyses

175 Except for the check-in, departure lounge and baggage reclamation and arrival hall, the rest of KLIA LCT areas are considered as general areas. However, evaluation of the provision of TFs excluded 'mandatory' facilities (i.e. immigration, security or customs) as these facilities are a requirement of government regulatory authorities.

of the survey results are important, as the selected cases used the Spearman correlation coefficient to rank the importance level in accordance with the LCC's preferences. The Spearman correlation coefficient measures the variables on a rank scale, which means that the variables can be ranked in two ordered series (Norusis, 2002), as the correlation analysis is used to determine the extent to which changes in airport charges of an attribute are associated with changes in provision of TFs.

7.6.1 Cross-price elasticity and influence on the preferences of Air Asia managers and executives for specific TFs in check-in area

The evaluation of TFs considered the following as basic TFs for the check-in area: number of manual check-in desks available, hand baggage check-in, airline office, ticketing counter and self-service check-in kiosks. Table 7.1 shows the statistical correlation of the Air Asia managers and executives for a 10% reduction in airport charges. There are moderate correlations between the rankings of TFs, regardless of the position of airline staff, while Table 7.1 shows the Spearman Rho coefficient. It shows that the responses from the executive group of Air Asia employees are less sensitive to having hand baggage check-in and airline office and ticketing counter, if the airport charge is reduced by 10%. Of all the TFs evaluated, only the number of manual check-in desks and self service check-in kiosks are highly significant at an airport charge sensitivity level of 10%, as the r value is 0.894, 0.744 and 0.630, 0.611, respectively.

As shown in Table 7.2, the linkage between airport charges and TFs for hand baggage check-in, airline office and airline ticketing counter are less sensitive at 20% reduction in airport charges. Table 7.2 shows weak correlations in the ranking of TFs. This proved that airline staff preferences are for broadly similar TFs, even for a reduction in 20% in airport charges. Noting the number of manual check-in counters as an example, Air Asia regards the number of check-in counters (0.753, 0.653) to be included in check-in area, at 20% of reduction in airport charges, to be of high importance.

Table 7.3 shows a statistically weak correlation between the rankings of the TFs with the exception of the number of manual check-in desks (0.593, 0.600) and self-service check-in kiosks (0.611, 0.624). Table 7.3 shows that the responses of the two groups of airline employees are less sensitive to their preferences in giving up specific TFs, for a 30% reduction in airport charges[176].

The situation changes when the airport charges are at 'normal' level (i.e. unchanged). Table 7.4 shows that the expectations of managers on the number of manual check-in desks (0.638), airline offices (0.610), ticketing counters (0.655) and self-service check-in kiosks (0.756) are highly correlated with non-discounted airport charges, as the r value shows a strong correlation. It was also noted that the executives are highly interested in the inclusion of the airline ticketing counter (0.715) as the results show a high correlation for this TF.

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176 Airline management are more flexible in their requirements on the number of TFs to be included in LCT design, after having a reduction in airport charges.

Table 7.1 Correlation of airline position preferences for TFs within check-in area at 10% reduction in airport charges

No.	Terminal Facilities	Managers			Executives		
	Importance	Low	Moderate	High	Low	Moderate	High
1.	Number of manual check-in desks			0.894			0.744
2.	Hand baggage check-in	-0.175			0.065		
3.	Airline office			0.597	0.305		
4.	Ticketing counter	-0.381			-0.258		
5.	Self-service check-in kiosks			0.630			0.611

To summarise, in the analysis of both managers and executives, it was found that, except for the number of manual check-in desks and self-service check-in kiosks, provision of TFs are less sensitive to reduced airport charges, regardless of the position of managers and executives on their preferences for specific TFs in LCT design. Therefore the airport planner should retain these TFs to be included in LCT design, as the need of the airline is to benefit from increased efficiency in the terminal processes.

Table 7.2 Correlation of airline position preferences for TFs within check-in area at 20% reduction in airport charges

No.	Terminal Facilities	Managers			Executives		
	Importance	Low	Moderate	High	Low	Moderate	High
1.	Number of manual check-in desks			0.753			0.653
2.	Hand baggage check-in	0.266			0.170		
3.	Airline office	0.308			0.207		
4.	Ticketing counter	-0.196			0.340		
5.	Self-service check-in kiosks			0.611			0.649

Table 7.3 Correlation of airline position preferences for TFs within check-in area at 30% reduction in airport charges

No.	Terminal Facilities	Managers			Executives		
	Importance	Low	Moderate	High	Low	Moderate	High
1.	Number of manual check-in desks			0.593			0.600
2.	Hand baggage check-in	0.106			0.166		
3.	Airline office	0.219			0.108		
4.	Ticketing counter	-0.126			-0.096		
5.	Self-service check-in kiosks			0.611			0.624

7.6.2 Cross-price elasticity and effect on preferences of Air Asia managers and executives for specific TFs in departure lounge

The analysis was then repeated for the LCT departure lounge. TFs such as airline boarding counter (Figure 7.9), airline shop[177], boarding pass control machines (Figure 7.10), air-bridge, standing area and seating were included for the LCT departure lounge. In terms of managers' expectations, Table 7.5 shows that the airline boarding counter (0.441), boarding pass control machine (0.536), seating (0.584) and airbridge (0.401) are moderately important at the 10% reduction level. However, from the executives' point of view, the following TFs are rated with low to medium correlations, as the results show 0.419, 0.223 and 0.120 for the airline boarding counter, airline shop and boarding pass control machine, respectively.

At a 20% reduction in charges, Table 7.6 shows that none of the facilities evaluated are a function of airport charges at 20% discount level, as shown by r value close to 0. Managers and executives preferences between TFs and airport charges are relatively medium to weak which indicates that correlations for the following facilities are less important: airline boarding counter (0.423, 0.324), airline shop (0.193, 0.182), boarding pass control machine (0.193,-0.071) and standing area (0.209, 0.321), as the r values less than 0.390.

[177] Air Asia has introduced a shop named as 'Buy and Fly' in the departure lounge of KLIA LCT.

Table 7.4 Correlation of airline position preferences for TFs within check-in area at 'no-change' rate in airport charges

No.	Terminal Facilities	Managers			Executives		
	Importance	Low	Moderate	High	Low	Moderate	High
1.	Number of manual check-in desks			0.638			0.655
2.	Hand baggage check-in	0.197			-0.287		
3.	Airline office			0.610		0.585	
4.	Ticketing counter			0.655			0.715
5.	Self-service check-in kiosks			0.756		0.544	

Table 7.5 Correlation of airline position preferences for provision of TFs within departure lounge at 10% reduction in airport charges

No.	Terminal Facilities	Managers			Executives		
	Importance	Low	Moderate	High	Low	Moderate	High
1.	Airline boarding counter		0.441			0.419	
2.	Airline shop	0.197			0.223		
3.	Boarding pass control machine		0.536		0.120		
4.	Air-bridge		0.401				0.597
5.	Standing area	-0.052				0.541	
6.	Seating		0.584			0.454	

Table 7.6 Correlation of airline position preferences for provision of TFs within departure lounge at 20% reduction in airport charges

No.	Terminal Facilities	Managers			Executives		
	Importance	Low	Moderate	High	Low	Moderate	High
1.	Airline boarding counter		0.423		0.324		
2.	Airline shop	0.193			0.182		
3.	Boarding pass control machine	0.193			-0.071		
4.	Air-bridge		0.393			0.401	
5.	Standing area	0.209			0.321		
6.	Seating	0.287				0.414	

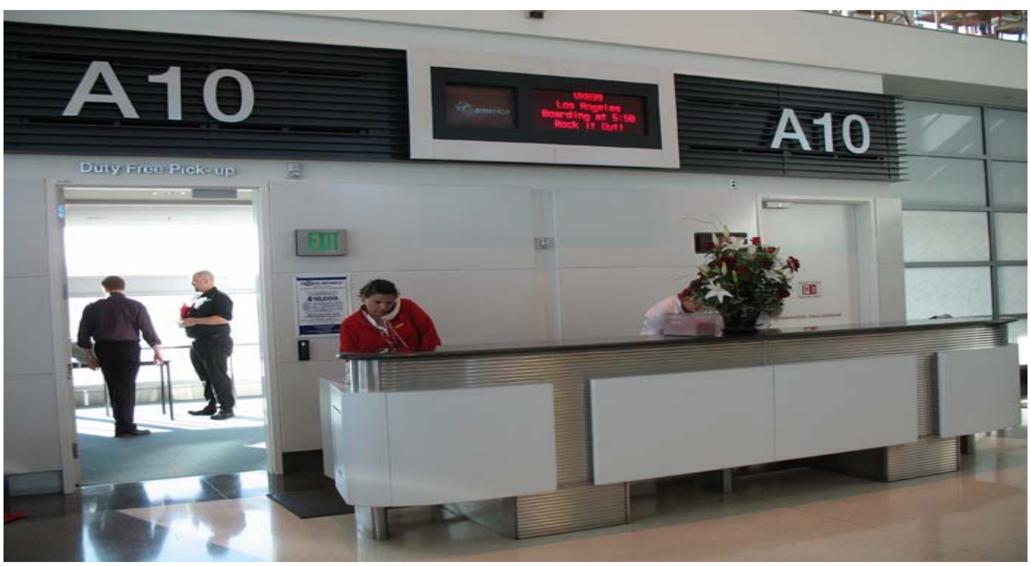

Figure 7.9 An example of airline boarding counter[178]

178 http://www.airliners.net/aviation-forums/trip_reports/read.main/107561/

Figure 7.10 An example of boarding pass control machine[179]

At 30% reduction in charges, Table 7.7 shows that both groups require similar facilities which are airline shop (0.021, 0.049), boarding pass control machine (0.150, -0.032), air-bridge (0.214, 0.134) and standing area (0.379, 0.274), which statistically represents a weak correlation of those variables as the r value is less than 0.390. In this case, it shows that the group of airport managers and executives agreed that there is less sensitivity between the TFs and airport charges, if the airport charges were reduced by 30%.

Table 7.8 shows the differences between the expectations of managers and executives towards the inclusion of TFs for LCT design (comparing Tables 7.5 to 7.7) when the airport charges are not discounted. In both manager and executive expectations, Table 7.8 shows that the air-bridge (0.756, 0.593), airline shop (0.593, 0.678) and seating (0.547, 0.689) are strongly correlated with the non-discounted airport charges. For other facilities: airline boarding counter, boarding pass control machine, and standing area, a mixture of moderate and weak correlations were noted.

In conclusion, in the analysis of Air Asia managers and executives on their preferences for TFs, it was found that there is a similarity in their preferences. However, there is a noticeable change if the airport charges are unchanged as both groups preferred the availability of air-bridges for their operation as an alternative to reducing airport charges.

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179 http://www.noideasbutinthings.com/ixd/displays/

Table 7.7 Correlation of airline position preferences for provision of TFs within departure lounge at 30% reduction in airport charges

No.	Terminal Facilities	Managers			Executives		
	Importance	Low	Moderate	High	Low	Moderate	High
1.	Airline boarding counter	0.255			0.374		
2.	Airline shop	0.021			0.049		
3.	Boarding pass control machine	0.150			-0.032		
4.	Air-bridge	0.214			0.134		
5.	Standing area	0.379			0.274		
6.	Seating		0.464			0.438	

Table 7.8 Correlation of airline position preferences for provision of TFs within departure lounge at 'normal' rate in airport charges

No.	Terminal Facilities	Managers			Executives		
	Importance	Low	Moderate	High	Low	Moderate	High
1.	Airline boarding counter	0.355			0.342		
2.	Airline shop			0.593			0.678
3.	Boarding pass control machine	-0.078			0.039		
4.	Air-bridge			0.756			0.593
5.	Airline boarding counter	0.309				0.529	
6.	Seating		0.547				0.689

7.6.3 Cross-price elasticity and effect on preferences of Air Asia managers and executives for TFs in arrival area[180]

The provision of a lost and found counter, the number of baggage reclaim carousels and baggage reclaim display were tested in order to associate the provision of TFs with airport charges at discrete decrements of 10%, 20%, 30% or 'no-change' in airport charges. Table 7.9 shows that the lost and found counter (0.129, 0.138) in the arrival area is weakly correlated, regardless of the manager and executives positions, at a 10% reduction in charges. For both managers and executives' expectations, noting the number of baggage reclaim carousels (0.552, 0.478) as an example, this facility is moderately correlated, at 10% reduction in charges. This shows that a decrease of airport charges has less influence on the decision to reduce the number of carousels, as they are seen to be important for airport operations.

Table 7.9 Correlation of airline position preferences for provision of TFs within arrival area at 10% reduction in airport charges

No.	Terminal Facilities	Managers			Executives		
	Importance	Low	Moderate	High	Low	Moderate	High
1.	Baggage reclaim display	0.084				0.544	
2.	Number of baggage reclaim carousels		0.552			0.478	
3.	Lost and found counter	0.129			0.138		

The situation slightly changes when the airport charge is reduced by 20%, as Table 7.10 shows that all TFs have a moderate to low correlation. The results show that the availability of those facilities is not influenced by the level of airport charges[181]. It also shows that the variables are independent as they proved to be less significant at the 20% level of sensitivity.

In Table 7.11, the results again show a moderate to weak correlation between the provision of TFs and reduction of airport charges by 30%. In this scenario, the lost and found counter, number of baggage reclaim carousels and baggage reclaim display are considered to be less important. However, baggage reclaim display and sufficient carousels are still required to speed up terminal processes.

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180 This includes the baggage reclamation and arrival hall areas.

181 The facilities are required in order to speed terminal processes.

However, there is a noticeable change in the correlations between the TFs and airport charges from the point of view of managers and executives (Table 7.12), if there is no change in charges. Both managers and executives expressed their interest in the available number of baggage reclaim carousels (0.780, 0.850) and lost and found counters (0.664, 0.751), as the r values were nearer to 1. Table 7.12 also shows that there is low correlation in the ranking of the baggage reclaim display by both managers and executives, statistically represented by low r-value.

To summarise, most of the results show moderate to low correlation when airport charges have been revised to measure the willingness of airline respondents to trade-off in their preferences for TFs in LCT design. However, a sufficient number of baggage reclamation carousels is important to speed-up the terminal process. It maybe because the number of baggage reclaim carousel currently fails to deliver an efficient service[182].

Table 7.10 Correlation of airline position preferences on provision of TFs in arrival area at 20% reduction in airport charges

No.	**Terminal Facilities**	**Managers**			**Executives**		
	Importance	Low	Moderate	High	Low	Moderate	High
1.	Baggage reclaim display	0.205			0.250		
2.	Number of baggage reclaim carousels		0.478			0.406	
3.	Lost and found counter	0.016			0.142		

182 The responses may exhibit bias because of experiences and problems with existing facilities.

Table 7.11 Correlation of airline position preferences for provision of TFs in the arrival area with a 30% reduction in airport charges

No.	Terminal Facilities	Managers			Executives		
	Importance	Low	Moderate	High	Low	Moderate	High
1.	Baggage reclaim display	0.359			0.100		
2.	Number of baggage reclaim carousels	0.314			0.335		
3.	Lost and found counter	0.011			0.071		

Table 7.12 Correlation of airline position preferences for provision of TFs in arrival area at 'normal' rate in airport charges

No.	Terminal Facilities	Managers			Executives		
	Importance	Low	Moderate	High	Low	Moderate	High
1.	Baggage reclaim display	0.236			0.150		
2.	Number of baggage reclaim carousels			0.780			0.850
3.	Lost and found counter			0.664			0.751

7.6.4 Cross-price elasticity and its effect on preferences of Air Asia managers and executives for other TFs

The availability of air conditioning, disabled facilities, flight information display system (FIDS), information counter, airport way-finding, café or restaurant, product promotional areas[183] and toilets were examined to determine whether the provision of those facilities could be linked to a reduction in airport charges by 10%, 20%, 30% or no-change rate. Table 7.13 shows the statistical correlation of Air Asia managers and executives at 10% reduction in charges. There are weak correlations between the

183 In order to increase commercial revenues, MAB offers a space for promotional activities (for example, credit cards) to airlines or concessions in the check-in area and arrival hall.

rankings of the TFs where Table 7.13 illustrates the Spearman rho coefficients for the following TFs: air conditioning (0.125, 0.046), disabled facilities (0.342, 0.508), FIDS (-0.147, 0.112), information counter (0.157, 0.115), way-finding (0.191, 0.522), café or restaurant (0.297, 0.045) and product promotional areas (0.084, 0.544), all been seen by the respondents has having low or moderate importance. Executives were more positive than managers about disabled facilities, way-finding and product promotional areas.

Except the provision of toilets (0.467, 0.404) and disabled facilities (0.475, 0.514), Table 7.14 (20% reduction) shows a low correlation between airport charges and the following TFs: air conditioning, FIDS, information counter, way-finding, café or restaurant and product promotional areas. This clearly shows that these facilities are seen of low importance if airport charges are reduced by 20%.

Table 7.13 Correlation of preferences of airline position for other TFs with a 10% reduction in airport charges

No.	Terminal Facilities	Managers			Executives		
	Importance	Low	Moderate	High	Low	Moderate	High
1.	Air conditioning	0.125			0.046		
2.	Disabled facilities	0.342				0.508	
3.	FIDS	-0.147			0.112		
4.	Information counter	0.157			0.115		
5.	Way-finding	0.191				0.522	
6.	Café or restaurant	0.297			0.045		
7.	Product promotional	0.084				0.544	
8.	Toilets		0.392			0.414	

Table 7.15 (30% reduction in airport charges) shows that the respondents expressed a preference to have disabled facilities (0.736, 0.655) and toilets (0.593, 0.481) as they are strongly correlated. The other facilities are less strongly correlated. Table 7.16 (no-change in airport charges) shows that there are different priorities for TFs, as disabled facilities (0.882, 0.544) and toilets (0.672, 0.499) have the highest correlation. For the other TFs, the responses of managers and executives were very inconsistent.

In conclusion, both managers and executives showed strong support for disabled facilities, as the results show there is a strong correlation between these facilities and the level of airport charges. It was also interesting to note that most of the facilities evaluated are weakly correlated, regardless of any reduction in airport charges at 10%, 20% and 30%, and the no-change rate of airport charges.

Table 7.14 Correlation of preferences by airline position for the provision of other TFs with a 20% reduction in airport charges

No.	Terminal Facilities	Managers			Executives		
	Importance	Low	Moderate	High	Low	Moderate	High
1.	Air conditioning	0.032			0.028		
2.	Disabled facilities		0.475			0.514	
3.	FIDS	-0.127			0.277		
4.	Information counter	0.065			0.143		
5.	Way-finding	0.333			0.284		
6.	Café or restaurant	0.128			-0.056		
7.	Product promotional	0.205			0.250		
8.	Toilets		0.467			0.404	

7.7 Determination of core and secondary facilities based Air Asia preferences for LCT facilities

As referred to Chapter 5, Section 5.6.2, the following hypotheses were developed to achieve the research objectives:

1. **Null Hypothesis (Ho):** Preferences of the TFs used in LCT design are considered as secondary, and of low significance from the managers and executives' point of view, indirect effect on the structure of airport charges [184].
2. **Alternative Hypothesis (H_1):** Preferences of the TFs used in LCT design are considered as core, and of high significance from the managers and executives' point of view, direct effect on the structure of airport charges[185].

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[184] The secondary facilities are included if test results show that the ρ value is more than 0.05 (ρ>0.05). The TFs are identified as being the least important facilities. There is less significant difference between managers and executives' preferences on the provision of TFs at check-in, departure lounge and arrival areas and the level of airport charges.

[185] The core facilities are included if results show that the ρ value is less than 0.05 (ρ<0.05). The TFs are identified as the most important facilities. There is a high significant difference between managers and executives' preferences on the provision of TFs at check-in, departure lounge and arrival areas and the level of airport charges.

Table 7.15 Correlation expressed by airline position for the provision of other TFs for a 30% reduction in airport charges

No.	Terminal Facilities	Managers			Executives		
	Importance	Low	Moderate	High	Low	Moderate	High
1.	Air conditioning	0.013			0.152		
2.	Disabled facilities			0.736			0.655
3.	FIDS	-0.111			-0.338		
4.	Information counter	0.098			0.076		
5.	Way-finding		0.396			0.390	
6.	Café or restaurant	0.063				0.396	
7.	Product promotional area	0.359			0.152		
8.	Toilets			0.593		0.481	

Figure 7.11 shows the response to service processing facilities (check-in before going through immigration and security) from the surveys of 16 managers and executives of Air Asia. A sufficient number of manual check-in counters (0.016), airline ticketing counters (0.024) and self-service check-in kiosks (0.005) were considered to be the core facilities to be provided in the LCT service processing area. The result is accepted with a significance of alpha 0.05, which means that the alternative hypothesis is accepted. The hypothesis states that there is a highly significant relationship between the preferences of managers and executives and check-in TFs**.** The results show that the manager and executive expectations are likely to significantly influence the decision of LCCs in their preferences with regard to reducing airport charges at all decrement levels. It can be seen that self-service check-in is important to reduce queuing and waiting time and its introduction would be useful to decrease the dependency on manual check-in, especially during peak hours, as the r value of self-service check-in is less than 0.05 ($r<0.05$).

Table 7.16 Correlation expressed by airline position for the provision of other TFs for a no-change of airport charges

No.	Terminal Facilities	Managers			Executives		
	Importance	Low	Moderate	High	Low	Moderate	High
1.	Air conditioning		0.457		-0.174		
2.	Disabled facilities			0.882		0.544	
3.	FIDS	-0.129				0.481	
4.	Information counter	0.326			0.057		
5.	Way-finding		0.489		0.057		
6.	Café or restaurant	0.079			0.226		
7.	Product promotional area	0.236			0.150		
8.	Toilet			0.672		0.499	

For LCT design, the following facilities: hand baggage check-in (0.438) and airline offices (0.518) are classified as secondary facilities because they have been shown to be of less importance for the sampled group of managers and executives. The null hypothesis was accepted as the r-value for each TF shows that it was greater than the significant alpha of 0.05 (r>0.05). The results showed there was a less significant relationship between airline management viewpoint and the provision of specific check-in facilities.

Within the departure lounge area (Figure 7.12), from the survey of Air Asia managers and executives, they were most interested in not having an air-bridge (0.797). The result accepts the null hypothesis with a significant r-value of more than 0.05 (r<0.05). This shows that there is a less significant relationship between the airport charges and the provision of air-bridges. The air-bridge is not important and should be excluded from the LCT design and confirms that airline use of contact stands can reduce airport charges. Except for seating (0.024), Figure 7.12 also shows that airline boarding counter (0.190), boarding pass control machine (0.364), airline shop (0.112) and standing area (0.364), while still important, are of less significance for the departure lounge, and therefore should be classified as secondary facilities in terminal design.

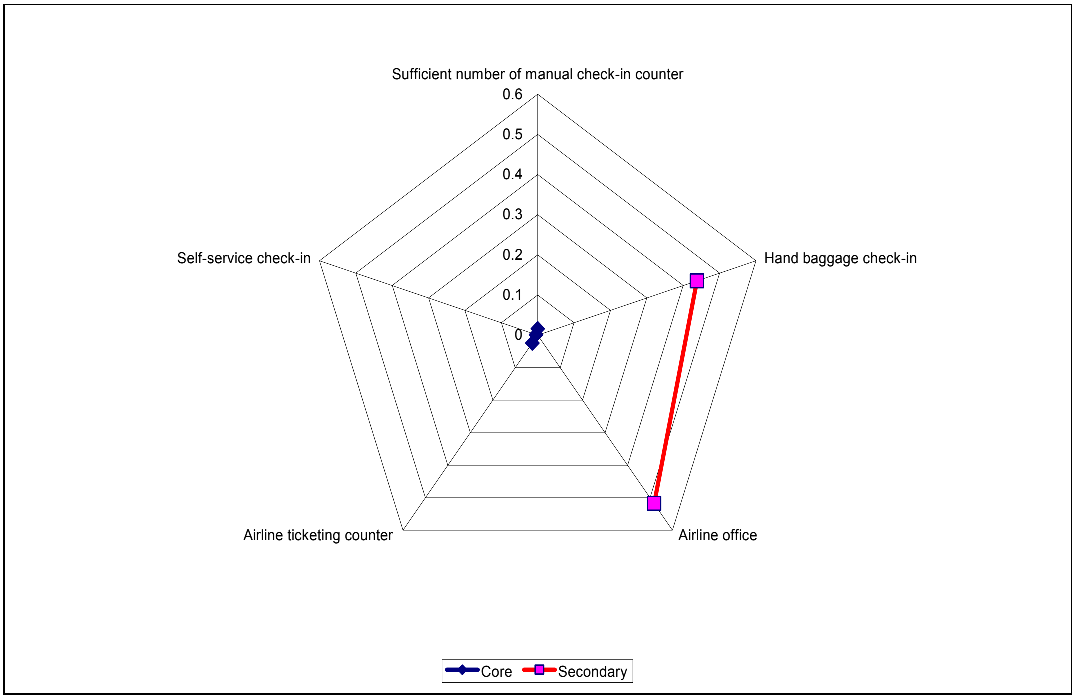

Figure 7.11 Core and secondary facilities in the check-in area

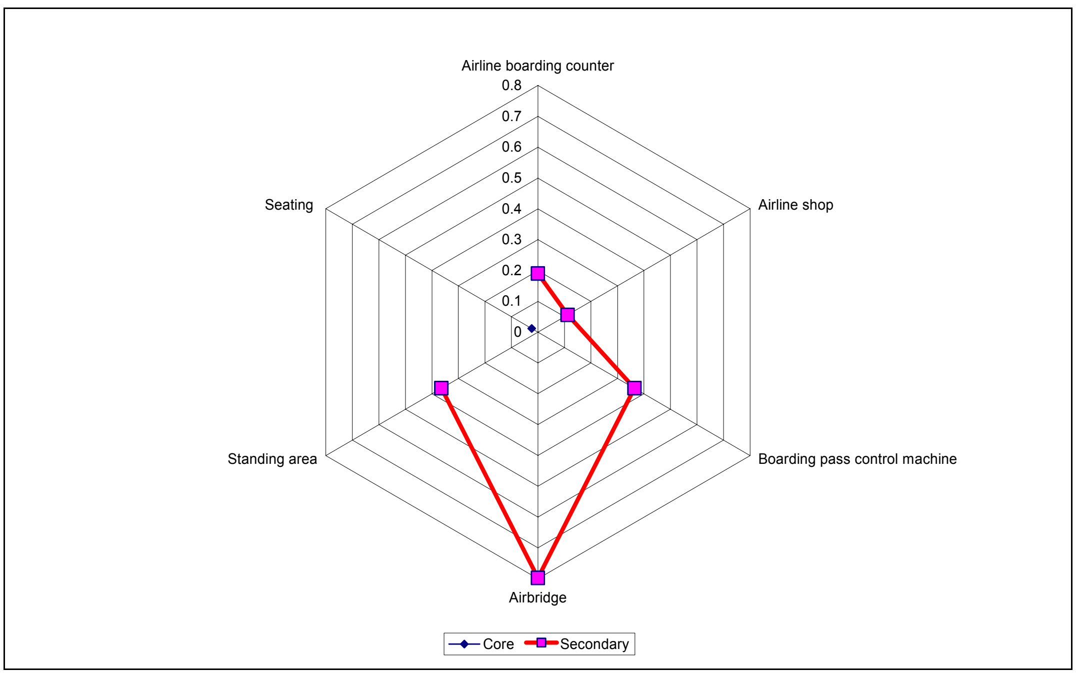

Figure 7.12 Core and secondary facilities in the departure lounge area

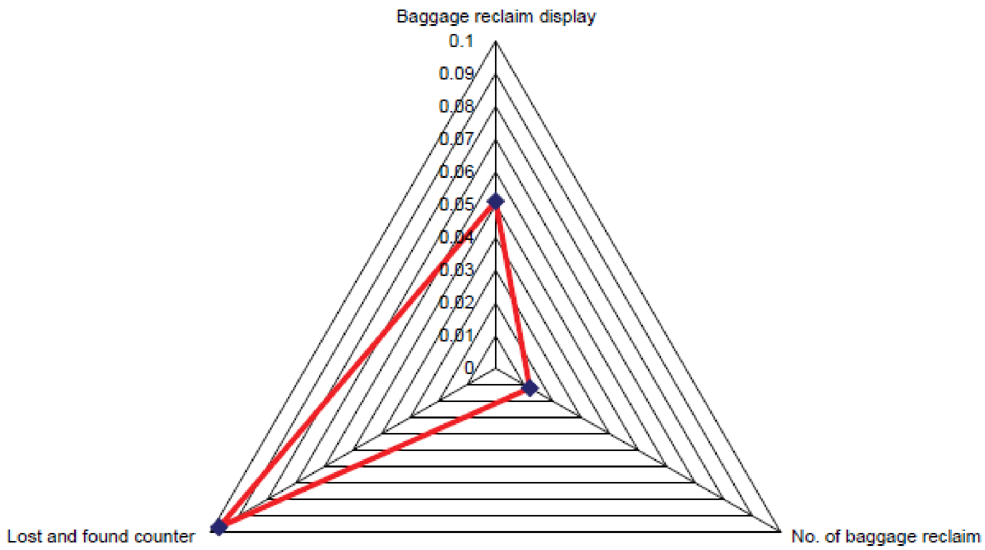

Figure 7.13 Core and secondary facilities in the baggage reclamation and arrival hall

In the arrival area (Figure 7.13), the lost and found counter (0.097) and baggage reclaim display (0.051) are of low importance as the results indicate the r-values are more than 0.05 ($r>0.05$). However, the Air Asia executives and management were still interested in having a sufficient number of baggage reclaim carousels (0.012) available in the terminal. The results show that there is highly significant relationship between the expectations of managers and executives and the provision of a sufficient number of baggage reclaim carousels within the baggage reclamation and arrival hall.

Figure 7.14 shows that the provision of disabled facilities (0.018) and toilets (0.021) are very important and must be included in the terminal design after consideration of Air Asia preferences for other facilities in the terminal area. The alternative hypothesis has been accepted and at the same time the null hypothesis was rejected at a significant alpha of 0.05 ($r<0.05$). The respondents show their preferences for these facilities in order to have improved efficiency within the LCT. The results also show that air conditioning (0.797), FIDS (0.197), information counter (0.797), way-finding (0.147), café or restaurant (0.518) and product promotional area (0.240) have lower priorities. Air Asia managers and executives classified them as secondary facilities and, for example, were less concerned about the availability of an airline information counter in the LCT design. However, with the increased demands of passengers, the airport should include an information counter for passengers' convenience although the inclusion of these facilities from the Air Asia point of view seemed to be less important.

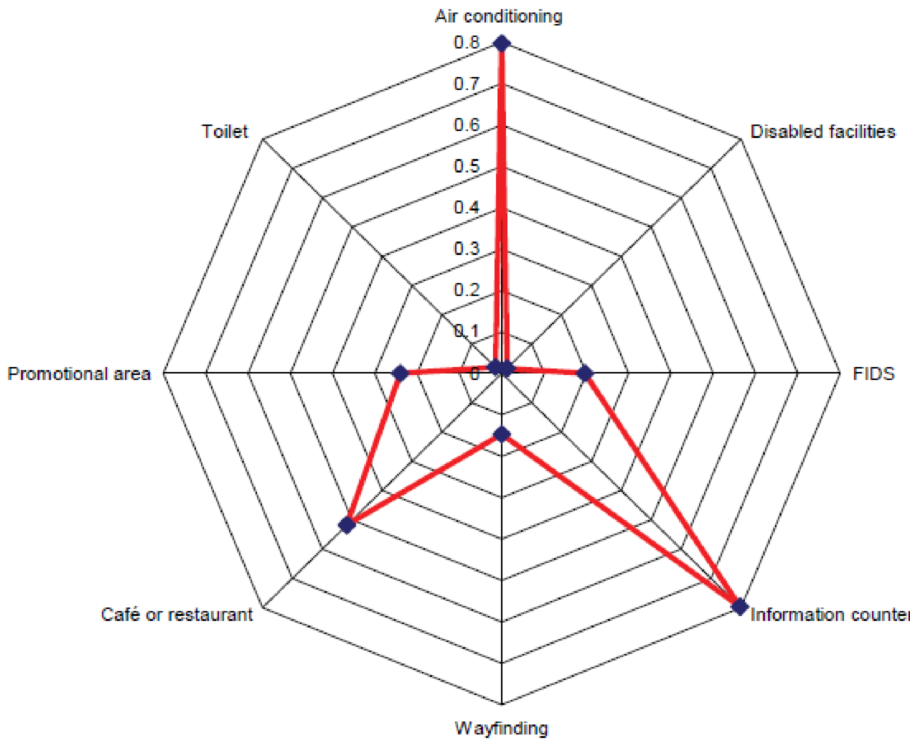

Figure 7.14 Other core and secondary facilities in the LCT

7.8 Summary

As noted earlier, the requirements of airlines are in accordance with the aim of minimising aircraft downtime with 25 minutes' turnaround time (Chapter 3). Efficiency in terminal operations is important to reduce costs, increase service standards and maximise utilisation of airline resources.

The survey explored the perception of Air Asia management. The airline now operates from the KLIA LCT. The survey received fifteen and sixteen responses from the pre- and post-development survey, respectively, that was conducted at the Air Asia Headquarters, KLIA. The analysis confirmed that airline preferences for the provision of specific TFs in LCT are variable but important. The pre-development survey revealed that the installation of self-service kiosks was seen as the most important design feature as there use should reduce congestion inside the check-in area, leading in turn to the benefits of faster terminal processes and minimisation of queue lengths. In the same survey, the results show that manual check-in desks also had a high positive response.

In terms of commercial initiatives in the landside area, the survey captured the perception of LCCs, in that the availability of an airline shop and airline offices are seen as being important to airline operations.

In the arrival area, it was noted that managers and executives were agreed on having a sufficient number of automatic baggage handling carousals in the baggage reclamation area. This facility is preferred by airline management as the result of inadequacy at the current baggage reclamation areas. In terms of TFs in the general area, it was noted that the information counter was seen as being most important. Further details can be seen in Section 7.5 and Table 7.17 of the thesis.

Using Table 7.18 as an example, in terms of views of managers and executives between airport charges and the provision of TFs, the use of the Spearman Correlation Coefficient is useful in order to classify the provision of TFs in terms of low importance, moderate importance and high importance (Section 7.6). The analyses confirmed that a sufficient number of manual check-in desks were classified as being necessary, after the Spearman Correlation test shows that the r values (rho) exceeded than 0.590.

The research confirmed that the TFs could be classified into core and secondary groups [Section 7.7 and Appendix 9 (Tables 1, 2 and 3)] as the research hypotheses showed there were significant results when the r value was less than 0.05 ($r<0.05$). The research confirmed that the provision of TFs can be grouped into core and secondary facilities and that correlations from the responses of Air Asia managers and executives on specific facilities are less than 0.05($r<0.05$). With the number of baggage reclaim carousels as an example, the r value of 0.012 signifies the alternative hypothesis, as the r-value is less than 0.05 ($r<0.05$). The viewpoints of the managers and executives are important as they have a role as influencers (as previously discussed in Chapter 5) in LCT design. This is therefore why airport authorities should consider the preferences of airlines in establishing LCT design.

Table 7.17 Most important facilities for LCT design (Air Asia Managers and Executives preferences)

Terminal Facilities	Managers (No.)	Executive (No.)	Total
Check-in area			
Self-service ticketing kiosk	1	1	2
Number of manual check-in desks	4	1	5
Fast track/ premium facilities	2	1	3
No-baggage check-in	4	2	6
Pre-departure check-in	2	2	4
Self-service check-in kiosk	5	1	6
Split check-in desk	2	1	3
Commercial area			
Airline office	5	1	6
Airline shop	6	0	6
Café or restaurant	3	1	4
Departure Lounge			
Flight boarding counter	2	0	2
VIP lounges	3	0	3
Waiting area	3	0	3
Boarding pass control machine	2	0	2
Air-bridge	2	0	2
Contact stands	6	1	7
Baggage reclaim and arrival areas			
Baggage reclaim display (airside)	4	1	5
Airline lost and found counter (landside)	5	1	6
Number of automatic baggage handling carousals (airside)	5	1	6
Others			
Lighting	3	2	5
Air conditioning	3	2	5
Carpeting	1	1	2
Disabled facilities	3	1	4
FIDS	3	1	4
Prayer room	3	1	4
Restroom	4	0	4
Information desk	5	0	5

Table 7.18 Correlation of the preferences of Air Asia management at reduction 30% in airport charges

Terminal Facilities	Managers	Executives
Check-in area		
Number of manual check-in desks	0.593	0.600
Hand baggage check-in	0106	0.166
Airline office	0.219	0.108
Ticketing counter	-0.126	-0.096
Self-service check-in kiosks	0.611	0.624
Departure Lounge		
Airline boarding counter	0.255	0.374
Airline shop	0.021	0.049
Boarding pass control machine	0.150	-0.032
Air-bridge	0.214	0.134
Standing area	0.379	0.274
Seating	0.464	0.438
Baggage reclamation and arrival hall		
Baggage reclaim display	0.359	0.100
No. of baggage reclaim	0.314	0.335
Lost and found counter	0.011	0.071
Others TFs		
Air conditioning	0.013	0.152
Disabled facilities	0.736	0.655
FIDS	-0.111	-0.338
Information counter	0.098	0.076
Way-finding	0.396	0.390
Café or restaurant	0.063	0.396
Promotional area	0.359	0.152
Toilet	0.593	0.481

Chapter 8 continues by investigating the preferences of airport management for TFs to be included as part of the LCT design.

CHAPTER 8

8 Preferences of Airport Management for the Inclusion of Specific Terminal Facilities (TFs) as part of Low Cost Terminal (LCT) Design

8.1 Introduction

At present, LCT facilities preferred by LCCs and passengers are not always justified and the provision of TFs can be inadequate. Users such as LCCs are rarely systematically consulted by LCT airports before the specific provision of TFs is fixed. However, LCCs indicate their preferences for limited TFs as being important, as a major concern of the LCCs is in reducing airport charges. In addition, although operating high load factors, LCCs aim to restrict aircraft turnaround time to less than 30 minutes, thereby requiring efficient TFs to be included in LCT design[186].

This Chapter therefore discusses the preferences of airport management, in terms of the expectations of both managers and executives, as they are the decision makers for LCT design, a role previously discussed in Chapter 5, Section 5.2.2. As decision makers, they are responsible for making the right decision to decide which TFs are to be included in the terminal design, taking into consideration airport charges, capital investment[187], operational costs and revenues. This Chapter discusses the results of the surveys at KLIA, Malaysia, by revealing key aspects, such as respondents' background, elements of cost and revenue structures (for example, airport charges), and has three aims. Firstly, a discussion of airport management preferences for cost and revenue structures in LCT design. Secondly, the preferences of airport management for TFs based on airport charges (AC), capital investment (CI), operational costs (OC) and airport revenues (AR), and finally, the selection of core and secondary facilities to meet airport management preferences in order to suggest optimum LCT model guidelines.

8.2 Kuala Lumpur International Airport (KLIA)

Kuala Lumpur International Airport (KLIA), Malaysia, is situated at Sepang which is 30 miles from the main city, Kuala Lumpur. The construction cost of KLIA was about $3.5 billion. Planning and development of the new airport began in 1990 when it became evident that the then existing airport, Sultan Abdul Aziz Shah International Airport or Subang International Airport, faced capacity constraints and was incapable of meeting long-term increases in passenger traffic and cargo demand. In addition, KLIA was interested in becoming one of Asia's major aviation hubs along with neighbouring airports, Bangkok Suvarnabhumi Airport and Singapore Changi Airport.

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186 Note that not all TFs influence aircraft turnaround time.
187 The terms capital investment and investment cost are used interchangeably.

In 2007, the airport ranked as the 13th busiest airport in the world and handled 26 million passengers and 677,446 metric tonnes of cargo. The airport is operated by Malaysia Airport Holding Berhad (MAHB), Sepang Berhad, and serves as the base for Malaysia Airlines, MASkargo, Air Asia and Air Asia X. Malaysia Airlines (MAS) is a traditional airline with comprehensive hub-and-spoke networks comprised of regional, domestic and international services. In contrast, Air Asia and Air Asia X are airlines with point to point services, low fares and lower overall cost structures.

Figure 8.1 shows some clear differences in passenger traffic as growth significantly increased between 2005 and 2007. In 2005, about 14.3 million and 8.3 million international and domestic passengers, respectively, used the main terminal building of KLIA traffic being stimulated by LCC operational activities at KLIA. However, the passenger traffic increased remarkably after Malaysia Airport Berhad agreed to construct the LCT building, to cope with the demand generated by Air Asia. About 16.9 million international and 9.1 million domestic passengers used the KLIA (MTB and KLIA LCT) in 2007, showing increases of 18.2% and 9.6% in international and domestic passenger traffic, respectively[188].

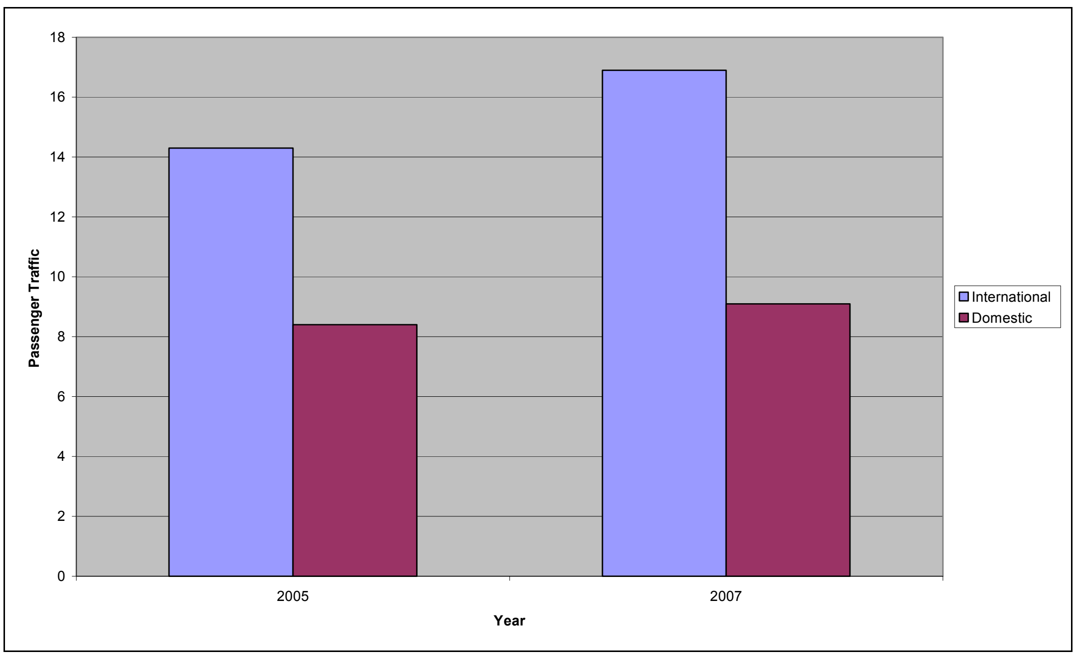

Figure 8.1 Percentages of international and domestic passengers at KLIA, Malaysia

[188] http://www.rati.com./frameset/frameset_f.asp?target=../news/news.asp

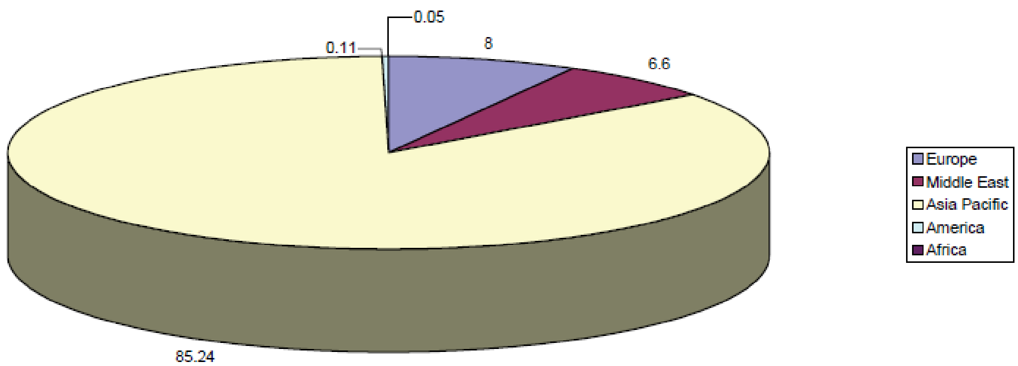

Figure 8.2 Percentages of International Passenger Movements by Sectors at KL International Airport

Figure 8.2 above shows the percentages of passenger traffic from the Asia Pacific, Europe, the Middle East, America and Africa sectors in 2007[189]. The traffic from the Asia Pacific region generates most traffic at KLIA, LCT, with 85% of all passengers from the region. The establishment of routes by Air Asia to most Asia Pacific countries has successfully generated additional traffic through KLIA.

8.3 Research Methodology

The aim of the survey[190] was to examine the inclusion of core and secondary TFs in LCT design from the airport authority's perspective. The primary source of data consisted of feedback from 16 'managers'[191] and 'executives'[192] of Malaysia Airport Holding Berhad. Questionnaires were completed by them to determine their viewpoints on the provision of TFs to be included in LCT design. The survey was conducted in 2007, after a year of KLIA LCT operation. The MAB had granted permission for the managerial and executive levels survey to be carried out at Malaysia Airport headquarters at Sepang, Malaysia. The results were processed by SPSS and the data was coded, counted and presented.

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189 Malaysia Airport Holding Berhad Annual Report.

190 Post development survey questionnaire is shown in Appendix 7.

191 Airport manager refers to the person that responsible for the planning, administration and operations of assigned programs, capable in managerial, financial and supervisory functions, and knowledgeable about the airport business. The managers (that includes senior management) are involved directly in LCT planning as well as having experience of LCT development.

192 Airport executive refers to a person that responsible for making decisions that affect airport policy and responsible for the success or failure of the airport business. Airport executives are directly involved in terminal planning and development (commercial, planning and operations).

8.4 Discussion of results: Demographic background (KLIA staff)

Figure 8.3 shows the proportion of airport managers and executives from Malaysia Airport Berhad participating in the survey. The two groups of managers and executives showed a very different perception in the relationship between airport charges, capital investment, operational cost and airport revenue and the provision of TFs. As a group the managers represented 75% of the total responses whereas executives only 25% of the total responses. Their role as decision makers on LCT development needs to be borne in mind.

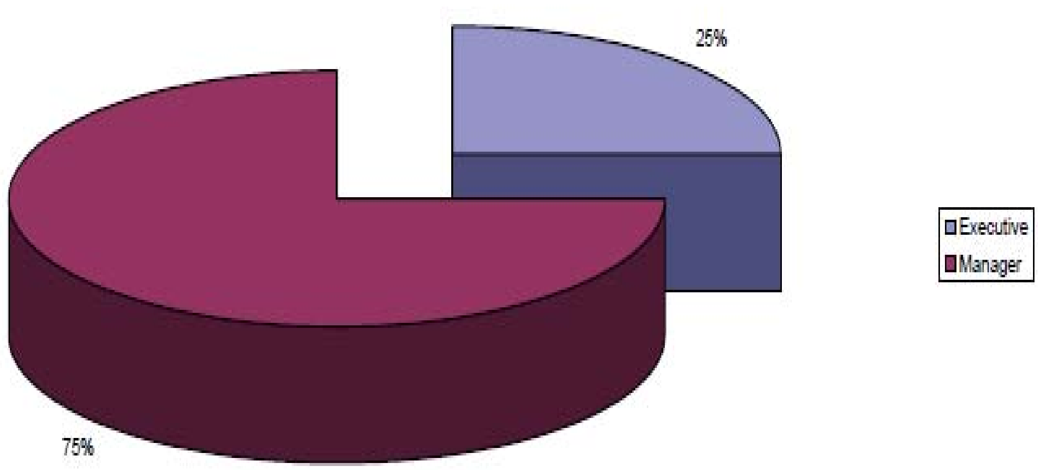

Figure 8.3 Proportion of KLIA Managers and Executives responding to survey

8.5 Relationship between cost and revenue structures and preferences of Managers and Executives for TF provision

This section continues with frequency analyses. The responses, in the form of percentages, are expressed using a Likert scale[193] in terms of either strongly disagree, or disagree, or neither agree nor disagree, or agree, or strongly agree. This scale was based on a rating of 1 for strongly disagree, and 5 for strongly agree, with the statements on different types of facilities[194]. A frequency distribution is a display of the frequency of occurrence of each score value (Coakes, 2006). In order to have a better understanding,

193 The applicability of the Likert scale to the research has been previously discussed in Chapter 1.

194 For check-in, departure lounge, baggage reclaim and arrival areas.

the results are supported with bar charts wherever applicable so that the findings could be clearly illustrated.

This section seeks to identify the perceptions of the two respondent groups (managers and executives) on the cost and revenue structures (airport charges, capital investment, operational costs and airport revenue) and the relationship with the provision of TFs. The respondents selected from five possible responses and rated 1 to 5 the relationship between cost and revenue structures and provision of TFs. The responses enabled the relationship of cost and revenue structures, to the allocation of TFs, to be identified. Several analyses covered four different cost and revenue elements (airport charges, capital investment, operational cost and airport revenue). Furthermore, due to the relatively small sample of 16, frequency analyses were used in this section.

The survey aimed to explore airport management opinions on whether certain cost elements could be reduced after the basic TFs are considered. From the survey, based on seven out of sixteen responses, Figure 8.4 shows that the reduction of passenger service charges (PSCs) is highly important to the adequacy of TFs. This shows the importance of reducing airport charges to LCCs regardless of the inconvenience of LCC passengers using the terminal facilities (Chapter 3, Section 3.5).

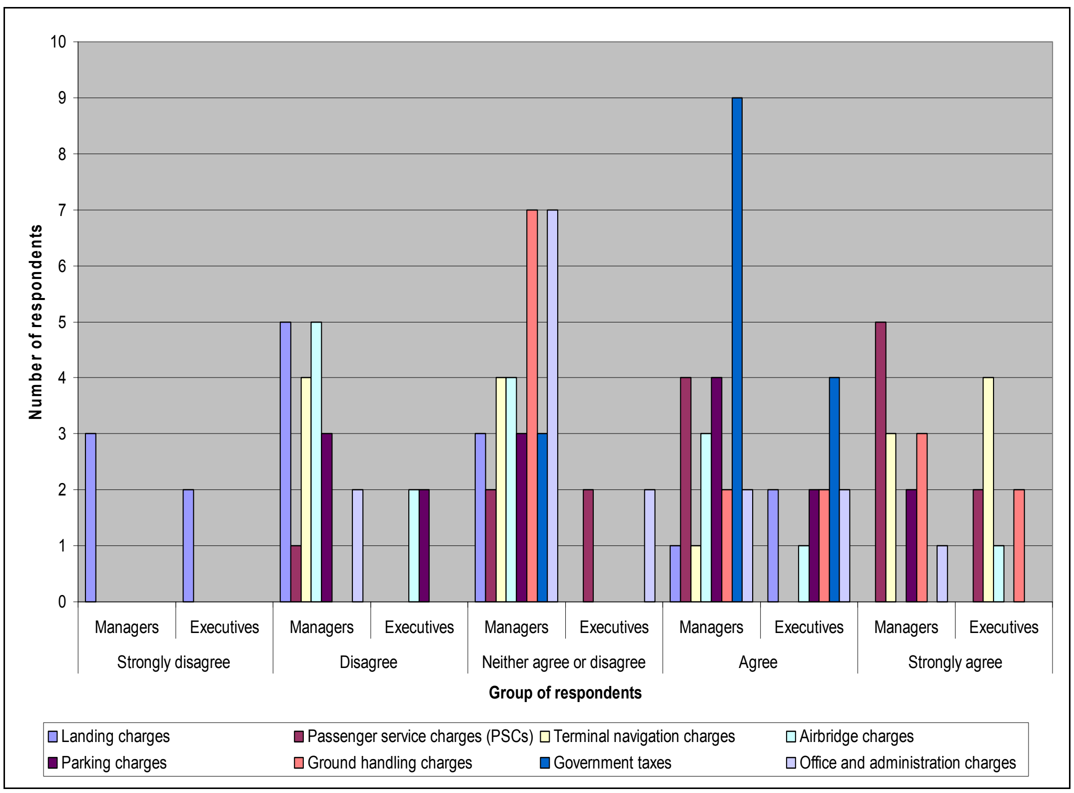

Figure 8.4 Frequency analyses of airport charges and TFs

It was also interesting to note that both managers and executives disagreed with the option that landing charges could be reduced. Indeed, low landing charges are already imposed on airlines by KLIA as an incentive to attract new LCCs. In terms of air-bridge charges, the availability of air-bridges is not seen as important as the inclusion of contact stands is seen as being more appropriate to reduce airport charges. In terms of ground handling charges, government taxes, and administration charges, most of the managers and executives were agreed that, ideally, the development of KLIA LCT should reduce such charges. Figure 8.4 shows a frequency analysis of airport charges and provision of TFs.

In most of the literature reviewed (Chapter 5, Section 2.5), the introduction of specific LCT facilities can reduce costs in order to develop the terminal as well as to fulfil the LCCs requirements. Regarding reduction of capital investment (Figure 8.5), both airport executives and managers agreed that the adequacy of TFs is important notwithstanding reducing capital investment by developing a new terminal.

Despite that, there was no consensus that capital investment could be minimised when simplifying or downgrading of TFs. The reason may be that the redevelopment of the main terminals of KLIA into a LCT would incur a significantly higher cost. This would indicate that the optimum solution for LCT development would be the construction of a new dedicated building.

Regarding operational costs (Figure 8.6), a minority of the managers disagreed that the availability of only basic TFs would bring more efficiency to the operational area. In the current KLIA LCT design, passengers and airlines are facing very bad delays, in which the airport fails to meet operational standards, mostly at peak times. The results show that the availability of basic TFs should take into account of passengers' convenience with regard to the restrictions on space and terminal size. Similarly, Figure 8.6 shows that airport operational costs cannot be reduced by minimising the operational processes for LCT activities. However, the advantages of basic TFs can be significant by reducing the operational cost through minimising labour costs and by using advanced technologies in critical areas such as self-service check-in kiosks.

Figure 8.7 shows the views expressed by the managers and executives in terms of what additional TFs should be included in the LCT design. From the results, it was interesting to learn that the introduction of more than the basic TFs for LCT design is not likely to increase passenger traffic as the passengers are more attracted by the fare structures offered by LCCs. However, an increase in passengers will significantly influence the structure of airport revenues including a potential increase in commercial revenues. In order to generate the revenues by taking account of the availability of commercial space, both managers and executives agreed that the allocation of temporary facilities was most important. However, from the responses received, permanent space for commercial revenues was also considered to be highly important.

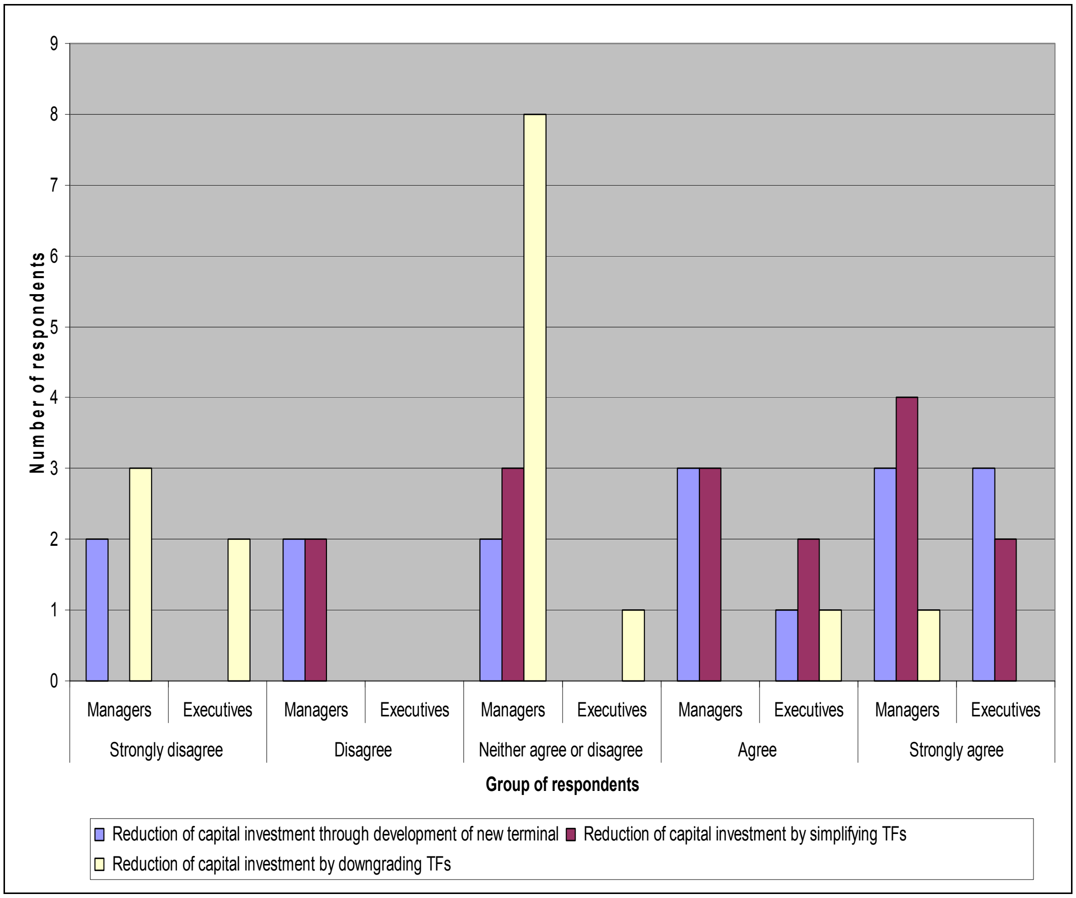

Figure 8.5 Frequency analyses of capital investment and the provision of TFs

The respondents doubted that the conversion of 'luxury' facilities to commercial facilities would significantly increase the airport revenues. However, a minority view point was that the potential increase in airport revenues could be achieved by further development of LCT commercial facilities.

8.6 Preferences of airport managers and executives for provision of TFs linked to flexibility in airport charges (AC), capital investment (CI), operational costs (OC) and airport revenues (AR)

This section investigates the provision of TFs linked to flexibility of cost (airport charges, capital investment and operational) and revenue (airport revenue) structures in general, as deemed important by airport management perceptions. The questionnaire aimed to investigate the willingness of airport management to trade-off between the provision of TFs and the flexibility of cost and revenue structures in LCT design. The selection of TFs is important in the design as they would influence airport charges, capital investment, operational costs and airport revenues. The results appear in the cross-price elasticity dynamic in general, whereby provision of TFs is decided regardless of manager and executive positions. The survey indicates the willingness of the group of managers to trade-off between TF provision, and cost and revenue structures.

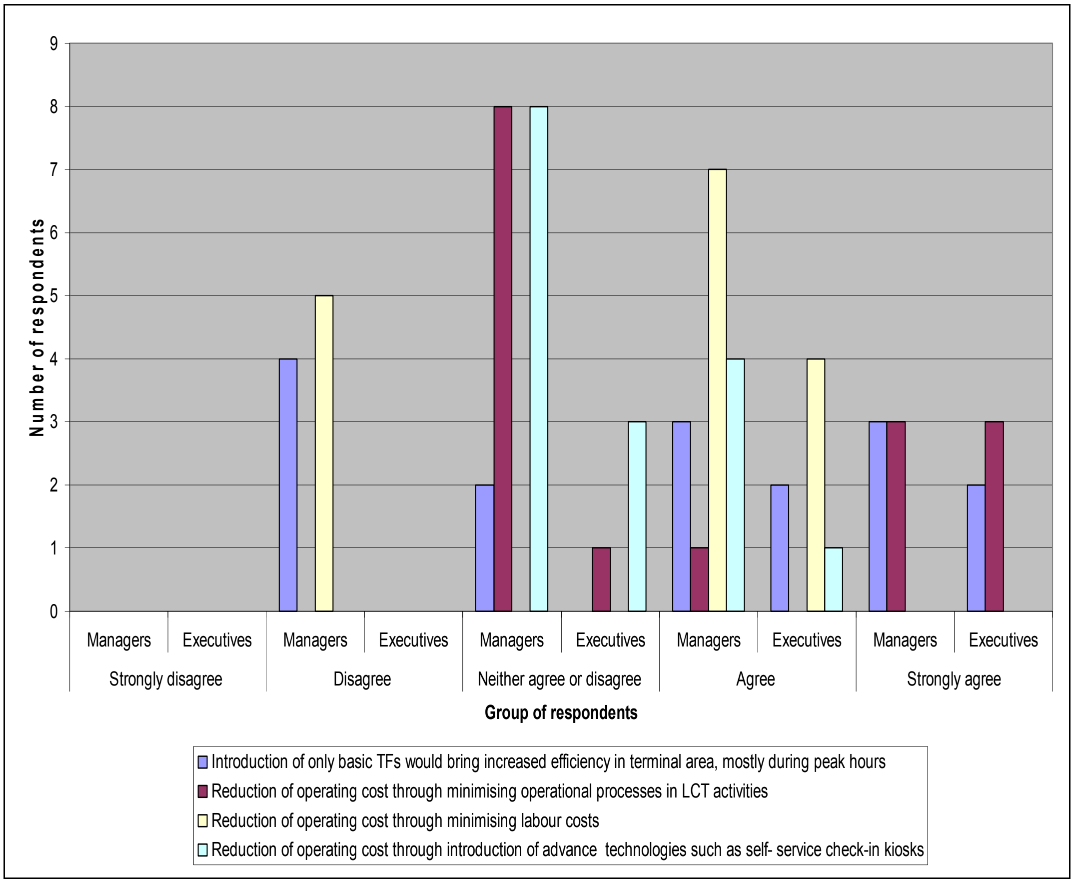

Figure 8.6 Frequency analyses of operational cost and provision of TFs

The open-ended questions were used chiefly to determine the influence of the cost and revenue structure sensitivity correlated in the three major parts of the LCT design: check-in, departure lounge and arrival areas. Similar to Section 7.5, the Spearman correlation coefficient[195] was used to rank the levels of TF importance in accordance with airport management expectations, and to determine the extent to which changes in cost and revenue structures are associated with changes in TF provision.

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195 Research Methods in Psychology, Department of Psychology, College of Arts and Sciences, University of Central Florida, USA.
https://webct.ucf.edu/dav/psy3214a/reach/notes/notes4correlation.html

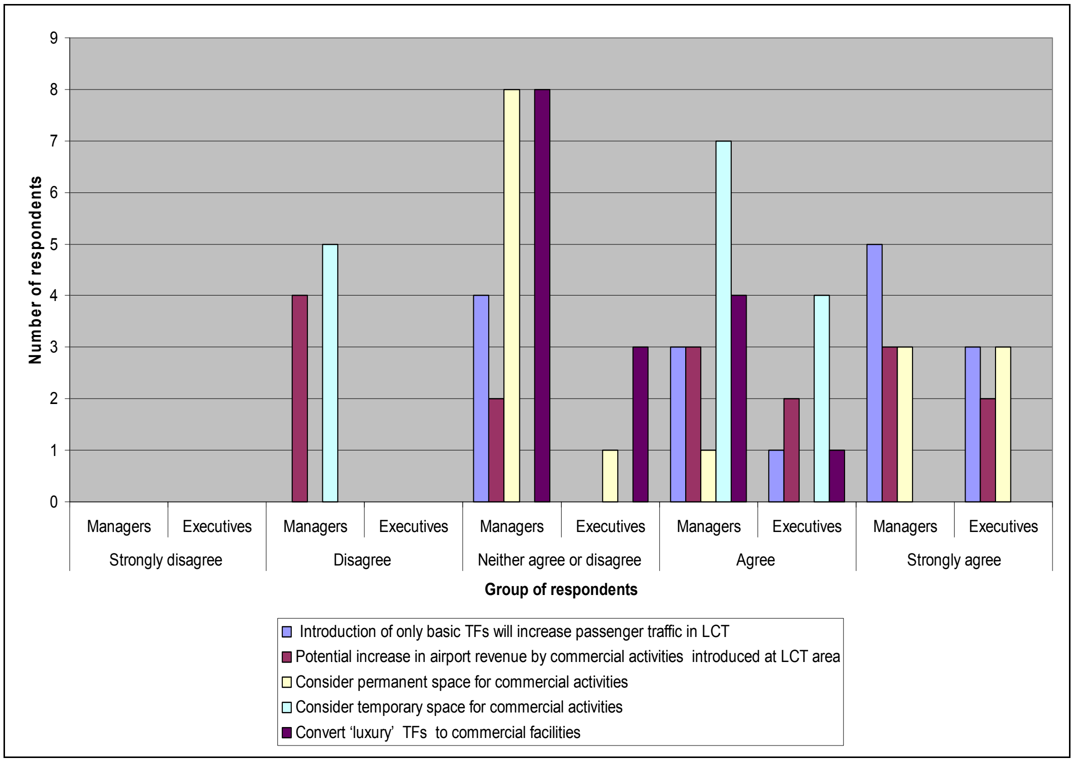

Figure 8.7 Relationship of airport revenues and provision of TFs

8.6.1 Flexibility effect on preferences of airport management for TFs in check-in area

Evaluation of TFs considered the following facilities as being basic for the check-in area: airline office, product promotional area, airline ticketing counter, bureau de change, café or restaurant, cash machine, flight information display system (FIDS), hand baggage check-in, manual check-in desk, seating, self-service kiosk, convenience shop, television and trolleys. Table 8.1 shows the significant relationships between the provision of TFs and structure of airport charges. A café or restaurant (0.639), manual check-in desk (0.620) and self-service check-in kiosks (0.692) are strongly correlated with the level of airport charges, as both managers and executives similarly agreed that these facilities should be included. The facilities are significant to airport charges as the rho values are close to 1 ($r>1.00$).

In the relationship of airport charges with other TFs, it was also noted that there was a positive low correlation for the availability of airline office (0.052), seating (0.289), convenience shop (0.200) and baggage trolleys (0.320). This signifies that an increase in airport charges would indicate possible inclusion of these TFs. By contrast, product promotional areas (-0.267), airline ticketing counter (-0.035), bureau de change (-0.316), cash machines (-0.358), FIDS (-0.158), hand baggage check-in (-0.277), television (-0.246) are negatively correlated with the airport charges structure. This means that an increase in airport charges would lead to a decrease in the demand for the provision of these specific TFs.

Table 8.1 Correlation of preferences, by airport management, for the provision of TFs in check-in area, with airport charges

No.	Terminal Facilities	Airport charges (r)		
	Importance	Low	Moderate	High
1.	Airline office	0.052		
2.	Product promotional area	-0.267		
3.	Airline ticketing counter	-0.035		
4.	Bureau de change	-0.316		
5.	Café or restaurant			0.639
6.	Cash machine	-0.358		
7.	FIDS	-0.158		
8.	Hand baggage check-in	-0.277		
9.	Manual check-in desk			0.620
10.	Seating	0.289		
11.	Self service check-in			0.692
12.	Convenience shop	0.200		
13.	Television	-0.246		
14.	Trolleys	0.320		

Table 8.2 shows that there are low correlations for the TFs evaluated and capital investment. The café or restaurant is a negatively correlated with capital investment (-0.369) from the viewpoints of both managers and executives. This means that there is little significant change in the demand for café or restaurant with a reduction of capital investment. In contrast, noting the airline ticketing counter (0.182), FIDS (0.191), hand baggage check-in (0.101), television (0.018) and baggage trolleys (0.012) as examples, the availability of the facilities have a low positive correlation with the investment costs, as the r-values are close to 0. The results signify that the relationship between the TFs and the capital investment is less significant and therefore, the flexibility of capital investment does not influence the inclusion of those facilities in terminal design.

Table 8.3 shows the relationship between operational cost and provision of TFs in LCT design. Table 8.3 indicates that the airline office (0.035), product promotional area (0.124), airline ticketing counter (0.327), bureau de change (0.107), self-service check-in kiosks (0.106), television (0.323), FIDS (0.234) and trolleys (0.149) have a positive correlation with the flexibility of operational cost. It can be assumed that the non-availability of these facilities would not significantly reduce operational costs. By comparison, cash machines, hand baggage check-in and seating are negatively correlated with the operational cost, with r-values of -0.467, -0.401 and -0.447, respectively. The results show that the availability of those facilities is less influenced by the structure of operational costs, as the r values are between – 0.39 and – 0.59.

Table 8.2 Correlation of preferences, by airport management, for the provision of TFs in check-in area, with capital investment

No.	Terminal Facilities	Capital investment (r)		
	Importance	Low	Moderate	High
1.	Airline office			-0.596
2.	Product promotional area		-0.447	
3.	Airline ticketing counter	0.182		
4.	Bureau de change		-0.505	
5.	Café or restaurant	-0.369		
6.	Cash machine		-0.459	
7.	FIDS	0.191		
8.	Hand baggage check-in	0.101		
9.	Manual check-in desk			0.667
10.	Seating		-0.440	
11.	Self service check-in			0.698
12.	Convenience shop			0.709
13.	Television	0.018		
14.	Trolleys	0.012		

In the check-in area, Table 8.4 clearly shows that airport management selected the potential for revenue as being an important variable to determine the inclusion of TFs. Airline offices (0.495), product promotional areas (0.437), bureau de change (0.695) and café or restaurants (0.629) are positively correlated with airport revenues, which indicate that these facilities should be present to increase the commercial revenues of an LCT.

To summarise, from the responses of managers and executives, most of the TFs are not generally sensitive to the flexibility of cost and revenue structures, regardless of their preferences for specific TFs in LCT design. Therefore, this means that airport planners should continue to take into consideration those facilities.

Table 8.3 Correlation of preferences, by airport management, for the provision of TFs in check-in area, with operational costs

No.	Terminal Facilities	Operational cost (r)		
	Importance	Low	Moderate	High
1.	Airline office	0.035		
2.	Product promotional area	0.124		
3.	Airline ticketing counter	0.327		
4.	Bureau de change	0.107		
5.	Café or restaurant	-0.358		
6.	Cash machine		-0.467	
7.	FIDS	0.234		
8.	Hand baggage check-in		-0.401	
9.	Manual check-in desk			0.673
10.	Seating		-0.447	
11.	Self service check-in	0.106		
12.	Convenience shop	-0.025		
13.	Television	0.323		
14.	Trolleys	0.149		

8.6.2 Flexibility effect on preferences by airport management for TFs in departure lounge

Table 8.5 shows the following facilities that have been evaluated for the departure lounge area: airline boarding counter, airline boarding pass control machine, airline shop, contact stand, bureau de change, café or restaurant, cash machine, seating, convenience shop, product promotional area, smoking area and television. Table 8.5 shows the TFs correlated according to their degree of strength in their relationship with the structure of airport charges. A moderate correlation exists between the rankings of TFs, regardless of the position of airport management, while Table 8.5 indicates the correlation between the provision of specific facilities and airport charges. The results show that there is combination of negatively moderate and low correlation for airline boarding counters (-0.447), airline boarding pass control machines (-0.362), airline shop (-0.324), café or restaurant (-0.347), cash machine (-0.459), convenience shop (-0.558), product promotional areas (-0.236) and television (-0.312), as the r-values are close to 0. It shows that if a reduction in airport charge is imposed, moderate and low importance preferences of airport management are similar. However, the availability of contact stands is also moderately correlated with airport charges.

Table 8.4 Correlation of preferences, by airport management, for the provision of TFs in check-in area, with airport revenues

No.	Terminal Facilities	Airport revenues (r)		
	Importance	Low	Moderate	High
1.	Airline office		0.495	
2.	Product promotional area		0.437	
3.	Airline ticketing counter	0.018		
4.	Bureau de change			0.695
5.	Café or restaurant			0.629
6.	Cash machine	0.119		
7.	FIDS	-0.036		
8.	Hand baggage check-in	-0.158		
9.	Manual check-in desk	0.173		
10.	Seating	0.105		
11.	Self service check-in	0.218		
12.	Convenience shop	-0.387		
13.	Television	-0.035		
14.	Trolleys	0.246		

Table 8.6 shows that the airline boarding desk (0.325), café or restaurant (0.096), seating in the departure area (0.035), smoking area (0.236), and television (0.089) are less significant in their relationship with the amount of capital investment in the departure lounge area. Table 8.6 also shows there is a low correlation regardless of manager and executive positions, while the provision of specific TFs is indicated by the Spearman Rho coefficient. The results show that both airport managers and executives are not very sensitive to having those TFs included in LCT design. In contrast, airline boarding pass control machine (-0.041), airline shop (-0.249), bureau de change (-0.362), cash machine (-0.369), convenience shop (-0.220) and product promotional area (-0.348) are negatively correlated with the capital cost as the results show r-values close to 0. The results show that these TFs are less preferred by the managers and executives for inclusion into LCT design, as they were evidently less correlated with capital investment.

Table 8.5 Correlation of preferences, by airport management, for the provision of TFs in departure lounge, with airport charges

No.	Terminal Facilities	Airport charges (r)		
	Importance	Low	Moderate	High
1.	Airline boarding counter[196]		-0.447	
2.	Airline boarding pass control machine[197]	-0.362		
3.	Airline shop	-0.324		
4.	Contact stand		0.532	
5.	Bureau de change		-0.562	
6.	Café or restaurant	-0.347		
7.	Cash machine		-0.459	
8.	Seating	0.034		
9.	Convenience shop		-0.558	
10.	Product promotional area	-0.236		
11.	Smoking area	0.172		
12.	Television	-0.312		

Table 8.6 Correlation of preferences, by airport management, for the provision of TFs in departure lounge, with capital investment

No.	Departure Lounge	Investment Cost (r)		
	Importance	Low	Moderate	High
1.	Airline boarding counter	0.325		
2.	Airline boarding pass control machine	-0.041		
3.	Airline shop	-0.249		
4.	Contact stand		0.467	
5.	Bureau de change	-0.362		
6.	Café or restaurant	0.096		
7.	Cash machine	-0.369		
8.	Seating	0.035		
9.	Convenience shop	-0.220		
10.	Product promotional area	-0.348		
11.	Smoking area	0.236		
12.	Television	0.089		

196 Refer to 7.9 (Section 7.6.2)
197 Refer to Figure 7.10 (Section 7.6.2)

Table 8.7 shows that the inclusion of the following facilities are of low or moderate importance in the departure lounge area: airline boarding counter (0.165), airline boarding pass control machine (0.333), contact stand (0.419), café or restaurant (0.440), seating in the departure area (0.385), product promotional area (0.158) and smoking area (0.467), as the r-values are between 0.0 and 0.5. Interpretation of the results is that these facilities do not influence a reduction of operational costs, while Table 8.7 shows positive low correlations. In the other results, negative correlations exist for the following facilities with regard to preferences: airline shop, bureau de change, cash machine, convenience shop and television with r-values of -0.033, -0.017, -0.364, -0.431 and -0.228, respectively.

Table 8.7 Correlation of preferences, by airport management, for the provision of TFs in departure lounge, with operational charges

No.	Departure Lounge	Operational charges (r)		
	Importance	Low	Moderate	High
1.	Airline boarding counter	0.165		
2.	Airline boarding pass control machine	0.333		
3.	Airline shop	-0.033		
4.	Contact stand		0.419	
5.	Bureau de change	-0.017		
6.	Café or restaurant		0.440	
7.	Cash machine	-0.364		
8.	Seating		0.385	
9.	Convenience shop		-0.431	
10.	Product promotional area	0.158		
11.	Smoking area		0.467	
12.	Television	-0.228		

As shown in Table 8.8, there are noticeable changes in the r-values for the following facilities: airline boarding counter (0.291), airline boarding-pass control machine[198] (0.185), airline shop (0.152), café or restaurant (0.207), convenience shop (0.343), product promotional area (0.335), smoking area (0.255), and television (0.231) as the Table shows positive r-values close to 0. This indicates that the preferences of airport management are broadly similar for TFs in the departure lounge area, after taking into consideration the options for increasing airport commercial revenues. Noting the bureau de change as an example, the facility was strongly correlated as the r-value is 0.682. Inclusion of the bureau de change is evidently significant for increasing airport commercial revenues.

198 This is only needed when a 'stub' is required for seat allocation - free seating just requires collection of boarding cards.

Similar to Section 8.6.1, the analyses of both managers and executives responses show their interest in having most of these facilities included in the terminal design. All the results show that there is little correlation between provision of TFs at departure lounge area and capital investment which indicates that the allocation of capital investment should be sufficient, irrespective of the type of TFs, in order to develop a dedicated LCT.

Table 8.8 Correlation of preferences, by airport management, for the provision of TFs in departure lounge, with airport revenues

No.	Departure Lounge	Airport revenues (r)		
	Importance	Low	Moderate	High
1.	Airline boarding counter	0.291		
2.	Airline boarding pass control machine	0.185		
3.	Airline shop	0.152		
4.	Contact stand	0.268		
5.	Bureau de change			0.682
6.	Café or restaurant	0.207		
7.	Cash machine	-0.172		
8.	Seating	-0.105		
9.	Convenience shop	0.343		
10.	Product promotional area	0.335		
11.	Smoking area	0.255		
12.	Television	0.231		

8.6.3 Flexibility effect on preference of airport authorities for TFs in arrival area[199] and cost and revenue structures

Table 8.9 shows the survey results for managers and executives on the inclusion of TFs in the arrival area according to the structure of airport charges. The correlations are shown in Table 8.9 to illustrate what is statistically significant between airport charges and the inclusion of specific TFs. The following TFs were included in LCT design: airline information counter, baggage reclaim display, bus ticket counter, café or restaurant, cash machine, left luggage counter, lost and found counter, automatic baggage handling carousal, seating, convenience shop, product promotional area, taxi counter and trolleys. There were low correlations between the rankings of specific TFs, regardless of the status of airport management, while Table 8.9 illustrates the Spearman Rho Coefficient. The results show that there are positive low correlations for the information counter (0.286), baggage reclaim display (0.106), bus ticket counter (0.191), café or restaurant (0.260), cash machine (0.235), left luggage counter (0.362), lost and found counter (0.179), seating (0.257), convenience shop (0.118), product promotional counter (0.178), taxi counter (0.174) and baggage trolleys (0.267). It shows

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[199] The arrival area indicates baggage reclamation and arrival hall of LCT.

that there would be less demand for these TFs if the airport charges were to be reduced. However, noting as an example the number of baggage reclaim carousels (0.748), it can be shown that this facility is of high importance, regardless of managers and executives expectations, if a reduction airport charges were imposed.

Table 8.9 Correlation of preferences, by airport management, for the provision of TFs in arrival area, with airport charges

No.	Arrival and baggage reclamation area	Airport charges (r)		
	Importance	Low	Moderate	High
1.	Information counter	0.286		
2.	Baggage reclaim display	0.106		
3.	Bus ticket counter	0.191		
4.	Café or restaurant	0.260		
5.	Cash machine	0.235		
6.	Left luggage counter	0.362		
7.	Lost and found counter	0.179		
8.	Automatic baggage handling carousels			0.748
9.	Seating	0.257		
10.	Convenience shop	0.118		
11.	Product promotional area	0.178		
12.	Taxi counter	0.174		
13.	Trolleys	0.267		

A separate set of results is shown in Table 8.10 as the relationship between TF provision and capital investment. Table 8.10 shows the TFs ranking by managers and executives, if capital investment were reduced. It is clear that the respondents selected capital investment as being an important variable to measure the willingness to trade-off between the provision of TFs and capital investment. Facilities such as café and restaurant, lost and found, product promotional area and trolleys have a low correlation with reduction of capital investment, as the r values show that these are positively correlated at 0.333, 0.369, 0.021 and 0.122, respectively. This means that these facilities: café or restaurant, lost and found counter, product promotional area and trolleys are of less significance in reducing capital investment for arrival hall facilities.

In addition, other facilities such as information counter (-0.327), bus counter (-0.089), left luggage counter (-0.218), seating (-0.179), convenience shop (-0.168) and taxi counter (-0.129) are less significant as it has been shown that these facilities are negatively correlated and have less impact on the structure of capital investment, where the results show that r-values are close to 0. The exclusion of these facilities has less impact on capital investment for LCT design.

Table 8.10 Correlation of preferences, by airport management, for the provision of TFs in arrival area, with capital investment

No.	Arrival and baggage reclamation area	Capital investment (r)		
	Importance	Low	Moderate	High
1.	Information counter	-0.327		
2.	Baggage reclaim display		-0.534	
3.	Bus counter	-0.089		
4.	Café or restaurant	0.333		
5.	Cash machine		-0.414	
6.	Left luggage counter	-0.218		
7.	Lost and found counter	0.369		
8.	No. of automatic baggage handling carousels			0.614
9.	Seating	-0.179		
10.	Convenience shop	-0.168		
11.	Product promotional area	0.021		
12.	Taxi counter	-0.129		
13.	Trolleys	0.122		

Table 8.11 shows the statistical correlation between the views of managers and executives on the relationship between TFs and operational costs, within the baggage reclamation and arrival halls. There were low correlations between the rankings of the baggage reclaim display (0.247) while Table 8.11 shows the Spearman Rho coefficient. The remaining facilities that have been evaluated show a negative correlation as the facilities have little influence, as the r values are close to 0.0. Noting the café or restaurant (0.432) in the arrivals hall, as an example, moderate correlation exists which can be interpreted as being a facility of moderate importance.

The other results show that there is a low correlation of the following facilities: information counter (-0.228), bus counter (-0.036), cash machine (-0.034), left luggage counter (-0.149), seating (-0.257), convenience shop (-0.251), product promotional area (-0.277), taxi counter (-0.267) and trolleys (-0.257), as the r values were close to 0.0.

Except for the café or restaurant (0.862), the responses of the airport management show that they have a lower preference on the availability of these facilities (Table 8.12) as a means of increasing airport revenue. As far airport revenue is concerned, there was a weak correlation between the other TFs [i.e. information counter (0.200)] and airport revenue regardless of managers and executives preferences, where most of the r values are negatively low correlated and close to 0.

Table 8.11 Correlation of preferences, by airport management, for the provision of TFs in arrival area, with operational costs

No.	Arrival and baggage reclamation area	Operational cost (r)		
	Importance	Low	Moderate	High
1.	Information counter	-0.228		
2.	Baggage reclaim display	0.247		
3.	Bus counter	-0.036		
4.	Café or restaurant		0.432	
5.	Cash machine	-0.034		
6.	Left luggage counter	-0.149		
7.	Lost and found counter		0.580	
8.	No. of automatic baggage handling carousels			0.783
9.	Seating	-0.257		
10.	Convenience shop	-0.251		
11.	Product promotional area	-0.277		
12.	Taxi counter	-0.267		
13.	Trolleys	-0.257		

In conclusion, most of TFs that have been evaluated showed little relationship with the cost and revenue structures as most of the r values are close to 0.0.

8.6.4 Flexibility effect on preference of airport management for other TFs as part of LCT design

The evaluation of other TFs considered the following facilities as being basic TFs to be included within LCT design: air conditioning, way-finding, baby changing facilities, disabled facilities, flight information display system (FIDS), information counter, prayer room, public telephone, public waiting area, smoking area, staff restroom and toilet. Linked to the preferences of airport managers and executives and the relationship between other facilities and airport charges (Table 8.13), the results show that air conditioning (-0.558) is of negative moderate correlation, as the results show an r value closer to 1 ($r>1.00$). By interpretation, the provision of these TFs are seen as less necessary by managers and executives, if a reduction of airport charges is applied. Except for the staff restroom (0.200), Table 8.13 also shows negative weak correlations for these following facilities: airport way-finding (-0.221), baby changing facilities (-0.249), disabled facilities (-0.347), FIDS (-0.214), information counter (-0.371), prayer room (-0.073), public phone (-0.215), public waiting area (-0.105), smoking area (-0.277) and toilet (-0.369). It can be assumed that the provision of these TFs have a lower priority by the managers and executives, with a reduction in airport charges.

Table 8.12 Correlation of preferences, by airport management, for the provision of TFs in arrival area, with airport revenues

No.	Arrival and baggage reclamation area	Airport revenues (r)		
	Importance	Low	Moderate	High
1.	Information counter	0.200		
2.	Baggage reclaim display	-0.172		
3.	Bus counter	-0.151		
4.	Café or restaurant			0.862
5.	Cash machine	-0.218		
6.	Left luggage counter	-0.267		
7.	Lost and found counter	-0.271		
8.	No. of automatic baggage handling carousels	-0.119		
9.	Seating area	0.313		
10.	Convenience shop		0.467	
11.	Product promotional area	0.050		
12.	Taxi counter	-0.050		
13.	Trolleys	-0.267		

Table 8.14 also shows the other TFs and their relationship with capital investment. Air conditioning (-0.163), airport way-finding (-0.158), baby changing facilities (-0.267), FIDS (-0.340), public waiting area (-0.311), smoking area (-0.213) and toilets (-0.017) are negatively correlated as the r-values are close to 0. From Table 8.14, it is clear that airport management have selected capital investment as being an important variable to measure the willingness to trade-off the provision of TFs. Furthermore, there are less important TFs that have been also evaluated, such as the disabled facilities, information counter, prayer room, public telephone and staff restroom. These show 0.335, 0.083, 0.050, 0.096 and 0.165 positive r values, respectively. This can be interpreted that these facilities are less important in reducing capital investment.

The discussion continues on the statistical evaluation between the preferences of TFs and operational costs. Table 8.15 shows that a statistical correlation exists between the viewpoints of managers and executives. Except for airport way-finding (0.018) and baby changing facilities (0.058), most of the TFs are negatively correlated with capital investment cost. This shows that the disabled facilities (-0.228), FIDS (-0.231), information counter (-0.035), prayer room (-0.299), public telephone (-0.192), public waiting area (-0.240), smoking area (-0.277) and staff restroom (-0.253) have a low correlation with operational costs, as the r-values are close to 0. These facilities were less preferred to be included in LCT design. However, air conditioning and toilets are considered as moderately correlated to operational costs as the result of these facilities appears as 0.431 and 0.449, respectively.

Table 8.13 Correlation of preferences, by airport management, for the provision of other TFs, with airport charges

No.	Terminal Facilities	Airport charges (r)		
	Importance	Low	Moderate	High
1.	Air conditioning		-0.558	
2.	Way-finding	-0.221		
3.	Baby changing facilities	-0.249		
4.	Disabled facilities	-0.347		
5.	FIDS	-0.214		
6.	Information counter	-0.371		
7.	Prayer room	-0.073		
8.	Public telephone	-0.215		
9.	Public waiting area	-0.105		
10.	Smoking area	-0.277		
11.	Staff restroom	0.200		
12.	Toilets	-0.369		

Table 8.14 Correlation of preferences, by airport management, for the provision of other TFs, with capital investment cost

No.	Terminal Facilities	Capital investment (r)		
	Importance	Low	Moderate	High
1.	Air conditioning	-0.163		
2.	Airport way-finding	-0.158		
3.	Baby changing facilities	-0.267		
4.	Disabled facilities	0.335		
5.	FIDS	-0.340		
6.	Information counter	0.083		
7.	Prayer room	0.050		
8.	Public telephone	0.096		
9.	Public waiting area	-0.311		
10.	Smoking area	-0.213		
11.	Staff restroom	0.165		
12.	Toilets	-0.017		

Table 8.15 Correlation of preferences, by airport management, for the provision of other TFs, with operational costs

No.	Terminal Facilities	Operational cost (r)		
	Importance	Low	Moderate	High
1.	Air conditioning		0.431	
2.	Airport way-finding	0.018		
3.	Baby changing facilities	0.058		
4.	Disabled facilities	-0.228		
5.	FIDS	-0.231		
6.	Information counter	-0.035		
7.	Prayer room	-0.299		
8.	Public telephone	-0.192		
9.	Public waiting area	-0.240		
10.	Smoking area	-0.277		
11.	Staff restroom	-0.253		
12.	Toilets		0.449	

As shown in Table 8.16, there are noticeable changes in the ranking of airport revenue and other TFs, as there are weak correlations in the overall provision of TFs regardless of which managers and executives choose, while Table 8.16 shows low Spearman Rho coefficients. Airport management expectations are broadly similar in their preferences of TFs for increasing airport revenues. Most of the facilities that have been evaluated are related to terminal convenience, as they do not directly contribute to airport revenue.

To summarise, analysis of managers and executives' survey responses indicated that most of the facilities do not significantly influence the inclusion or provision of other TFs within the design. It should be noted that other facilities and their association with airport revenues, as an example, the availability of these facilities does not significantly increase airport revenues and can be classified as being primarily for passenger convenience.

8.7 Selection of core and secondary facilities for LCT design model based on airport management preferences

As referred to Chapter 5, Section 5.6.2, the following hypotheses[200] were developed to achieve the research objectives:

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[200] Basic understanding from the published article: 'The Effect of Brand, Agent and Price on Consumer Evaluation of Travel Services, Ainscough (2005).

1. **Null Hypothesis (Ho):** Preferences for the TFs used in LCT design are considered as secondary, less significant from the managers and executives' point of view, indirect effect on the structure of cost and revenue structures [201].
2. **Alternative Hypothesis (H_1):** Preferences for the TFs used in LCT design are considered as core, highly significant from the managers and executives' point of view, direct effect on the cost and revenue structures[202]

Table 8.16 Correlation of preferences, by airport management, for the provision of other TFs, with airport revenues

No.	Terminal Facilities	Airport revenue (r)		
	Importance	Low	Moderate	High
1.	Air conditioning	-0.150		
2.	Airport way findings	-0.036		
3.	Baby changing facilities	-0.095		
4.	Disabled facilities	-0.165		
5.	FIDS	-0.343		
6.	Information counter	-0.166		
7.	Prayer room	-0.320		
8.	Public telephone	-0.178		
9.	Public waiting area	-0.178		
10.	Smoking area	-0.311		
11.	Staff restroom	-0.218		
12.	Toilets	-0.057		

To reduce airport charges, Figure 8.8 and Table 8.17 show airport management responses to service processing facilities (check-in before going through immigration and security). Noting self service check-in (0.025) and a sufficient number of check-in counters (0.004) as examples, these facilities are considered to be core TFs for LCT design after the results show significant values of less than 0.05 ($r<0.05$). The remaining facilities, such as airline office (0.717) and product promotional area (0.211), are considered as secondary facilities after the r values show a significant alpha of more than 0.05 ($r>0.05$), thereby, the null hypothesis is accepted. Also, airline ticketing counter (0.607), bureau de change (0.051), cash machine (0.076), FIDS (0.540), hand

201 The secondary facilities are included if test results show that the ρ value is more than 0.05 ($\rho>0.05$). The TFs are identified as the least important facilities. There is a less significant difference between managers and executives' preferences on the provision of TFs at check-in, departure lounge and arrival areas and cost and revenue structures.

202 The core facilities are included if results show that the ρ value is less than 0.05 ($\rho<0.05$). The TFs are identified as the most important facilities. There is a highly significant difference between managers and executives' preferences on the provision of TFs at check-in, departure lounge and arrival areas and cost and revenue structures.

baggage check-in (0.376), seating (0.088), convenience shop (0.440), television (0.943) and trolleys (1.000) are considered as secondary facilities.

In terms of capital investment, self-service check-in kiosks (0.031) are highly relevant to be included within LCT design. Also shown in Figure 8.8, discussion on the design of adequate TFs continues as the results show that the following: airline office (0.120) and product promotional area (0.070) are not significant at r-values of more than 0.05, and in the same Figure, discussion on the design of adequate TFs continues after the results show that airline ticketing counters (0.607), bureau de change (0.679), café or restaurants (0.425) and cash machines (0.076) are also less significant at r-values of more than 0.05 (r>0.05). Therefore, these facilities are considered to be secondary facilities for LCT design.

With regards the check-in facilities and operational charges, except manual check-in (0.039) and self-service check-in (0.005), none of these facilities are highly significant as the r-values are more than 0.05. Most of the TFs are rated as secondary facilities. Finally, Figure 8.8 also shows that in association of the check-in facilities and airport revenue, apart from the bureau de change (0.025) and café or restaurant (0.008), the rest of the TFs are less significant at r-values of 0.05. The results show that those facilities are seen as less important in increasing LCT airport revenue.

In departure lounge area (Figure 8.9 and Table 8.18), airport managers and executives show their preferences for the availability of airline boarding counters, airline boarding pass control machines, airline shop, contact stands, bureau de change, café or restaurants, cash machine, seating in the departure area, convenience shop, product promotional area, smoking area and television to be included in the terminal design. For the association of departure lounge facilities and airport revenue, except for bureau de change (0.038) and cash machine (0.008), the remaining facilities are ranked as secondary facilities as the r-values are more than 0.05. Figure 8.9 and Table 8.19 show that the association between the availability of contact stands and airport revenues is not considered as being a primary facility for LCT design, as the result shows r-values of more than 0.05 (r>0.05). However, the availability of contact stands is highly significant due to an interest in reducing the airport charges (0.003), as the availability of contact stands is more applicable to LCT design. However, in the relationship of capital investment and operational charges and departure lounge facilities, most of the facilities are also considered as secondary facilities.

Within the baggage reclamation area (Table 8.19 and Figure 8.10), from the survey of managers and executives' expectations, they were more interested in having additional automatic baggage handling carousels, as the r-value results of 0.044 and 0.038 show in their relationship of airport charges and operational costs, respectively. This may be because the numbers of automatic baggage carousels are limited in the current LCT design. Also, by having an association with airport revenues, the availability of this facility has significant r values of 0.529, which is more than 0.050. The result indicates acceptance of the null hypothesis because there is a less significant relationship between airport revenues and the number of automatic baggage handling carousels in the LCT design. Other facilities that have been evaluated are ranked as secondary facilities within the LCT design.

Table 8.17 Core and secondary facilities in check-in area

	Check-in Area (r)	Airport charges	Capital Investment	Operational charges	Airport revenue
1.	Airline office	0.717	0.120	1.000	0.829
2.	Product promotional area	0.211	0.070	0.876	0.112
3.	Airline ticketing counter	0.607	0.607	0.880	0.070
4.	Bureau de change	0.051	0.679	0.107	0.025
5.	Café or restaurant	0.259	0.425	0.866	0.008
6.	Cash machine	0.076	0.076	1.000	0.221
7.	FIDS	0.540	0.461	0.093	0.888
8.	Hand baggage check-in	0.376	0.604	0.404	0.617
9.	No. manual check-in desk	0.004	0.127	0.039	0.406
10.	Seating	0.088	0.083	0.683	0.320
11.	Self-service check-in	0.025	0.031	0.005	0.240
12.	Convenience shop	0.440	0.440	0.150	0.134
13.	Television	0.943	0.210	0.894	0.310
14.	Trolleys	1.000	0.564	0.340	0.264

The survey continued to investigate the evaluation of other TFs (Figure 8.11 and Table 8.20) regardless of the group of managers and executives expectations on their preferences of LCT design. Most of the facilities that have been evaluated can be classified as secondary facilities as the results show that the null hypothesis has been rejected at a r value 0.05 of significant alpha ($r<0.05$). Noting air conditioning as an example, the availability of this facility is rejected as the results shows r-values 0.196, 0.528 and 0.150 respectively with its relationship with the airport charges, capital investment and operational costs. In addition, the availability of air conditioning has a low significant influence on airport revenue (0.562), although the passengers are particularly demanding this for their convenience, while waiting to board their flights.

8.8 Summary

The survey captured the perception of airport management who have a role as decision makers for the current LCT. The analyses (Table 8.21) confirmed that airport management agreed that a reduction in airport charges could be possibly reduced if only the basic TFs were included in LCT design. Despite that, in the context of the landing charges, a minority of managers strongly disagreed on the reduction of landing charges for LCT operations.

In fact, the introduction of LCT specific facilities will not be able to significantly reduce capital investment through downgrading (Table 8.22). In contrast, the development of a new terminal based on LCT design was accepted. This may lead to the viewpoint that

LCT development will cost less than the capital investment required to reconstruct the existing terminals to LCT standards. In a different analysis (Table 8.23), the adoption of basic LCT facilities will not increase efficiency as the airport is currently facing the problems of the congestion, mostly, in peak hours.

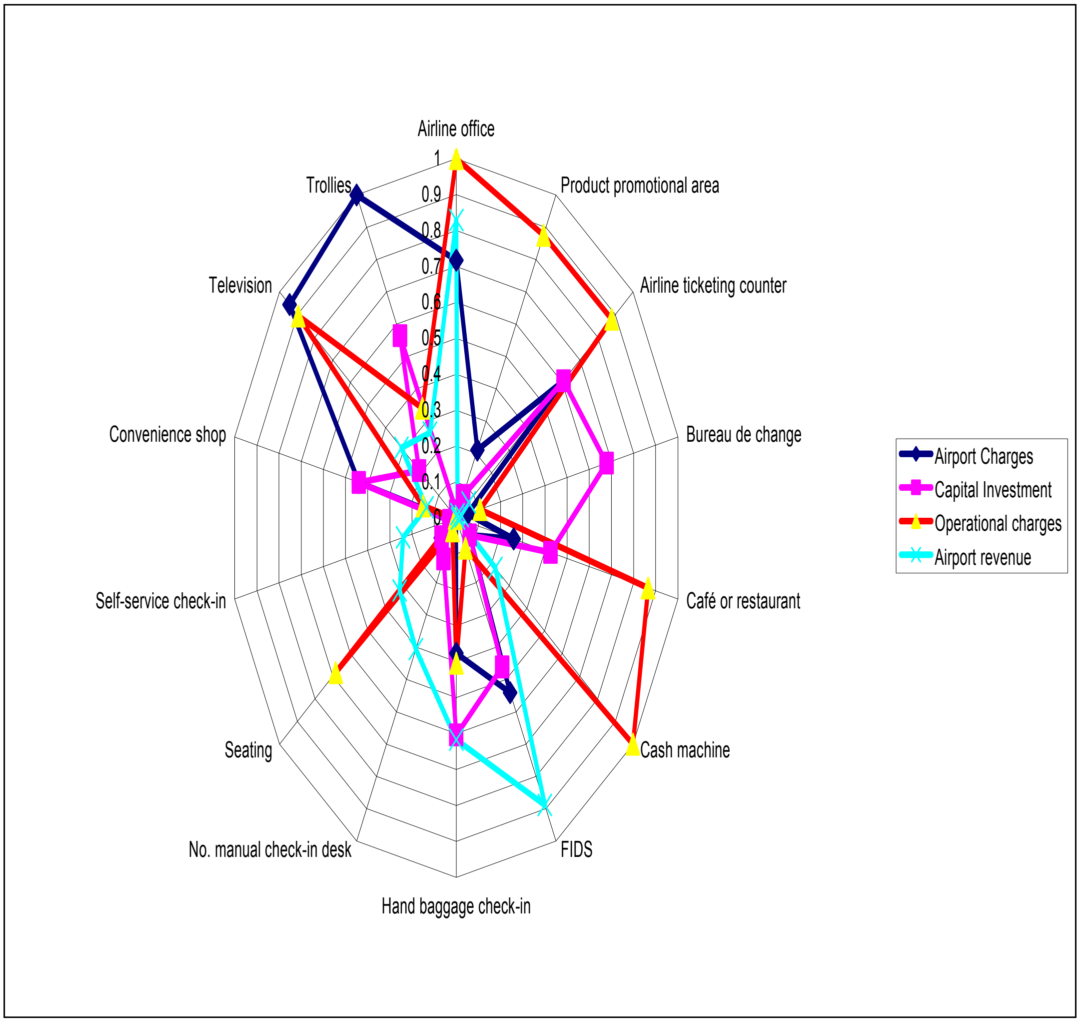

Figure 8.8 Core and secondary facilities in check-in area

Table 8.18 Core and secondary facilities in departure area

	Departure Lounge	Airport charges	Capital investment	Operational charges	Airport revenue
1.	Airline boarding counter	0.107	0.092	0.690	0.170
2.	Airline boarding pass control machine	0.218	0.640	0.174	0.640
3.	Airline shop	0.275	0.178	0.892	0.118
4.	Contact stand	0.003	0.203	0.500	0.408
5.	Bureau de change	0.133	0.153	0.947	0.038
6.	Café or restaurant	0.143	0.932	0.111	0.475
7.	Cash machine	0.175	0.153	0.159	0.008
8.	Seating	0.896	0.092	0.136	0.504
9.	Convenience shop	0.124	0.239	0.415	0.465
10.	Product promotional area	0.360	0.177	0.540	0.075
11.	Smoking area	0.504	0.091	0.071	0.371
12.	Television	1.000	0.264	0.376	0.194

Table 8.19 Core and secondary facilities in baggage reclaim and arrival hall area

	Baggage Reclaim and Arrival Hall	Airport charges	Capital investment	Operational charges	Airport revenue
1.	Airline information counter	0.415	0.076	0.465	0.259
2.	Airline lost and found counter	0.376	0.943	0.778	0.209
3.	Baggage reclaim display	0.325	0.110	0.111	0.659
4.	Bus counter	0.460	0.730	0.890	0.559
5.	Café or restaurant	0.315	0.291	0.947	0.029
6.	Cash machine	0.363	0.109	0.895	0.302
7.	Left luggage counter	0.161	0.398	0.564	0.294
8.	Lost and found counter	0.488	0.153	0.480	0.644
9.	Number of automatic baggage handling carousels	0.044	0.016	0.038	0.529
10.	Seating area	0.302	0.564	0.320	0.226
11.	Shop	0.646	0.514	0.330	0.302
12.	Product promotional area	0.490	0.936	0.283	0.846
13.	Taxi counter	0.501	0.616	0.302	0.848
14.	Trolleys	0.302	0.637	0.320	0.302

Table 8.20 Core and secondary other facilities for LCT design

	General area	Airport charges	Capital investment	Operational charges	Airport revenue
1.	Air conditioning	0.196	0.528	0.150	0.562
2.	Airport way-finding	0.391	0.540	0.944	0.890
3.	Baby changing facilities	0.335	0.302	0.823	0.712
4.	Disabled facilities	0.796	0.194	0.890	0.522
5.	FIDS	0.123	0.114	0.500	0.239
6.	Information counter	0.184	0.748	0.839	0.229
7.	Prayer room	0.778	0.846	0.247	0.215
8.	Public Phone	0.108	0.709	0.456	0.490
9.	Public waiting area	0.683	0.229	0.353	0.490
10.	Smoking area	0.226	0.303	0.303	0.130
11.	Toilet	0.153	0.947	0.564	0.825
12.	Baggage trolley	1.000	0.709	0.890	0.398

Figure 8.9 Core and secondary facilities in departure lounge area

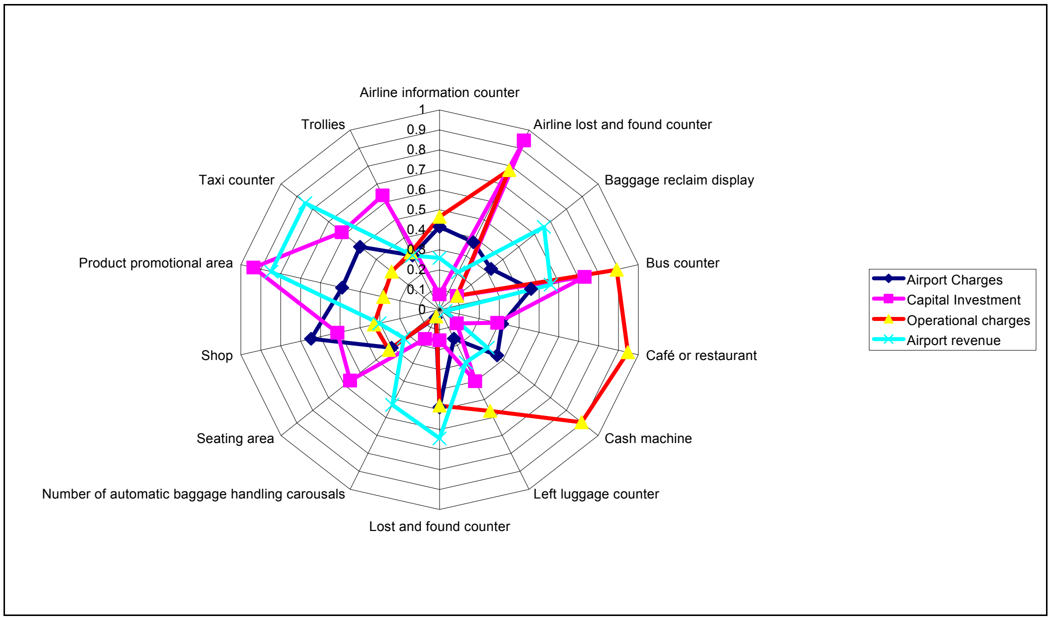

Figure 8.10 Core and secondary facilities in baggage reclaim and arrival hall area

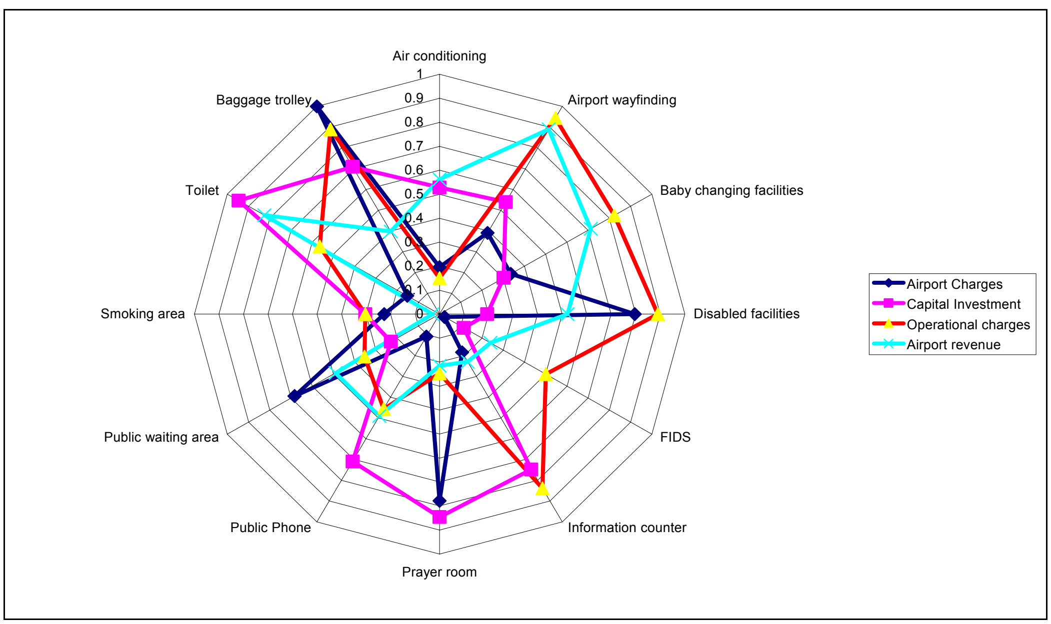

Figure 8.11 Core and secondary other facilities for LCT design

In Section 8.6, the preferences of airport management for TFs, from the point of view of cost (airport charges, investment cost, and operational cost) and revenue structures (airport revenue), was evaluated. Most of the tests indicated that there is little correlation of association with the provision of TFs and cost and revenue airport structures, which indicates that the preferences of airport management are broadly similar. Therefore, the availability of those facilities such as check-in, boarding and arrival are important in order to increase the efficiency of LCT design.

The analysis continued to determine those primary and secondary TFs proposed for the TFs model guidelines based on airport management preferences (Section 8.7). For example, self-service check-in and a sufficient number of manual check-in counters were considered to be core facilities for the check-in area, after the results gave r values of 0.025 and 0.004, respectively which is significant at $r < 0.05$. In the boarding area, the relationship between the availability of contact stands and airport charges is significantly important as there was a r values of less than 0.05 ($r = 0.003$). This confirmed that the availability of contact stands to reduce airport charges is an important feature of LCT design. Furthermore, the results show that a sufficient number of automatic baggage handling carousels is also important as the survey results give r values of 0.044 and 0.038, respectively, in their relationship towards the airport charges and operational cost. Finally, most of the other facilities can be classified as being secondary as the results show that the r value is more than 0.05 ($r > 0.05$).

The analysis also showed that the viewpoints of the managers and executives of the airport are important as they have an established role as decision makers in LCT development. Therefore, the survey was highly significant to airport designers as the results apparently give reasonable guidance to justify the TFs to be included for LCT design.

Table 8.21 Frequency analyses of airport charges and the provision of TFs

No.	Airport Charges	Neither agree or disagree		Agree		Strongly agree	
		Managers	Executives	Managers	Executives	Managers	Executives
1.	Landing charge	3	0	1	2	0	0
2.	Passenger service charges (PSCs)	2	2	4	0	5	2
3.	Terminal navigation charges	4	0	1	0	3	4
4.	Airbridge charges	4	0	3	1	0	1
5.	Parking charges	3	0	4	2	2	0
6.	Ground handling charges	7	0	2	2	3	2
7.	Government taxes	3	0	9	4	0	0
8.	Office and administration charges	7	2	2	2	1	0

Table 8.22 Frequency analyses of capital investment and the provision of TFs

No.	Airport Charges	Neither agree or disagree		Agree		Strongly agree	
		Managers	Executives	Managers	Executives	Managers	Executives
1.	Reduction of capital investment cost through development of new terminal	2	0	3	1	3	3
2.	Reduction of capital investment by simplifying TFs	3	0	3	2	4	2
3.	Reduction of capital investment by downgrading TFs	8	1	0	1	1	0

Table 8.23 Frequency analyses of operating costs and the provision of TFs

No.	Airport Charges	Neither agree or disagree		Agree		Strongly agree	
		Managers	Executives	Managers	Executives	Managers	Executives
1.	Introduction of only basic TFs would bring increased efficiency in terminal area, mostly during peak hours	2	0	3	2	3	2
2.	Reduction of operating cost through minimising operational processes in LCT activities	8	1	1	0	3	3
3.	Reduction of operating cost through minimising labour costs	0	0	7	4	0	0
4.	Reduction of operating cost through introduction of advanced technologies such as self-service check-in kiosks	8	3	4	1	0	0

Table 8.24 Frequency analyses of airport revenue and the provision of TFs

No.	Airport Charges	Neither agree or disagree		Agree		Strongly agree	
		Managers	Executives	Managers	Executives	Managers	Executives
1.	Introduction of only basic TFs will increase passenger traffic in LCT	4	0	3	1	5	3
2.	Potential increase in airport revenue by commercial activities introduced at LCT area	2	0	3	2	3	2
3.	Consider permanent space for commercial activities	8	1	1	0	3	3
4.	Consider temporary space for commercial activities	0	0	7	4	0	0
5.	Convert 'luxury' TFs to commercial facilities	8	3	4	1	0	0

CHAPTER 9

9 Conclusions and Recommendations

9.1 Introduction

The aim of the research was to study the provision of TFs focusing on the selection of core and secondary facilities within LCT design. The selection of the 'right' TFs is based on the relationship between the provision of specific TFs and cost and revenue structures. The research under takes an in-depth study into the evaluation of TFs provision for LCT design with the intention of reducing TFs' capital investment and operational costs, and airport charges. These objectives and sub-objectives were summarised in Chapter 1, Section 1.4.

Demographic information was collected through questionnaires in order to ascertain the population's composition, demographic background, and the preferences of airline management and passengers on TFs. Conflicts of interest between passengers, airline management and airport operator were measured by using the price elasticity dynamic which indicates the cost and revenue structures and provision of specific TFs within LCT design. Therefore, the hypothesis developed was that there exist different interests in the provision of specific TFs within LCT design after taking into account cost and revenue structures, and the perceptions of passengers, airline management and airport operators.

9.2 Conflicting interests of passengers, airline and airport management on terminal facilities (TFs) for LCT design

9.2.1 Passengers' expectation for TFs in LCT design

In the pre-development survey, the preferences of Air Asia passengers were examined in terms of their expectation for specific facilities to be included in the LCT design.

Check-in area (Chapter 6, Section 6.5.1)

- The following facilities were examined: FIDS, way-finding, seating, self-service check-in, number of check-in desks, fast track, no-baggage check-in, pre-departure check-in and trolleys. The results showed that business passengers agreed that FIDS (11.4%) and seating (9.7%) were the most important facilities.
- Leisure passengers' preferences were also worthwhile considering. Seating at the check-in area was important for 30% of the leisure passengers who indicated that these facilities should be included as part of LCT design. Experience of long queues and delays at check-in have created a demand for seating.
- The post development survey showed that FIDS, way-finding, self-service check-in, a suitable number of manual check-in counters and trolleys were

available at KLIA LCT. However, fast track and no-baggage check-in, and pre-departure check-in were unavailable.

Boarding area (Chapter 6, Section 6.5.2)

- FIDS, seating area, baby changing facilities, disabled facilities, rest area, shower facilities, children's play area, toilets, prayer room and smoking lounge were examined.
- Toilets were rated as the most important facility, 6.6% of business passengers indicated toilet facilities as being most needed. The number of toilets available for passengers is currently limited due to space constraints. Leisure passengers indicated that FIDS (16.9%) and prayer rooms (20.9%) were rated as being of high importance and therefore these facilities should be available.
- Baby changing facilities and prayer rooms are shared between arrival and departure areas. However, the following TFs were not available in the current KLIA LCT: rest area, shower and children's play area. The unavailability of these facilities is highly influenced by space limitations as the development of KLIA LCT is oriented more towards operational expediency rather than passenger convenience.

Baggage reclamation and arrival hall (Chapter 6, Section 6.5.3)

- The number of baggage reclaim carousels, left luggage counter, lost and found counter, toilets and baggage information display were examined.
- Business passengers showed a high preference for left luggage and leisure passengers were interested in having similar facilities
- All of the facilities are included in the current KLIA LCT design.

Commercial Area (Chapter 6, Section 6.5.4)

- The survey showed that facilities such as seating, internet, telephone, bureau de change, cash machine, self-vending machines, food and beverage (F&B), duty free shops and post office need to be included as part of LCT design.
- About 8.9% of business passengers indicated their need for seating in the commercial area of departure lounges. Simplified concepts such as take-away food or self-vending machines should also be considered. It is also interesting to note that leisure passengers showed similar preferences.
- Also worth noting is that seating, telephone, cash machine, food and beverage, and duty free shop are included in the current terminal design. However, the remaining facilities, internet, bureau de change, self-vending machine and post office are not yet available in the LCT area. Thus, the provision of specific TFs should be considered as an opportunity to increase airport commercial revenues.

9.2.2 Responses towards cross-price elasticity dynamics and flexibility effect on preferences of passengers for TFs from change in airfare

i. The results from the two passenger surveys (pre- and post-development) conducted at KLIA, were analysed to examine the needs of business and leisure travellers using KLIA LCT. As the literature review shows, air fares were used as an indicator of both business and leisure passengers' preferences towards the inclusion of specific TFs into LCT design.

ii. The surveys supported the view that air fares can be used to determine the adequacy of TFs provision within LCT design. The first survey was undertaken in order to explore the importance of TFs provision to be included in the LCT design. The second survey indicated that there is a significant relationship between the provision of TFs, and cost and revenue structures. Tables 9.1 to 9.4 summarise the cross-price elasticity and flexibility effect on passengers' preferences for TFs from change in fares; and make comparisons between the 'expected LCT' and the current LCT at KLIA.

iii. In the check-in area, the self-service check-in counters were identified as of high importance in LCT design. The results showed that business passengers preferred to have this facility located at KLIA LCT. Leisure passengers also shared the same preferences towards the availability of check-in counters. Business passengers show less preference on shop, way-finding, cash machine and smoking area. Baby changing facilities, disabled facilities, toilet, television and product promotional area were seen as less necessary to be included into LCT design.

iv. Business passenger survey results confirmed that air conditioning and internet should be included in the departure area.

v. For the arrival and baggage reclamation areas, business passengers showed an interest in information counters. However, baggage reclaim signage, baby changing facilities, and disabled facilities were of high importance for leisure passengers.

Table 9.1 Summary of the cross-price elasticity and flexibility effect on passenger's preferences for TFs, and change in air-fare, in the check-in area

		Business				Leisure				
	Terminal Facilities	**No-change**	**-10%**	**-20%**	**-30%**	**No-change**	**-10%**	**-20%**	**-30%**	**KLIA LCT**
1	**Self-service check-in kiosks**	***	***	***	***	***	**	**	***	√
2	**Shops**	*	*	*	*	*	*	*	**	√
3	**Café or restaurant**	***	*	*	*	*	*	**	***	√
4	**FIDS**	*	***	*	**	***	*	*	**	√
5	**Way-finding**	*	*	*	*	*	*	*	*	√
6	**Manual check-in counter**	***	***	***	**	***	***	***	*	√
7	**Airport Information counter**	***	***	*	**	***	***	***	*	√
8	**Baggage trolleys**	***	*	*	*	***	**	***	*	√
9	**Seating**	*	***	***	**	***	***	**	*	√
10	**Cash machine**	*	*	*	*	***	*	***	*	**Shared**
11	**BDC**	*	***	**	**	***	***	**	*	**Shared**
12	**Smoking area**	*	*	*	*	**	***	*	*	√
13	**Baby changing facilities**					*	*	*	*	**Shared**
14	**Disabled facilities**					*	*	*	*	**Shared**
15	**Toilets**	*	*	**	*	*	*	*	*	√
16	**Prayer room**	***	*	*	**	*	***	***	*	**Shared**
17	**Television**	***	**	*	**	*	*	*	*	√
18	**Product promotional area**	**	*	*	*	*	*	*	*	√
19	**Airline ticketing counter**	**	*	***	***	***	**	***	*	√
20	**Telephone**	***	*	**	***	*	***	**	*	√
21	**Air conditioning**	**	*	*	**	***	***	**	*	√

*	Low importance, business	*	Low importance, leisure
**	Moderate importance, business	**	Moderate importance, leisure
***	High importance, business	***	High importance, leisure
	No preferences		

Table 9.2 Summary of the cross-price elasticity and flexibility effect on passenger's preferences for TFs, and change in fare, in the departure lounge

	Terminal Facilities	Business				Leisure				KLIA LCT
		No-change	-10%	-20%	-30%	No-change	-10%	-20%	-30%	
1	Self-vending machine	**	**	*	*	***	***	**	*	√
2	Shops	**	*	**	*	***	*	**	**	√
3	Café or restaurant	***	*	**	***	***	*	**	**	√
4	FIDS	**	***	*	*	*	**	*	*	√
5	Way-finding	*	*	*	*	*	*	*	*	√
6	Information board	*	***	*	*	*	**	*	*	√
7	Product promotional area	*	**	*	*	**	*	*	*	√
8	Seating	*	*	*	***	***	***	***	***	√
9	Cash machine	*	**	*	**	***	*	*	*	√
10	BDC	***	***	**	*	***	*	*	*	√
11	Smoking area	**	**	*	*	***	**	**	*	√
12	Baby changing facilities					***	***	***	**	√
13	Disabled facilities					***	***	***	**	√
14	Toilets	***	***	*	***	***	**	*	*	√
15	Prayer Room	**	**	*	*	*	**	*	*	√
16	Public Phone	**	*	*	*	*	*	*	*	√
17	Television	**	*	**	*	*	***	***	*	√
18	Air conditioning	**	**	***	**	**	***	***	***	√
19	Children plays area	*	*	*	*	***	**	*	**	√
20	Viewing deck	*	**	**	*	*	*	*	*	√
21	Internet	**	***	*	**	***	**	**	**	√

*	Low importance, business	*	Low importance, leisure
**	Moderate importance, business	**	Moderate importance, leisure
***	High importance, business	***	High importance, leisure
	No preferences		

Table 9.3 Summary of the cross-price elasticity and flexibility effect on passengers preferences for TFs, and change in fare, in the baggage reclaim and arrival halls

	Terminal Facilities	Business				Leisure				
		No-change	-10%	20%	30%	No-change	10%	20%	30%	KLIA LCT
1	Shops	***	*	*	*	***	**	**	**	√
2	Café or restaurant	*	*	*	*	*	*	*	*	√
3	FIDS	***	*	*	*	***	*	*	**	√
4	Baggage reclamation signage	***	***	***	**	***	***	**	***	√
5	Information desk	***	*	**	***	***	*	**	**	√
6	Self-vending machine	*	*	***	*	**	*	***	*	√
7	Trolleys	*	*	**	*	*	*	**	*	√
8	Seating	*	***	**	*	*	*	*	*	√
9	Left-luggage service	***	**	*	**	***	**	*	**	√
10	Cash machine	**	*	*	*	***	***	***	**	Shared
11	BDC	*	*	*	*	*	**	**	*	Shared
12	Lost and found counter	*	*	*	*	*	*	**	*	√
13	Baby changing facilities					***	***	**	***	Shared
14	Disabled facilities					***	***	***	***	Shared
15	Toilets	*	*	*	*	***	***	***	***	√
16	Prayer room	*	*	*	*	*	***	*	**	Shared
17	Telephone	*	*	*	*	*	*	*	**	√
18	Television	***	*	**	*	***	*	***	**	√
19	Air Conditioning	**	***	*	***	**	***	***	**	√
20	Taxi counter	***	*	*	*	***	***	*	**	√
21	Bus counter	*	*	*	**	*	*	*	**	√
22	Car hire counter	***	*	*	*	**	**	**	**	√
23	Hotel reservation counter	***	**	**	**	**	*	*	*	√

*	Low importance, business	*	Low importance, leisure
**	Moderate importance, business	**	Moderate importance leisure
***	High importance, business	***	High importance, leisure
	No preferences		

Table 9.4 Business and leisure passenger's preferences for high importance facilities, and changes in air fare

Air fare	Business passenger				Leisure passenger			
	No-change	-10%	-20%	-30%	No-change	-10%	-20%	-30%
Check-in	Manual check-in counter, self-service machine, café or restaurant, information counter, baggage trolley, prayer room, television and telephone	Manual check-in counter, self-service check-in machine, FIDS, information counter, seating and bureau de change	Manual check-in counter, self-service check-in counter, seating and airline ticketing counter	Airline ticketing counter, self-service check-in machine, telephone	Self- service check-in machine, FIDS, manual check-in, airport information counter, trolleys, seating, cash machine, bureau de change, ticketing counter and air conditioning	Manual check-in counter, Information counter, seating, bureau de change, prayer room, telephone and air conditioning	Manual check-in counter, information counter, trolleys, cash machine, prayer room and airline ticketing counter	Self-service check-in machine and café or restaurant
Departure Lounge	Café or restaurant, bureau de change, toilets and prayer room	FIDS, information board, bureau de change, toilet and internet	Toilet and air conditioning	Café or restaurant, seating and toilet	Self service vending machine, shop, café or restaurant, seating, cash machine, bureau de change, smoking area, baby changing facilities, disabled facilities, toilet, children's play area, air conditioning and internet	Self-vending machine, seating, baby changing facilities, disabled facilities, television and air conditioning	Seating, baby changing facilities, disabled facilities, television and air conditioning	Seating, air conditioning
Baggage reclamation area and arrival halls	Shop, FIDS, baggage reclamation signage, airline information desk, left luggage service, television, taxi counter, car hire counter, hotel reservation counter	Baggage reclamation signage, seating and air conditioning	Baggage reclamation signage and self-vending machine	Airline information desk and air conditioning	Shop, FIDS, baggage reclamation signage, airline information desk, left-luggage service, cash machine, baby changing facilities, disabled facilities, television, taxi counter and toilet	Baggage reclamation signage, cash machine, baby changing facilities, disabled facilities, toilet, prayer room, air conditioning and taxi counter	Self-vending machine, cash machine, disabled facilities, toilet, television and air conditioning	Baggage reclamation signage, baby changing facilities, disabled facilities and toilet

9.3 Airline Management Expectations

9.3.1 Demographic Background

Responses from Air Asia management and executives were collected from two series of surveys, pre- and post-development. In the pre-development survey, ten of the fifteen respondents come from managerial level and the remaining five from executive levels. In the post-development survey, 11 of the respondents were managers and the other 5 were executives. The discussion on the demographic background has been presented in Chapter 7, Section 7.4.

9.3.2 Airline preferences for TFs in LCT design

- **i.** Five of the managers and one executive preferred self-service kiosks in the check-in area. Four out of ten managers rated the following facilities as a 'very important': manual check-in and no baggage check-in. Two executives rated the following as most important: manual check-in counter, no baggage check-in and pre-departure check-in. The 'no baggage' check-in and pre-departure check in facilities are available in the current KLIA LCT (Chapter 7, Figure 7.4).
- **ii.** Six out of sixteen managers agreed that an airline shop should be included in the departure lounge area of the LCT design to generate new commercial revenues. This facility is currently available in the current KLIA LCT (Chapter 7, Figure 7.5).
- **iii.** Six managers and one executive indicated that the availability of contact stands for LCT design is important. In comparison, three out of five contact stands and air-bridges executive respondents indicated a preference for the availability of both. The use of contact stands for the embarkation and disembarkation of passengers was considered essential in reducing airport charges at the current KLIA LCT (Chapter 7, Figure 7.6).
- **iv.** The 'Lost and Found Property' counter and a suitable number of automatic baggage handling carousels were regarded as important in LCT design**,** six out of sixteen managers and executives consider them as 'most important' (Chapter 7, Figure 7.7).
- **v.** Five of sixteen managers and executives consider 'Information Counter' and air conditioning as 'most important' in LCT design. These facilities are currently available in the KLIA LCT (Chapter 7, Figure 7.8).

9.3.3 Responses to cross-price elasticity dynamics and the flexibility effect on preferences by airline management

i. The results from pre- and post-development surveys indicate that the views of the managers and executives of Air Asia are varied. Airport charges were used as an important variable to measure the willingness of airline management to trade-off the provision of specific TFs.

ii. Airport planners should always take into consideration the LCC's needs in the provision of TFs, these may vary from one LCC to another. Issues recognised as important to LCCs include a reduction in airport charges and minimising the turnaround time. Using Air Asia as an example, the interests of LCCs lie in reducing airport charges. As a result, basic TFs are a main factor in the establishment of LCTs in Southeast Asia region. Tables 9.5 and 9.6 illustrate the cross price elasticity dynamics and the flexibility effect of airline management's preferences.

iii. In the check-in area, the results confirmed that a sufficient number of manual check-in counters and self-service check-in kiosks were highly significant with the structure of airport charges.

iv. Seating should be allocated in the departure lounge as managers and executives expressed a high interest in this facility being included.

v. A sufficient number of baggage reclaim carousels should be included in LCT design, as the managers and executives show willingness to trade-off, if a reduction of airport charges were introduced.

vi. Disabled facilities and toilets are important to be included as the availability of these facilities is limited in the current LCT design.

Table 9.5 Cross-price elasticity dynamics and flexibility effect on airline management preferences for TFs, and change in airport charges

		Manager				Executive				
	Terminal Facilities	No change	-10%	-20%	-30%	No change	-10%	-20%	-30%	KLIA LCT
	Check-in									
1	Number of manual check-in counters	***	***	***	***	***	***	***	***	√
2	Hold baggage check-in	*	*	*	*	*	*	*	*	√
3	Airline office	***	***	*	*	**	*	*	*	√
4	Airline ticketing counter	***	*	*	*	***	*	*	*	√
5	Self-service check-in kiosks	***	***	**	***	**	***	***	***	√
	Departure Lounge									
1	Airline boarding counter	*	**	**	*	*	**	*	*	√
2	Airline shop	***	*	*	*	***	*	*	*	√
3	Boarding pass control machine	*	**	*	*	*	*	*	*	X
4	Air-bridge	***	**	**	*	***	***	**	*	X
5	Standing area	*	*	*	*	**	**	*	*	√
6	Seating	**	*	*	**	***	**	**	**	√

*	Low importance, managers	*	Low importance, executives
**	Moderate importance, managers	**	Moderate importance, executives
***	High importance, managers	***	High importance, executives

Table 9.6 Cross-price elasticity dynamics and flexibility effect on airline management preferences for TFs, and change in airport charges

		Manager				Executive				
	Terminal Facilities	No-change	-10%	-20%	-30%	No-change	-10%	-20%	-30%	KLIA LCT
	Baggage reclamation and arrival halls									
1	Baggage reclamation display	*	*	*	*	*	**	*	*	√
2	Number of baggage reclaim carousels	***	**	**	*	***	**	**	*	√
3	Lost and found counter	***	*	*	*	***	*	*	*	√
	Others									
1	Air conditioning	**	*	*	*	*	*	*	*	√
2	Disabled facilities	***	*	**	***	**	**	**	***	√
3	FIDS	*	*	*	*	*	*	*	*	√
4	Information counter	*	*	*	*	*	*	*	*	√
5	Way-finding	**	*	*	*	*	**	*	*	√
6	Café or restaurant	*	*	*	*	*	*	*	*	√
7	Product promotional area	*	*	*	*	*	**	*	*	√
8	Toilets	***	**	**	***	**	**	**	**	√

*	Low importance, managers	*	Low importance, executives
**	Moderate importance, managers	**	Moderate importance, executives
***	High importance, managers	***	High importance, executives

9.4 Airport Management Expectations

9.4.1 Demographic Background

The ratio of airport managers and executives from Malaysia Airport Holding Berhad (MAHB) participating in the survey was 3:1 managers and executives, respectively. Most of them were experienced, with more than 5 years work experience in airport planning and development. This has been discussed in Chapter 8, Section 8.4.

9.4.2 Relationship between cost and revenue structures, and the provision of TFs

i. The results confirmed that cost and revenue structures are influenced by the selection and provision of LCT facilities. Noting the passenger service charges (PSC) (Chapter 8, Figure 8.4) as an example, seven out of sixteen responses received indicated that both managers and executives prefer to have a reduction of airport charges at KLIA LCT. The fee structures for aeronautical charges, such as passenger service, should be revised with regards to the basic TFs included in LCT design.

ii. Noteworthy is the fee structure at KLIA LCT. For example, the aeronautical charges for the LCT are almost 40% of that charged at the main terminal. At the former, the international passenger service charges (PSC) were reduced from RM45 to RM15.

iii. Airport charges are divided into two, variable and fixed. The variable charges can be negotiated between LCCs and airports, and these charges can be used as an incentive to stimulate traffic, as well as to encourage new carriers. Airport charges, such as airport security, are fixed charges as they are levied and are normally controlled by government agencies such as immigration, and customs and excise.

iv. The other aeronautical charges (i.e. landing and parking charges) are still under consideration by airport authorities as the LCCs use the same facilities as network carriers.

v. In terms of capital investment (Chapter 8, Figure 8.5), six managers and executives strongly agreed that the development of a new dedicated LCT would reduce the investment cost, by comparison with a ‘normal’ terminal. Funding for LCT facilities is available from local, government and private sources. Reducing the construction cost for LCTs would have a major impact on airport cost structure. For example, the elimination of air bridges could reduce investment costs by 20%. Equipment costs can be reduced through less dependency on information technology (check-in, passenger information) and sophisticated baggage handling systems used in baggage transfer.

vii. Operational charges are expected to be reduced through limited TF provision (Chapter 8, Figure 8.6). The use of advanced technologies such as self-service check-in may reduce operational costs. As stated by O’ Connell (2007), the minimisation of operational processes and labour costs with the LCT concept is expected to be 30% to 40% of traditional terminal costs. Costs for labour intensive activities including security are difficult to reduce. However, check-in and commercial facilities can be reduced through the introduction self service check-in and smaller airline lounges compared with 'traditional' terminals.

viii. Increases in non-aeronautical revenues are indirectly linked with the growth in passenger traffic (Chapter 8, Figure 8.7). As passengers spend more in commercial outlets within the LCT, they contribute towards additional airport revenue. For example, commercial initiatives at KLIA LCT, which include a pharmacy and duty free outlets, increased commercial revenues by about USD 300 000 in 2006.

9.4.3 Responses to cross-price elasticity dynamics and flexibility effect on airport management preferences

Tables 9.7 to 9.10 summarise the results of the analysis comparing cost and revenue structures with the provision of check-in, departure lounge, arrival and baggage reclaim and other facilities. Most of the facilities are less sensitive towards cost and revenue structures as the results confirmed that most of the facilities are considered to be basic for airport operations. The results, therefore, were crossed checked with the availability of TFs currently provided at KLIA LCT.

Table 9.7 Cross-price elasticity dynamics and flexibility effect on airport management preferences for check-in facilities, and change in cost and revenue structures

	Check-in	Airport Charges	Capital investment	Operational cost	Airport revenue	KLIA LCT
1	Airline office	*	***	*	**	√
2	Product promotional area	*	**	*	**	√
3	Airline ticketing counter	*	*	*	*	√
4	Bureau de change	*	**	*	***	√
5	Café or restaurant	***	*	*	***	√
6	Cash machine	*	**	**	*	√
7	FIDS	*	*	*	*	√
8	Hold baggage check-in	*	*	**	*	X
9	Manual check-in desk	***	***	***	*	√
10	Seating	*	**	**	*	√
11	Self-service check-in kiosks	***	***	*	*	√
12	Convenience shop	*	***	*	*	√
13	Television	*	*	*	*	√
14	Trolleys	*	*	*	*	√

*	Low importance
**	Moderate importance
***	High importance

Table 9.8 Cross-price elasticity dynamics and flexibility effect on airport management preferences for departure lounge facilities, and change in cost and revenue structures

	Departure Lounge	Airport Charges	Capital investment	Operational cost	Airport revenue	KLIA LCT
1	Airline boarding counter	**	*	*	*	X
2	Airline boarding pass control	*	*	*	*	X
3	Airline shop	*	*	*	*	√
4	Contact stand	**	**	**	*	√
5	Bureau de change	**	*	*	***	√
6	Café or restaurant	*	*	**	*	√
7	Cash machine	**	*	*	*	√
8	Seating	*	*	**	*	√
9	Convenience shop	**	*	**	*	√
10	Product promotional area	*	*	*	*	√
11	Smoking area	*	*	**	*	√
12	Television	*	*	*	*	√

*	Low importance
**	Moderate importance
***	High importance

Table 9.9 Cross-price elasticity dynamics and flexibility effect on airport management preferences for baggage reclamation and arrival hall facilities, and change in cost and revenue structures

	Terminal Facilities	Airport Charges	Capital investment	Operational cost	Airport revenue	KLIA LCT
1	Information counter	*	*	*	*	√
2	Baggage reclamation display	*	**	*	*	√
3	Bus counter	*	*	*	*	√
4	Café or restaurant	*	*	**	***	√
5	Cash machine	*	**	*	*	√
6	Left luggage counter	*	*	*	*	√
7	Lost and found counter	*	*	**	*	√
8	No. of automatic baggage handling carousels	***	***	***	*	√
9	Seating	*	*	*	*	√
10	Convenience shop	*	*	*	**	√
11	Product promotional area	*	*	*	*	√
12	Taxi counter	*	*	*	*	√
13	Trolleys	*	*	*	*	√

*	Low importance
**	Moderate importance
***	High importance

Table 9.10 Cross-price elasticity dynamics and flexibility effect on airport management preferences for other facilities, and change in cost and revenue structures

	Terminal Facilities	Airport Charges	Capital investment	Operational cost	Airport revenue	KLIA LCT
1	Air conditioning	**	*	**	*	√
2	Way-finding	*	*	*	*	√
3	Baby changing facilities	*	*	*	*	√
4	Disabled facilities	*	*	*	*	√
5	FIDS	*	*	*	*	√
6	Information counter	*	*	*	*	√
7	Prayer room	*	*	*	*	√
8	Public telephone	*	*	*	*	√
9	Public waiting area	*	*	*	*	√
10	Smoking area	*	*	*	*	√
11	Staff restroom	*	*	*	*	√
12	Toilets	*	*	**	*	√

*	Low importance
**	Moderate importance
***	High importance

9.5 Proposed LCT facilities conceptual model, including cost and revenue structures and terminal facilities, after taking into consideration expectations of passengers, and airline and airport management

The research focuses on the evaluation of specific TFs after reviewing various LCT models and developments. The output of this research is a proposal for a conceptual model which indicates the core and secondary TFs that should be included in a LCT design, after examining the preferences of airline and airport management and passengers.

By examining the current provision of TFs at KLIA LCT, indicate the selection of core and secondary facilities for future dedicated LCT designs following the pre- and post-development surveys. The LCT facilities' conceptual model should enable increased efficiency of airport operations. Thus, the aim of LCT development to minimise aircraft turnaround times may be achieved. For basic TFs' provision, the adoption of single level terminal buildings is the ideal concept of a LCT with faster check-in services, simple baggage-handling system, no passenger transfers and simple surface access for passengers.

Table 9.11 shows the results as presented in Chapter 6 on the passengers' preferences for TFs in LCT design by considering their core and secondary preferences in the check-in, departure lounge and arrival areas. In the check-in area, both business and leisure passengers rated air conditioning, airline ticketing counter, information counter, bureau de change, café or restaurant, FIDS, manual check-in counter, seating, self-service check-in machine, telephone and toilet as core facilities. Regarding their secondary preferences, these included baby changing facilities, trolleys, cash machine, disabled facilities, prayer room, product promotional area, shop, smoking area, television and way-finding. The proposed conceptual model supported the view that air fares can be used to determine the adequacy of TFs provision within LCT design.

Table 9.11 Preferences for LCT facilities from the viewpoint of Air Asia passengers

	Air Fares	
	Core facilities	**Secondary facilities**
Check-in	Air conditioning, airline ticketing counter, information counter, bureau de change, café or restaurant, FIDS, manual check-in counter, seating, self-service check-in machine, telephone and toilets.	Baby changing facilities, trolleys, cash machine, disabled facilities, prayer room, product promotional area, shop, smoking area, television and way-finding.
Departure Lounge	Air conditioning, bureau de change, café or restaurant, cash machine, FIDS, information board, internet, seating, self-service vending machine, shop and toilets.	Baby changing facilities, children plays area, disabled facilities, prayer room, product promotional area, public telephone, smoking area, television, viewing deck and way-finding.
Baggage reclamation area and arrival halls	Air conditioning, information counter, baggage reclamation signage, car hire counter, FIDS, hotel reservation counter, left luggage service, seating, self-service vending machine, shop, taxi counter, television and toilets.	Baby changing facilities, trolleys, bureau de change, bus counter, café or restaurant, cash machine, disabled facilities, lost and found counter, prayer room and public telephone.

Table 9.11 also shows the preferences of business and leisure passengers for TFs in the departure lounge. Air conditioning, bureau de change, café or restaurant, cash machine, FIDS, information board, internet, seating, self-service vending machine, shops and toilets are classified as core facilities that should be included. Noting the self-vending machine as an example, the availability of this facility can reduce LCT design cost and space while, at the same time, it creates extra income for airport revenue. In terms of allocation of secondary facilities in LCT design, both business and leisure passengers indicate their preferences towards having baby changing facilities, children's play area, disabled facilities, prayer room, product promotional area, public telephone, smoking area, television, viewing deck and way-finding.

In the same Table, for the baggage reclamation area and arrival hall, air conditioning, information counter, baggage reclamation signage, care hire counter, FIDS, hotel reservation counter, left luggage service, seating, self-service vending machine, shop, taxi counter, television and toilet were selected as core facilities. Also worth noting is that the simplified concept such as the take-away aspect of self-vending machines should also be considered. Baby changing facilities, trolleys, bureau de change, bus counter, café or restaurant, cash machine, disabled facilities, lost and found counter, prayer room and public telephone were classified as secondary facilities.

The results from the post-development survey indicate that the views of the managers and executives of Air Asia are similar. Taking Air Asia management preferences as an example (Table 9.12), a suitable number of manual check-in counters, ticketing counters and self-service check-in machine are classified as core facilities, and both managers and executives preferred that these facilities be included in future LCT designs. Air Asia management considered hand baggage check-in and airline offices as being secondary facilities. In the departure lounge area, except for seating availability, most of the TFs are rated as secondary facilities. Seating availability in the check-in area was seen as important as both executives and managers indicated that this facility should be included as part of LCT design as airline boarding delays create a potential demand for seating. Airline management also expressed a preference for operating a LCT with only basic facilities, without the provision of air bridges, to reduce the cost of airport charges (Graham, 2006).

Table 9.12 Preferences for LCT facilities from the viewpoint of Air Asia management

	Airport charges	
	Core facilities	**Secondary facilities**
Check-in	Number of manual check-in counter, ticketing counter and self-service check-in machine	Hold baggage check-in and airline office
Departure Lounge	Seating	Airline boarding counter, airline shop, boarding pass control machine, air-bridge and standing area
Baggage reclamation area and arrival halls	Number of baggage reclaim carousels	Baggage reclaim display and lost and found counter
Other facilities	Disabled facilities and toilets	Air conditioning, FIDS, Information counter, way-finding, café or restaurant and product promotional area

Also shown in Table 9.12, a sufficient number of baggage reclaim carousels were considered as the most important facility to be included in the baggage reclaim area. A sufficient number of baggage reclaim carousels should be included in LCT design. However, the baggage reclaim display and lost and found counters were classified as secondary facilities in the baggage reclaim and arrival hall areas. Disabled facilities and toilets were seen to be important as the availability of these facilities is limited in the current LCT design.

Table 9.13 shows the conceptual model for LCT design that considers the influence of cost and revenue structures according to the viewpoint of airport management. The conflicting interest of passengers and airline management shown by the survey indicates that airfares and airport charges influence the selection of TF provision. In the same Table, the TFs have been grouped in four sections: check-in, departure lounge, baggage reclamation and arrival hall and other general facilities.

In the check-in area, airport charges influence the provision of TFs. Installation of manual check-in desks and self-service check-in kiosks was significantly related to the flexibility of airport charges. The other facilities (i.e. airline offices and product promotional areas) were considered as secondary. Airport management (executives and managers) preferred contact stands and a sufficient number of automatic baggage handling carousels. These facilities significantly influence the level of airport charges. For example, excluding air-bridges, in preference to contact stands, will reduce LCT construction costs and therefore the level of airport charges.

In terms of capital investment, both managers and executives consider that self-service check-in kiosks and number of automatic baggage handling carousels have a direct impact on the amount of capital investment to be allocated. The selection of the right facilities in LCT design could reduce investment costs by 20%. Equipment costs can be reduced through less dependency on both information technology (check-in and passenger information) and the use sophisticated baggage handling systems used for baggage transfer.

Operational charges would be expected to be reduced through limited TFs' provision. The use of advanced technologies such as self-service check-in may reduce operational costs. As stated by O' Connell (2007), the minimisation of operational processes and labour costs with the LCT concept is expected to save 30 to 40% of the traditional terminal costs. The cost of labour-intensive activities, including security, is difficult to reduce. However, check-in and commercial facilities can be reduced through the introduction of self-service check-in and smaller airline lounges (payable) compared with the 'traditional' terminal.

Increases in commercial revenue are indirectly linked with the growth in passenger traffic. As passengers spend more in commercial outlets within the LCT, they contribute towards additional airport revenue. By inclusion of bureau de change, café or restaurant and cash machines as core facilities, such a commercial initiative at KLIA increased commercial revenues by about USD300 000 in 2006.

Responses from airlines, airport and passengers were collected from the post-development surveys. Tables (9.14, 9.15 and 9.16) and Figure 9.1 summarise the conflicting views on the provision of terminal facilities (between airline and airport management, and passengers) in the check-in, departure lounge, and baggage reclamation and arrival hall areas.

Check-in area (Figure 9.1, Table 9.14)

1. Airline and airport management, and passengers, preferred to have a sufficient number of manual check-in desks and self-service check-in kiosks to be included in LCT design. These facilities were rated as highly important as only a limited number of these facilities is currently available at KLIA LCT.
2. The post development survey showed that bureau de change (BDC) and café or restaurant are highly important based on airport management and passengers preferences.
3. Both airline management and passengers agreed that airline ticketing counters should be available at KLIA LCT, although these facilities could be replaced in the future by online ticketing services.
4. Also, air conditioning, FIDS, information counter, seating, television and toilets are highly important according to the viewpoints of Air Asia business and leisure passengers.

Departure Lounge (Figure 9.1, Table 9.15)

1. Bureau de change (BDC), cash machines and self-vending machines were preferred by airport management and passengers. Noting the self-vending machine as an example, the availability of this facility is important as the allocation of this facility could generate extra revenue for the airport. Apart from that, the passengers feel that it is more convenient to have this facility available.
2. Seating was strongly required by airlines and passengers as most of the passengers were experiencing limited seating at the current KLIA LCT.
3. Contact stands are important to reduce LCT capital investment cost.
4. Air conditioning, café or restaurant, FIDS, information board, internet, shops and toilets were also of high importance for passengers.

Baggage reclamation and arrival hall (Figure 9.1, Table 9.16)

1. Both airlines and airport management preferred a sufficient number of baggage reclaim carousels in the baggage reclamation hall. They rated the facility as being of high importance as there are a limited number of carousels in the current LCT design.
2. Toilets are considered as being a core facility by airline management and passengers as the simplified design of the current LCT has restricted space for toilets.
3. Air Asia preferred to have disabled facilities for their passengers.
4. The following facilities were rated as core facilities based on passenger preferences: air conditioning, baggage reclamation signage, car hire counter, FIDS, hotel reservation counter, information counter, left luggage service, seating, self-vending machine, shop, taxi counter and television.

Table 9.17 shows a conceptual model of LCT facilities design that considers the influence of cost and revenue structures. In the check-in area, the availability of café or restaurant and manual check-in desk could increase the construction cost. Passengers, airlines and airport management shared similar interests in the inclusion of sufficient manual check-in desks. However, a sufficiency of check-in desks will use additional although there may be some generation of revenue if the desks are rented by individual airlines. In the check-in area, only the café or restaurant and convenience shop have the potential to make a significant contribution to airport revenues.

At medium construction cost, the following facilities have been identified: airline office, airline ticketing counter, bureau de change, FIDS, hand baggage check-in and convenience shop. These facilities are important and therefore should be considered by the airport management in LCT design. Product promotional area, cash machine, self-service check-in kiosks, television and trolleys are rated as low cost as such facilities take up a relatively small floor area in LCT design, although some facilities (kiosks, cash machines) have a high unit cost.

In the departure lounge, airline boarding counter, airline boarding pass control, airline shop, bureau de change, seating and convenience shop are rated as medium cost. The proposed conceptual design eliminates air-bridges to reduce the LCT cost. The inclusion of contact stands in exchange for air-bridges will significantly reduce the terminal construction cost by up to 20%, as well as airline operating costs. Also worth noting is that seating, airline shop, bureau de change, café or restaurant and convenience shop are included in the current KLIA LCT design. Thus, the provision of specific TFs should be considered as an opportunity to increase airport commercial revenues.

Similarly, the following facilities are rated as medium cost in baggage reclamation and arrival hall: café or restaurant, seating and convenience shop. Automatic baggage handling carousels is set at as high cost as even a few of these installed in the baggage reclamation area use a relatively large amount of floor space in the LCT area.

Table 9.13 Preferences for LCT facilities from the viewpoint of airport management

	Cost and revenue structures			
	Airport Charges	**Capital Investment**	**Operational cost**	**Airport revenue**
Check-in	Manual check-in and self-service check-in kiosks	Self-service check-in kiosks	Manual check-in counter and self-service check-in kiosks	Bureau de change and café or restaurant
	Airline office, product promotional area, airline ticketing counter, bureau de change, café or restaurant, cash machine, FIDS, hand baggage check-in, seating, convenience shop, television and trolleys	Airline office, product promotional area, airline ticketing counter, bureau de change, café or restaurant, cash machine, FIDS, hold baggage check-in, number of manual check-in, seating, television and trolleys	Airline office, product promotional area, airline ticketing counter, bureau de change, café or restaurant, cash machine, FIDS, hold baggage check-in, seating, self-service check-in, convenience shop, television and trolleys	Airline office, product promotional area, airline ticketing counter, cash machine, FIDS, hold baggage check-in, number of manual check-in, seating, self-service check-in, convenience shop, television and trolleys
Departure Lounge	Contact stand	Airline boarding counter, airline boarding pass control, airline shop, contact stands, bureau de change, cafe or restaurant, cash machine, seating, convenience shop, product promotional area, smoking area and television	Airline boarding counter, airline boarding pass control, airline shop, contact stands, bureau de change, cafe or restaurant, cash machine, seating, convenience shop, product promotional area, smoking area and television	Bureau de change and cash machine
	Airline boarding counter, airline boarding pass control, airline shop, bureau de change, cash machine, seating, convenience shop, product promotional area, smoking area and television			Airline boarding counter, airline boarding pass control, airline shop, contact stand, cafe or restaurant, seating, convenience shop, product promotional area, smoking area and television
Baggage reclamation area and arrival halls	Number of automatic baggage handling carousels	Number of automatic baggage handling carousels	Number of automatic baggage handling carousels	Café or restaurant
	Airline information counter, airline lost and found counter, baggage reclaim display, bus counter, cafe or restaurant, cash machine, left luggage counter, lost and found counter, seating, shop, product promotional area, taxi and trolleys	Airline information counter, airline lost and found counter, baggage reclaim display, bus counter, cafe or restaurant, cash machine, left luggage counter, lost and found counter, seating, shop, product promotional area, taxi and trolleys	Airline information counter, airline lost and found counter, baggage reclaim display, bus counter, cafe or restaurant, cash machine, left luggage counter, lost and found counter, seating, shop, product promotional area, taxi and trolleys	Airline information counter, airline lost and found counter, baggage reclaim display, bus counter, cash machine, left luggage counter, lost and found counter, number of automatic baggage handling carousals, seating, shop, product promotional area, taxi and trolleys
Other facilities	Air conditioning, airport way finding, baby changing facilities, disabled facilities, FIDS, information counter, prayer room, public phone, public waiting area, smoking area, toilet and trolleys	Air conditioning, airport way finding, baby changing facilities, disabled facilities, FIDS, information counter, prayer room, public phone, public waiting area, smoking area, toilet and trolleys	Air conditioning, airport way finding, baby changing facilities, disabled facilities, FIDS, information counter, prayer room, public phone, public waiting area, smoking area, toilet and trolley	Air conditioning, airport way-finding, baby changing facilities, disabled facilities, FIDS, information counter, prayer room, public phone, public waiting area, smoking area, toilet and trolley

Core facilities
Secondary facilities

Table 9.14 Ranked facility preferences by airline and airport management, and passengers, for the check-in area (core facilities)

Terminal Facilities	Airlines	Airport	Passengers
Air conditioning			xxx
Airline ticketing counter	xxx		xxx
Baby changing facilities			
Baggage trolleys			
BDC		xxx	xxx
Café or restaurant		xxx	xxx
Cash machine			
Disabled facilities			
FIDS			xxx
Information counter			xxx
Number of manual check-in desks	xxx	xxx	xxx
Prayer room			
Product promotional area			
Seating			xxx
Self-service check-in kiosks	xxx	xxx	xxx
Shop			
Smoking area			
Telephone			xxx
Television			
Toilets			xxx
Way-finding			

Table 9.15 Ranked facility preferences by airlines and airport management, and passengers, for the departure lounge area (core facilities)

Terminal Facilities	Airlines	Airport	Passengers
Air conditioning			xxx
Baby changing facilities			
BDC		xxx	xxx
Café or restaurant			xxx
Cash machine		xxx	xxx
Children play area			
Contact stands		xxx	
Disabled facilities			
FIDS			xxx
Information board			xxx
Internet			xxx
Prayer Room			
Product promotional area			
Public Phone			
Seating	xxx		xxx
Self-vending machine		xxx	xxx
Shop			xxx
Smoking area			
Television			
Toilets			xxx
Viewing deck			
Way finding			

Table 9.16 Ranked preferences by airlines and airport management, and passengers, for the baggage reclamation and arrival hall areas (core facilities)

Terminal Facilities	Airlines	Airport	Passengers
Air Conditioning			xxx
Baby changing facilities			
Baggage reclamation signage			xxx
Baggage trolleys			
BDC			
Bus counter			
Café / restaurant		xxx	
Car hire			xxx
Cash machine			
Disabled facilities	xxx		
FIDS			xxx
Hotel reservation counter			xxx
Information counter			xxx
Left-luggage service			xxx
Lost and found counter			
Number of baggage reclaim carousels	xxx	xxx	
Prayer room			
Seating			xxx
Self-vending vending machine			xxx
Shop			xxx
Taxi counter			xxx
Telephone			
Television			xxx
Toilet	xxx		xxx

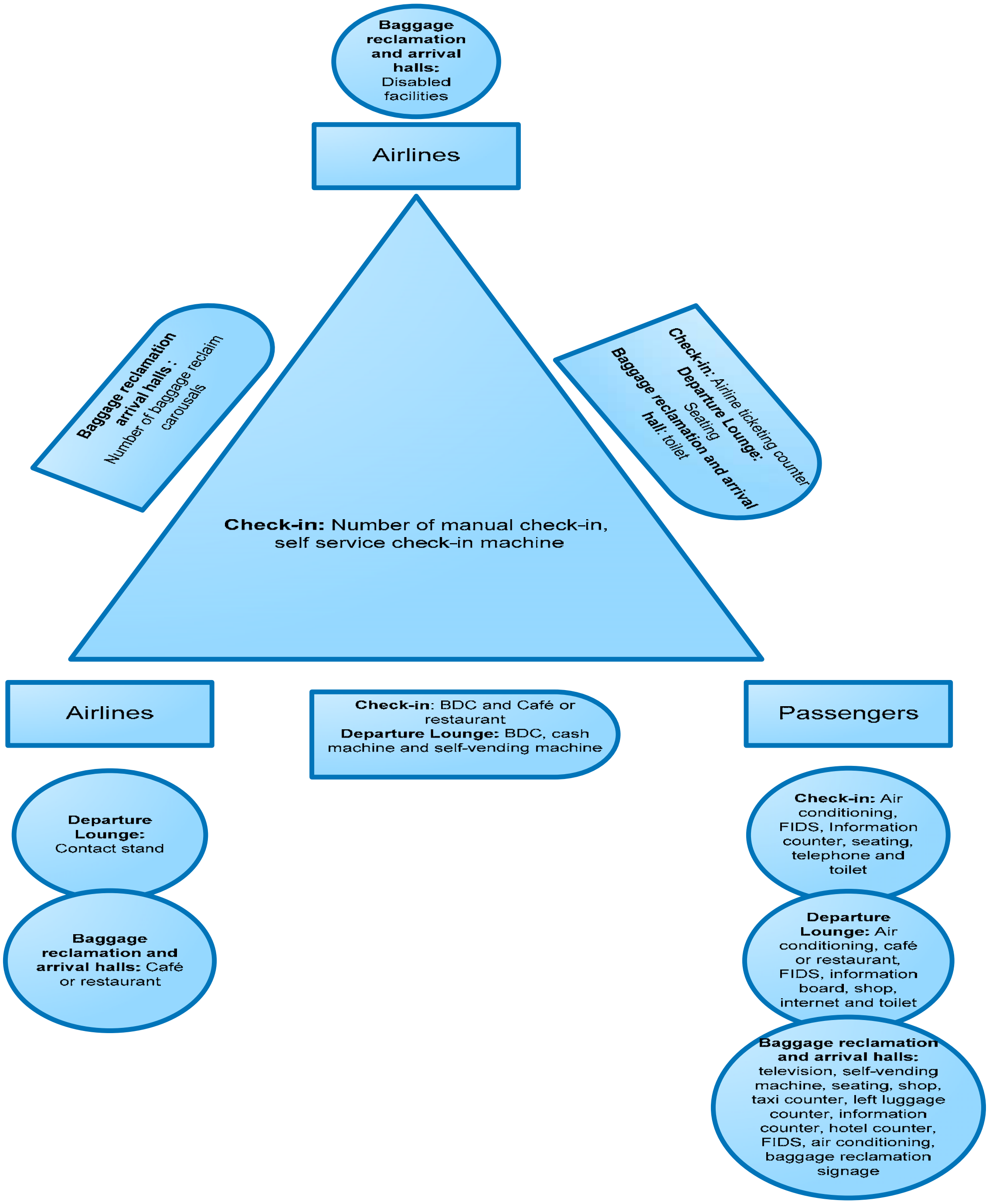

Figure 9.1 Conflicting expectations of airline and airport management, and passengers, towards primary LCT facilities

Table 9.17 also shows that the provision of air conditioning, way-finding, baby changing facilities, disabled facilities, FIDS, information counter, prayer room, public waiting area, smoking area, staff restroom and toilets will not be able to generate extra airport revenues. However, the availability of these facilities is important for passengers' convenience. The provision of these facilities will incur a moderate construction cost. Taking air conditioning as an example, its availability in the LCT area is of high importance in view of the hot weather conditions in Malaysia.

In conclusion, the proposed conceptual design benefits passengers and airline management as well as airport management by indicating specific concepts which take into account the influence of cost and revenue structures in LCT design. However, in order to enhance the research outcomes, future researchers, planners and designers should able to integrate 'real cost data' into the LCT design concept. With inclusion of 'real cost data', the proposed concept could be more viable, relevant and unique as airport management can take advantage of cost estimates while planning a specific LCT design. However, the applicability of the proposed conceptual design can be enhanced while airport management is able to take into account PESTLE analysis, more specifically the influence of culture (i.e. lifestyle) of passengers. As LCT research is still a new domain, it is of potential interest to airport management for reducing airport costs while planning and development of the airport takes place. In-depth discussion on cost and revenue structures contributes to the minimising of construction costs. The proposed conceptual design model will therefore enhance airport capacity in future LCT development.

9.6 Concluding note

This research has achieved the aims and objectives of the thesis. There is a conflict of interest between passengers, airline management and airport management on the selection and provision of TFs in LCT design. The findings indicate that the inclusion of specific TFs is highly correlated with cost and revenue structures (Chapters 6, 7 and 8).

The originality of this research is based on the following research principle: trying out in a region something that has previously only been done in another region or country, taking a particular technique and applying it in the new area and adding to knowledge in a way that has not been done before (Philip and Plough, 2000). This research performed an original study on the evaluation of a dedicated LCT using data and analyses from the airport as primary data. Also, this research supplements previous research efforts which sourced data from Europe, USA, Canada and Asia Pacific. Furthermore, a well established methodology and analysis applied in this research added useful information to the knowledge base. Thus, the above criteria for originality have been fulfilled.

Table 9.17 Proposed Conceptual Model for LCT Facilities Design [203]

	Check-in	Cost (High to Low)[204]	Revenue (High to Low)
1	Airline office	Medium	Medium
2	Product promotional area	Low	Low
3	Airline ticketing counter	Medium	Low
4	Bureau de change	Medium	Low
5	Café' or restaurant	High	High
6	Cash machine	Low	Low
7	FIDS	Medium	No
8	Hand baggage check-in	Medium	Low
9	Manual check-in desk	High	High (Potential revenue to the airport)
10	Seating	Medium	No
11	Self-service kiosks	High	Low
12	Convenience shop	Medium	High
13	Television	Low	No
14	Trolleys	Low	No
	Departure Lounge		
1	Airline boarding counter	Medium	No
2	Airline boarding pass control	Medium	No
3	Airline shop	Medium	Low
4	Contact stand	Medium (compare to airbridge)	High (Potential revenue to the airport)
5	Bureau de change	Medium	Low
6	Café or restaurant	High	High
7	Cash machine	Low	Low
8	Seating	Medium	No
9	Convenience shop	Medium	High
10	Product promotional area	Low	Low
11	Television	Low	No
	Baggage reclamation and arrival hall		
1	Information counter	Low	No
2	Baggage reclamation display	Medium	No
3	Bus counter	Low	Low
4	Café or restaurant	Medium	High
5	Cash machine	Low	Low
6	Left luggage counter	Low	Low
7	Lost and found counter	Low	Low
8	No. of automatic baggage handling carousel	High	Low
9	Seating	Medium	No
10	Convenience shop	Medium	High
11	Product promotional area	Low	Low
12	Taxi counter	Low	Low
13	Trolleys	Low	No
	Others		
1	Air conditioning	High	No
2	Way-finding	Low	No
3	Baby changing facilities	Medium	No
4	Disabled facilities	Medium	No
5	FIDS	Medium	No
6	Information counter	Low	No
7	Prayer room	Medium	No
8	Public telephone	Low	Low
9	Public waiting area	Medium	No
10	Smoking area	Medium	No
11	Staff restroom	Medium	No
12	Toilets	Medium	No

203 Based on author's judgement.

204 Based on the equipment cost

The lack of an evaluation process for including TFs within LCT design which takes into account passenger (user), airline management (influencer) and airport management (decision maker) interests, and linking them with cost and revenue structures, was identified. In addition, some of the findings were able to collect, group and classify as core and secondary TFs for LCT design. Therefore, these findings have provided worthwhile concepts for the design of suitable TFs in LCTs.

The information gathered in this research covered the following areas:

1. The evaluation only focussed on the provision of TFs at a currently operating dedicated LCT;
2. The evaluation covered three major areas: check-in, departure lounge and arrival areas; and
3. The research has not dealt with the evaluation of other factors that may influence terminal planning and design (i.e. level of service or terminal performance)

9.7 Implications of the research for airports and airlines

9.7.1 The conflicting viewpoints of airport management and their customers

The research has shown that there are conflicting expectations existing between passengers, and airline and airport management. A reduction in airport (passenger service) charges is seen as important in encouraging LCCs to develop routes and, in turn, passengers to make use of the LCT facilities. Therefore, a reduction in airport charges is seen as being in the interests of both passengers and LCCs, and therefore LCC management are supportive of the simplification of terminal facilities. However, it is necessary to ensure that sufficient terminal facilities should be provided to ensure the efficiency of terminal operations as far as passengers are concerned. For example, the development of the KLIA LCT has seen a comprehensive programme of consultation, in relation to the current and prospective needs of all airport users (in particular, the LCCs and passengers). The challenge for LCT development is to consider the varying objectives and requirements of the LCCs, the passengers and the extended airport community, and to balance short-term requirements with proper long term planning for the ongoing development of the LCT.

9.7.2 The scope for reducing capital investment

The research has indicated that there are a number of potential inter-linked issues including capital investment, operating costs, revenues and service standards that should be resolved. These issues are not independent of each other. The 'solving' of one issue has a knock-on impact on the other issues listed above. For example, a reduction in aeronautical revenues from the LCCs might encourage airport management to respond in terms of reducing capital investment.

Capital investment plans are critical to decisions taken by the airport management on the simplification of terminal facilities. The magnitude of capital spend in an LCT has a profound effect on the cash flow and capital structure position, its timing affects the operational throughput of the airport, and the cost effectiveness of the capital program will affect the airport's self-financing capability and impact on user charges. The starting point for capital investment plan is the development of passengers traffic forecast of, which must be developed in a robust and systematic manner. This may require the anticipation of new markets or the expansion of existing markets.

The proposition has been made that capital investment should remain at a low level in order to reduce the total construction cost of LCTs. The introduction of simplified terminal facilities and flexibility with airport charges will assist in the development of a viable aviation business that receives an appropriate degree of maintenance and upgrading and is able to compete internationally for the necessary capital required for future expansion. This will ensure that in the future airport management can provide appropriate facilities for both LCCs and passengers and will ultimately contribute to the long-term development of the national economy, including the aviation sector.

LCT growth would be greatly influenced by the ability of airport management to plan for the proper capital investment of the terminal facilities in the medium term, typically 5 to 15 years. As terminals comprise vital elements of airport infrastructure, the adoption of a long-term view is critical to ensure that terminals are properly integrated into wider planning process, such as National Airport Development Plans. A long-range plan ensures that the LCTs ability to expand and develop is preserved.

9.7.3 Trends in 'check-in'

There are limited operational areas within the terminal building in which capital investment might be significantly reduced. The research has shown that Air Asia management indicated that check-in facilities should be considered as core facilities. Check-in facilities require capital investment in terms of space within the terminal and also the acquisition of the equipment itself. Yet, in Europe, Ryanair is expecting passengers to check-in on-line on the basis that reducing capital investment for check-in facilities will in turn reduce airport charges. There is, therefore, an apparent contradiction and raises the question as to what long-term implications there might be for terminal operations and capital investment. Would on-line check-in be a benefit to the airport in terms of reduced capital investment? What are the implications of on-going changes in check-in procedures?

For example, airport management should consider future technologies that may influence the efficiency of LCT check-in facilities. In the long run, future technologies create the option to reduce operational costs. Therefore, it may be beneficial to reduce the space allocation for manual check-in counters. In turn, this may lead to reduced capital investment for LCT development. This contrasts with the more short-term focus of Air Asia, when LCCs have the ability to upgrade their check-in service (i.e. online check-in).

Therefore, investment in check-in equipment can improve service reliability and predictability which can be converted in lower generalised costs for low cost passengers and lower operating costs in the long run as the result of the introduction of more efficient technologies or making better use of those in existence.

For example, Ryanair charges €2 person for passengers who use the check-in service at the airport of departure. The charge, which used to be for online check-in, has now been switched to airport check-in to encourage more passengers to check-in online. However, the on-line check-in is only available to passengers travelling with hand luggage. Ryanair, and most likely easyJet, are pushing for only on-line check-in. An exception has to be made for hold-baggage check-in but this is being discouraged. The sole use of on-line check-in may only work if the passenger is able to check-in for both legs of the journey in advance, that is, at least 14-18 days before travel and maybe longer. This may also only work for short-haul journeys or where the trip period is two weeks or less.

If this strategy is further developed by the LCCs, this will lead to a reduced demand for check-in desks and self-service kiosks, except for hold-baggage check-in. This, in turn, will lead to a partial simplification of the baggage handling system in the check-in area and therefore to reduced capital investment and operating costs for the airport and reduced charges for the airlines. Simplification of the baggage handling system will lead to a further reduction in capital investment and operating costs for the airport. Removal of much of the check-in area fees up space for additional commercial revenue. Thus, increased commercial revenues, or reduced construction costs, may in turn lead to reduced passenger service charges to the airlines.

9.7.4 Alternative revenue sources

Many airports with LCTs or small terminals, attempting to balance the cost and revenue structure, have seen it as imperative that they try to attract LCCs. Taking Air Asia as an example, the airline has stimulated rapid growth at airports chosen as a base by the airline, for example, KLIA LCT. Also, airports have aggressively developed non-aeronautical revenues, for example, concessions, property and car parking. There is an added benefit that diversification of revenue sources protects the airports against exposure to aviation economic cycles.

Airports have to balance costs and revenues between such that:

Revenues from aeronautical charges [A] + Commercial and other revenues [B]
>>
Annual cost of capital investment / depreciation [C] + Operational costs [D]

Two extreme scenarios that could be considered are that either [A] = 0 or [B] = 0. If ‘A’ = 0 (which would suit the airlines), then the airport would have to maximise ‘B’. On the other hand, if ‘B’ = 0, then the airport would have to maximise ‘A’, not a good idea from the airline’s point of view. In practice, revenue is a balance between [A] and [B] but is it feasible for [A] to approach zero or become zero, are suggested by some LCC management?

For example, contact stands are revenue generators but only in terms of charges for medium and long-term aircraft parking. Car parking is a significant revenue generator at most airports, requiring a medium to high level of capital investment. Passenger preferences are primarily for cafés, bars, restaurants, and shops. These require a medium to high capital investment but with a medium level of operating costs but offset against potentially high revenues. Other passenger preferences are of a relatively low level in terms of capital investment and operational costs.

At KLIA, airport management have their preferences. The provision of check-in facilities, contact stands, and baggage sorting and reclaim facilities have high capital investment costs while baggage handling systems have high operating costs. Identified revenues streams (inside the terminal) included bureau de change (low capital cost), café, restaurants, bars, shops (medium capital investment costs. Nevertheless, the airport needs to establish the likely non-aeronautical revenue generated by passengers in order to be able to calculate exactly what it can charge airlines and still make a return.

9.7.5 Service standards

The research has shown that many of the passengers' preferences are for low investment / low revenue facilities but the presence of these would enhance the passenger's perception of service quality. It could be argued that low-cost airline passengers place different demands on airport facilities than do those flying with 'traditional carriers. For example, low cost passengers do not have the same requirements as business passengers. However, they prefer cafés, bars, restaurants and shops to be available in an LCT. These are facilities that potentially use a significant proportion of the terminal floor area.

LCTs are designed to be able to process a target hourly throughput with a given level of service (LOS). Thus, highly efficient LCT designs should be able to balance between the need to address traffic peaks, and the need to minimise unused capacity during the remainder of the terminal opening hours. Therefore, the LCTs need to supply a LOS that is acceptable to the passengers.

In terms of level of service, at the target level of throughput, a service standard is defined. The International Air Transport Association (IATA) has defined a scale of service standards, in terms of space available per occupant at various locations in the terminal. In current LCTs, the minimum limits are categorised by levels E to F, that is, considered as unacceptable delays and congestion. It is important to underline that the actual capacity of the terminal in terms of passenger throughput per hour is determined by the maximum capacity of the 'weakest point' along the passenger processing chain.

Passengers, airport and airline management agree that it is important for service standards of LCT facilities and the associated costs to be debated between the users. The provision of terminal facilities should meet the requirements of a range of user types. Overall, LCCs are committed to assisting airport management in LCT design for ensuring that the requirements of passengers and other parties are satisfactory met in an economical and efficient manner.

9.7.6 Scope for minimising the terminal footprint

From Section 9.7.4, in terms of the wider perspective, it was noted that reduction or elimination of [A] would be possible providing revenues are maximised from [B]. Therefore, to maximise [B] requires high revenue generating facilities. Does this mean that a small terminal building is financially unviable?

Identifying ways to increase passenger numbers in a small terminal building, such as attracting LCCs, is an appealing way for airports to attempt to improve their financial performance. Airport have large fixed infrastructure costs and unit costs decline significantly as traffic increases up to 1.5million Work Load Units (WLU) per annum (Graham, 2001). For LCTs, the fixed cost of providing airport capacity and staff is high. A past ICAO study found that the average unit costs for an airport of less than 300, 000 WLUs to be $15 compared to the average unit cost of $9.4 for airports 300,000 to 2.5 million WLUs (Graham, 2001). Once the initial investment in airport facilities has been made, the marginal costs of accommodating extra traffic are very low because additional traffic will improve the utilisation of spare capacity for which airport management has already invested.

A second question might be is a simplified building actually worthwhile as any savings in capital investment may result in a reduction in revenues? The construction costs of an LCT are marked by the challenge to simplify a terminal building so as to reduce the capital investment cost by 50%, compared with a 'traditional' terminal, while still maintaining suitable terminal facilities and an acceptable level of service in the terminal. Building a new LCT involves planning and land costs, and infrastructure and superstructure building costs. Feasibility studies, technical design, land acquisition, legal and administrative fees, licenses are included in the planning and land costs, which can reach up to 10% of the total infrastructure cost. Infrastructure and building (remote stands, manual check-in etc.) costs can range from 15 to 50% of total investment.

Other infrastructure costs for the LCT include such specific elements such as IT systems, electrical works, communication systems and safety equipment. Construction cost of the LCT can be compared with the construction cost of a 'traditional' terminal. Noting KLIA as an example, the total LCT construction cost is estimated at RM115 million compared with the 'traditional' terminal that cost around RM20 billion.

9.7.7 Implications for the industry

If it is accepted that, under an ideal albeit perhaps hypothetical situation, an LCT should be self-sufficient in terms of costs and revenues, then the most likely driver to be considered (and which is already taking place in Europe) is the ways and means by which the airlines are 'encouraging' passengers check-in for their flights.

The implications of this are twofold. Firstly, the check-in zone in departures may be significantly reduced in size. Secondly, baggage sorting systems may be simplified although there will be little scope for reducing the footprint occupied by baggage carousels in baggage reclaim. This in turn will leave LCT designers with two options.

The opportunity may be taken to reduce the overall footprint of the LCT, due to shrinkage of the check-in area. This will have the benefit of reducing construction and operational costs but leaves little scope for raising additional commercial revenues. Alternatively, the LCT footprint could be left unchanged and the area released from check-in facilitation used to generate additional commercial revenues albeit at no saving in construction costs and marginal reduction in operation costs. Whichever plan is adopted would depend on a more detailed analysis of the trade-off between terminal building construction costs, maintenance and operation costs, and facility capital investment, with facility revenue generation both in terms of commercial and aeronautical revenues.

The conclusion of the research has revealed that there are differences between the views of passengers, airline management and airport management on the basic provision of TFs in LCT design. Some of the needs for provision of TFs that were revealed during pre-development survey were not included in the LCT design (i.e. hold-baggage). However, the provision of TFs at present follows airline management preferences rather than those of passengers. Therefore, passengers have had little say on the design of LCT facilities. The LCT facilities developed recently were unable to increase passenger convenience due to space and cost limitations. These limitations were observed to make the LCT TFs inadequate, causing additional delays in terminal area, especially during peak times. By using the proposed design which incorporates the preferences of passengers, airline management and airport operators, hopefully, the research proposals will provide a useful design concept for TFs within the LCT design to LCT planners and designers in future.

9.8 Research Management

The research made use of a well established method and utilised a verified arrangement for encoding. It involved collecting primary and secondary data as well as carrying out the required analysis. The evaluation of specific TFs within LCT design is new to the aviation industry. Therefore, the availability of research material was limited. Thus, in this study, LCT academic theory was supported by secondary material which was gathered from airport designers and developers. This required close collaboration between the researcher and airport designers.

Difficulties were encountered in obtaining approval to undertake the required study at LCT airports. Authorisation for conducting the survey related to management and airport operations at KLIA, Malaysia, was granted after 3 months of negotiation prior to conducting the survey. The lack of LCT models currently available increased the research challenges.

The barriers in interpretation reduce the quality of the data, so assistance from MAMTs was highly appreciated. In order to minimise interpretation errors, face-to-face interviews were conducted with the respondents. However, support from MAMTs improved the response rate in the passenger survey. The responses to the survey on airline management were low as the staffs were too busy to commit time to respond to the survey questionnaires. However, follow-up by phone and email improved the response rate. In the end, data collection and processing were completed in 24 months.

In order to improve the research quality, it was noted in the literature review that the research needs to be validated and reliable for further research. Validity refers to the correctness or credibility of a description, conclusion, explanation or other sort of account (Hammersley, 1992). Validity is primarily important in a research context as it deals with the integrity of the research. Measures to reduce bias and improve validity, reliability and research ability were integrated into the research method. The validity and reliability of the process should bring about the advantages of the research process by consideration of the overall tasks in the research phase that are controlled by adequate techniques or approaches. The whole process was synchronised from the research approach, including aim, objectives, sampling techniques, data collection and data analysis.

9.9 Future research

Cost and revenue structures play a dominant part in LCT design. Pressure from airline management and passengers for a reduction of airport charges and fares have encouraged airport management to increase terminal efficiency. Bearing this in mind, one aim for a LCT is to maximise aircraft utilisation by reducing aircraft turnaround time.

While the objectives were met, the research raised questions which warrant further investigation. Nonetheless, an evaluation of specific TFs at KLIA LCT is not sufficient to allow a generalisation of all LCT models that have mushroomed around the world. Given the cost advantages, and based on KLIA experiences, these findings support the concept for designing and developing TFs based on the LCT model.

While Singapore and Thailand have also developed dedicated LCTs with specific TFs, the impact of cultural differences and other variables have not been considered in this research. Therefore, it also worth considering the following areas for further research:

- Issues surrounding the modification of existing terminals and associated facilities to a LCT design and their impact on airport cost and revenue structures.
- Evaluation of capacity issues such as level of service. There is also a research gap to examine service levels and the influence on cost and revenue structures in LCT design.
- The conversion of secondary airports to low cost airports is another interesting subject to be studied. Recent designs show that secondary airports are enthusiastic about LCC operational methods. Therefore, this is an academic gap where future studies can explore the impact of the conversion of secondary airports to become a low cost airport.
- The real costs effectively incurred during a given time to develop a LCT. This would considers the real cost and value to airport development. The influence of real cost data may cover the full depreciation cost of terminals, runways, construction, navigation air systems, communication systems, data processing

systems, terminal facilities, whose duration is dependent on LCT development. The real cost data should represent the replacement value of terminal facilities.

- As the research offers a conceptual model on the selection of adequate terminal facilities model for LCT, making use of real cost data is recommended. This would help to determine the capacity of an airport terminal by taking into consideration the level of service (LOS) and several cost factors. Thus, the future model can be tailored to any airport. This can be evaluated using real cost data associated with terminal development.

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11 APPENDIX 1

DEPARTING SURVEY QUESTIONNAIRE (PRE-DEVELOPMENT)

Notes:

- The objective of this survey is to identify and evaluate the relationship between airline fares and passenger needs and expectations.
- For the purpose of this survey, passenger expectations in relation to terminal facilities and comfort levels of Low Cost Terminals will be explored.
- Please note that all data collected will be treated with the strictest of confidence and is only for use in PhD Low Cost Terminal research and education purpose only.

PART A: IMPORTANCE OF TERMINAL FACILITIES

The section seeks to identify the 5 most important facilities during the processing activities for check- in and baggage drop.

For example, if based upon your experience and knowledge, you consider '***Seating'*** to be the ***'most important'*** then please a (1) under SCORE against (3) below and a score between 2 and 5 on the next 4 important aspects and leave the rest blank.

1: CHECK-IN SERVICE

This section refers to processing activities for check-in and baggage drop.

From the following please select what you consider to be the 5 important aspects during check-in and rate them in order of importance. **Please tick (x) your answer.**

1: Most important; 2: Next important; 3: Important; 4: Less important 5: Not important

A	Terminal Facilities	Score
1.	Flight Information Display System (FIDS)	
2.	Wayfinding	
3.	Seating	
4.	Self-service check-in	
5.	Number of manual check-in	
6.	Fast track	
7.	No baggage check-in	
8.	Pre-departure check-in	
9.	Trollies	
10.	Others (Please specify):	

2: SHOPS (COMMERCIAL AREA)

This section refers to the concession such as restaurants and shops.
From the following please select what you consider to be the 5 important facilities at shop areas and rate them in order of importance. **Please tick (x) your answer.**

1: Most important; 2: Next important; 3: Important; 4: Less important; 5: Not important

B	**Terminal Facilities**	**Score**
1.	Seating	
2.	Internet	
3.	Telephone	
4.	Bureau de Change	
5.	Cash machine	
6.	Smoking lounge	
7.	Self- vending machine	
8.	Food & Beverage (F&B)	
9.	Duty free shop	
10.	Post office	
11.	Other (please specify):	

3: DEPARTURE LOUNGE

This section refers to departure lounge and circulation area.

From the following please select what you consider to be the 5 important facilities at departure lounges and rate them in order of importance. **Please tick (x) your answer**

1: Most important; 2: Next important; 3: Important; 4: Less important; 5: Not important

C	**Terminal Facilities**	**Score**
1.	Flight Information Display System (FIDS)	
2.	Seating	
3.	Baby changing facilities	
4.	Disabled facilities	
5.	Rest area	
6.	Shower	
7.	Children's play areas	
8.	Toilet	
9.	Prayer room	
10.	Others (please specify):	

PART B: DEMOGRAPHIC BACKGROUND

Q1: Sex		√
1	Male	
2	Female	

Q2: Age		√
1.	Under 20 years	
2.	21 to 34 years	
3.	35 to 50 years	
4.	Over 50 years	

Q3: Annual Earnings		√
1.	Up to RM12000	
2.	RM12001 to RM24000	
3.	RM24001 to RM36000	
4.	RM36001 to RM48000	
5.	RM48001 to RM60000	
6.	Over than RM60000	

Q4: Type of Travel		√
1.	Business	
2.	Holiday	
3.	Visiting Friends and Relatives	
4.	Weekend with friends	
5.	Others	

Q5: Type of Journey		√
1.	Domestic	
2.	International	

Q6: Time of the day :		√
1.	0600-0800	
2.	0800-1000	
3.	1000-1200	
4.	1200-1400	
5.	1400-1600	
6.	1600-1800	
7.	1800-2000	
8.	2000-2200	

Q7: Day of Week, WRITE IN : ___________

12 APPENDIX 2

ARRIVING SURVEY QUESTIONNAIRE (PRE- DEVELOPMENT)

Notes:

- The objective of this survey is to identify and evaluate the relationship between airline fares and passenger needs and expectations.
- For the purpose of this survey, passenger expectations in relation to terminal facilities and comfort levels of Low Cost Terminals will be explored.
- Please note that all data collected will be treated with the strictest of confidence and is only for use in PhD Low Cost Terminal research and education purpose only.

PART A: IMPORTANCE OF TERMINAL FACILITIES

This section seeks to identify the 5 most important facilities within baggage reclaim arrival area.

For example, if based upon your experience and knowledge, you consider that '***Left luggage counter'*** is to be most important, please score (1) under SCORE against (2) below and score between 2 and 5 on the next 4 important aspects then leave the rest blank.

1: BAGGAGE RECLAIM AND ARRIVAL HALL AREAS

This section refers to baggage reclaims and arrival hall at arrival area.

From the following please select what you consider to be the 5 important facilities at arrival areas and rate them in order of importance. **Please tick (x) your answer.**

1: Most important; 2: Next important; 3: Important; 4: Less important 5: Not important

A	Terminal Facilities	Score
1.	Number of baggage reclaim carousels	
2.	Left luggage counter	
3.	Lost and found counter	
4.	Trollies	
5.	Baggage information display	
6.	Others (please specify):	

PART B: DEMOGRAPHIC BACKGROUND

Q1: Sex		√
1	Male	
2	Female	

Q2: Age		√
1.	Under 20 years	
2.	21 to 34 years	
3.	35 to 50 years	
4.	Over 50 years	

Q3: Annual Earnings		√
1.	Up to RM12000	
2.	RM12001 to RM24000	
3.	RM24001 to RM36000	
4.	RM36001 to RM48000	
5.	RM48001 to RM60000	
6.	Over than RM60000	

Q4: Type of Travel		√
1.	Business	
2.	Holiday	
3.	Visiting Friends and Relatives	
4.	Weekend with friends	
5.	Others	

Q5: Type of Journey		√
1.	Domestic	
2.	International	

Q6: Time of the day :		√
1.	0600-0800	
2.	0800-1000	
3.	1000-1200	
4.	1200-1400	
5.	1400-1600	
6.	1600-1800	
7.	1800-2000	
8.	2000-2200	

Q7: Day of Week, WRITE IN : __________

13 APPENDIX 3

DEPARTING PASSENGER SURVEY (POST- DEVELOPMENT)

The survey examines the relationship between Low Cost Terminal (LCT) Facilities and air fares from passenger experiences. All data collected will be treated with the strictest of confidence and used for research and educational purposes only.

Q1. Did you use any of the following in the check-in hall, before going through immigration/security in to departure area?

From the following, what is to be an appropriate reduction of air fares, as a trade–off between fewer LCT facilities available at terminal areas? **Please tick (x) your answer**			FARE DISCOUNT (%)			
			10%	20%	30%	No change
1.	Self-service check-in machine	a) Yes				
		b) No				
2.	Shop	a) Yes				
		b) No				
3.	Café or restaurant	a) Yes				
		b) No				
4.	Flight Information Display System (FIDS)	a) Yes				
		b) No				
5.	Wayfinding	a) Yes				
		b) No				
6.	Manual check-in counter	a) Yes				
		b) No				
7.	Airport Information counter	a) Yes				
		b) No				
8.	Baggage trolley	a) Yes				
		b) No				
9.	Seating	a) Yes				
		b) No				
10.	Cash machine	a) Yes				
		b) No				
11.	Bureau de change	a) Yes				
		b) No				
12.	Smoking area	a) Yes				
		b) No				
13.	Baby changing facilities	a) Yes				
		b) No				
14.	Disabled facilities	a) Yes				
		b) No				
15.	Toilet	a) Yes				
		b) No				
16.	Prayer room	a) Yes				
		b) No				
17.	Telephone	a) Yes				
		b) No				
18.	Television	a) Yes				
		b) No				
19.	Product promotional area	a) Yes				
		b) No				
20.	Airline ticketing counter	a) Yes				
		b) No				
21.	Telephone	a) Yes				
		b) No				
22.	Air-conditioning	a) Yes				
		b) No				
23.	Others	a) Yes				
		b) No				

2. Now, you're in the departure area. Did you use any of the following in the departure area, after you've been through to the immigration/security procedures?

From the following, what is to be an appropriate reduction of air fares, as a trade–off between fewer LCT facilities available at terminal areas? **Please tick (x) your answer**			FARE DISCOUNT (%)			
			10%	20%	30%	No change
1.	Self- service vending machine	a) Yes				
		b) No				
2.	Shop	a) Yes				
		b) No				
3.	Café or restaurant	a) Yes				
		b) No				
4.	Flight Information display System (FIDS)	a) Yes				
		b) No				
5.	Wayfinding	a) Yes				
		b) No				
6.	Information board	a) Yes				
		b) No				
7.	Product promotional area	a) Yes				
		b) No				
8.	Seating	a) Yes				
		b) No				
9.	Cash machine	a) Yes				
		b) No				
10.	Bureau de change	a) Yes				
		b) No				
11.	Smoking area	a) Yes				
		b) No				
12.	Baby changing facilities	a) Yes				
		b) No				
13.	Disabled facilities	a) Yes				
		b) No				
14.	Toilet	a) Yes				
		b) No				
15.	Prayer room	a) Yes				
		b) No				
16.	Public Phone	a) Yes				
		b) No				
17.	Television	a) Yes				
		b) No				
18.	Air conditioning	a) Yes				
		b) No				
19.	Children plays area	a) Yes				
		b) No				
20.	Viewing deck	a) Yes				
		b) No				
21.	Internet	a) Yes				
		b) No				
22.	Others	a) Yes				
		b) No				

PART B: DEMOGRAPHIC BACKGROUND

Q1: Sex		√
1	Male	
2	Female	

Q2: Age		√
1.	Under 20 years	
2.	21 to 34 years	
3.	35 to 50 years	
4.	Over 50 years	

Q3: Annual Earnings		√
1.	Up to RM12000	
2.	RM12001 to RM24000	
3.	RM24001 to RM36000	
4.	RM36001 to RM48000	
5.	RM48001 to RM60000	
6.	Over than RM60000	

Q4: Type of Travel		√
1.	Business	
2.	Holiday	
3.	Visiting Friends and Relatives	
4.	Weekend with friends	
5.	Others	

Q5: Type of Journey		√
1.	Domestic	
2.	International	

Q6: Time of the day :		√
1.	0600-0800	
2.	0800-1000	
3.	1000-1200	
4.	1200-1400	
5.	1400-1600	
6.	1600-1800	
7.	1800-2000	
8.	2000-2200	

Q7: Day of Week, WRITE IN : ___________

14 APPENDIX 4

ARRIVING PASSENGER SURVEY (POST- DEVELOPMENT)

The survey examines the relationship between Low Cost Terminal (LCT) Facilities and air fares from passenger experiences. All data collected will be treated with the strictest of confidence and used for research and educational purposes only.

Q1. Did you use any of the following in the baggage reclaim area and arrival hall of airport terminal?

From the following, what is to be an appropriate reduction of air fares, as a trade–off between fewer LCT facilities available at terminal areas? **Please tick (x) your answer**			FARE DISCOUNT (%)			
			10%	20%	30%	No change
1.	Shop	a) Yes				
		b) No				
2.	Café or restaurant	a) Yes				
		b) No				
3.	Flight information display system (FIDS)	a) Yes				
		b) No				
4.	Airline information desk	a) Yes				
		b) No				
5.	Self-vending machine	a) Yes				
		b) No				
6.	Baggage trolley	a) Yes				
		b) No				
7.	Seating	a) Yes				
		b) No				
8.	Left-luggage service	a) Yes				
		b) No				
9.	Cash machine	a) Yes				
		b) No				
10.	Bureau de change	a) Yes				
		b) No				
11.	Lost and found counter	a) Yes				
		b) No				
12.	Baby changing facilities	a) Yes				
		b) No				
13.	Disabled facilities	a) Yes				
		b) No				
14.	Toilet	a) Yes				
		b) No				
15.	Prayer room	a) Yes				
		b) No				
16.	Telephone	a) Yes				
		b) No				
17.	Television	a) Yes				
		b) No				
18.	Air conditioning	a) Yes				
		b) No				
19.	Taxi counter	a) Yes				
		b) No				
20.	Bus counter	a) Yes				
		b) No				
21.	Car hire counter	a) Yes				
		b) No				
22.	Hotel reservation counter	a) Yes				
		b) No				
23.	Others	a) Yes				
		b) No				

PART B: DEMOGRAPHIC BACKGROUND

Q1: Sex		√
1	Male	
2	Female	

Q2: Age		√
1.	Under 20 years	
2.	21 to 34 years	
3.	35 to 50 years	
4.	Over 50 years	

Q3: Annual Earnings		√
1.	Up to RM12000	
2.	RM12001 to RM24000	
3.	RM24001 to RM36000	
4.	RM36001 to RM48000	
5.	RM48001 to RM60000	
6.	Over than RM60000	

Q4: Type of Travel		√
1.	Business	
2.	Holiday	
3.	Visiting Friends and Relatives	
4.	Weekend with friends	
5.	Others	

Q5: Type of Journey		√
1.	Domestic	
2.	International	

Q6: Time of the day :		√
1.	0600-0800	
2.	0800-1000	
3.	1000-1200	
4.	1200-1400	
5.	1400-1600	
6.	1600-1800	
7.	1800-2000	
8.	2000-2200	

Q7: Day of Week, WRITE IN : __________

15 APPENDIX 5

AIRLINE SURVEY QUESTIONNAIRE (PRE- DEVELOPMENT)

Please note that all information will be treated as strictly confidential and will not be made public. Please provide the following information as requested. (Please tick (X) where appropriate)

Section A: Respondent Background

Q1: Which of the following options best describes about your current position in the airline industry?

Please choose one					
a.	CEO/ Managing Director		d.	Senior executive/ Executive	
b.	General Manager		e.	Other: Please specify	
c.	Senior Manager/Manager				

Section B: Expectation towards Terminal Facilities at LCCT Development

Q2: From the following please select what you consider to be the most important facilities at Low Cost Terminal (LCT) and rate them in order of importance. **Please tick (x) your answer.**

Please rank from: (1: Very important; 2: quite important; 3: Moderate; 4: Not important; 5: Not very important)		**Score**					
		1	**2**	**3**	**4**	**5**	**N/A**
A	**TF associated to Check-in Counter & Baggage Drop**						
1.	Airline ticketing counter						
2.	Fast track/premium facilities						
3.	No-baggage check-in						
4.	Pre-departure check-in						
5.	Number of manual check-in counter						
6.	Self-service check-in kiosk						
7.	Split check-in desk						
8.	Others:						

Please rank from: (1: Very important; 2: quite important; 3: Moderate; 4: Not important; 5: Not very important)		Score					
		1	2	3	4	5	N/A
B.	**TF associated to Commercial Area**						
1.	Airline office						
2.	Airline shop						
3.	Café or restaurant						
4.	Others:						
C.	**TF associated to Departure Lounge**						
1.	Flight boarding counter						
2.	VIP lounges						
3.	Boarding pass control machine						
4.	Airbridge						
5.	Contact stand						
7.	Others:						
D.	**Baggage Reclaim area**						
1.	Baggage reclaim display						
2.	Airline lost and found counter						
3.	Automatic baggage handling carousals						
4.	Others:						
E.	**Others facilities**						
1.	Lighting						
2.	Air conditioning						
3.	Carpeting						
4.	Disabled facilities						
5.	FIDS						
6.	Prayer room						
7.	Restroom						
8.	Information desk						
9.	Others:						

16 APPENDIX 6

AIRLINE SURVEY QUESTIONNAIRE (POST- DEVELOPMENT)

Please note that all information will be treated as strictly confidential. Please provide the following information as requested. Please tick (x) against your answer.

Section A: Respondent Background

Q1: Which of the following options best describes your current position in the airline industry?

Please choose one					
a.	CEO/ Managing Director		d.	Senior executive/ Executive	
b.	General Manager		e.	Other: Please specify	
c.	Senior Manager/Manager				

Section B: Provision of Terminal Facilities for Low Cost Terminal Design

Q2: From the following, what would be an appropriate airport charges discount as a trade-off between provision of terminal facilities available at LCT area? **Please tick (x) your answer**

TERMINAL FACILITIES (TFs)		**SCORE**			
A.	**TFs associated to Check-in Counter**	**10%**	**20%**	**30%**	**No change**
1.	No. of manual check-in				
2.	Hand baggage check-in				
3.	Baggage sorting machine				
4.	Airline office				
5.	Ticketing counter				
6.	Self-service check-in machine				
7.	Others:				

TERMINAL FACILITIES (TFs)		SCORE			
B	**TFs associated to departure lounge**	**10%**	**20%**	**30%**	**No change**
1.	Airline boarding counter				
2.	Airline shop				
3.	Boarding pass control machine				
4.	Airbridge				
5.	Standing area				
6.	Seating				
7.	Others:				

TERMINAL FACILITIES (TFs)		SCORE			
C.	**TFs associated to baggage reclamation and arrival halls**	**10%**	**20%**	**30%**	**No change**
1.	Lost and found counter				
2.	Number of baggage reclaim carousal				
3.	Baggage reclaim display				
4.	Others:				

TERMINAL FACILITIES (TFs)		SCORE			
D.	**Other facilities**	**10%**	**20%**	**30%**	**No change**
1.	Air conditioning				
2.	Disabled facilities				
3.	Flight Information Display System (FIDS)				
4.	Information counter				
5.	Wayfinding				
6.	Café or restaurant				
7.	Product promotional Area				
8.	Toilet				
9.	Others:				

17 APPENDIX 7

AIRPORT SURVEY QUESTIONNAIRE (POST- DEVELOPMENT)

Please note that all information will be treated as strictly confidential. Please provide the following information as requested. Please tick (x) against your answer.

Section A: Respondent Background

Q1: Which of the following options best describes your current position in the airline industry?

Please choose one					
a.	CEO/ Managing Director		d.	Senior executive/ Executive	
b.	General Manager		e.	Other: Please specify	
c.	Senior Manager/Manager				

Section B: Provision of Terminal Facilities and Cost and Revenue Structures

Q2: What is your opinion towards the inclusion the provision of terminal facilities (TFs) for LCT design? Please score the statements from 1 (Strongly disagree) …. 5 (Strongly agree)

	Please rank from: (1: Strongly disagree; 2: disagree; 3: Neither agree or disagree; 4 : Agree ; 5: Strongly agree)	1	2	3	4	5	N/A
A) Economic Factor							
	A1) Profitability						
1.	Introduction of only basic TFs will increase passenger traffic in LCT						
2.	Potential increase in airport revenue by commercial activities introduced at LCT						
3.	Consider permanent space for commercial activities						
4.	Consider temporary space for commercial activities						
5.	Convert 'luxury' TFs to commercial facilities						
	A2) Cost efficiency						
	i) Investment Cost						
1.	Reduction of capital investment cost through development of new terminal						
2.	Reduction of capital investment by simplifying TFs						
3.	Reduction of capital investment by downgrading TFs						
	ii) Airport Charges						
1.	Providing basic TFs would decrease amount of airport charges:						
	a) Landing charges						
	b) Passenger security charges (PSCs)						
	c) Airbridges charges						
	d) Parking charges						
	e) Office and administration charges						
	f) Government taxes						
	g) Terminal navigation charges						
	h) Ground handling charges						
	i) Others: Please specify:						
2.	Reduction of airport charges is essential as a trade-off as introduction of basic terminal facilities						
	iii) Operational cost						
1.	Introduction of only basic TFs would bring increased efficiency in terminal area, mostly during peak hours						
2.	Reduction of operating cost through minimising operational processes in LCT activities						
3.	Reduction of operating cost through minimising labour cost						
4.	Reduction of operating cost through introduction of advance technologies such as self-service check-in kiosks						

Section C: Provision of Terminal Facilities for Low Cost Terminal Design

Q3: From the following, what would be an appropriate airport charges discount as a trade-off between provision of terminal facilities available at LCT area? **Please tick (x) your answer**

TERMINAL FACILITIES (TFs)		**SCORE**			
A.	**TFs associated to check-in area**	**10%**	**20%**	**30%**	**No change**
1.	Airline office				
2.	Product promotional area				
3.	Airline ticketing counter				
4.	Bureau de change				
5.	Café' or restaurant				
6.	Cash machine				
7.	Flight Information Display System (FIDS)				
8.	Hand baggage check-in				
9.	Manual check-in desk				
10.	Seating				
11.	Self-service check-in kiosk				
12.	Convenience shop				
13.	Television				
14.	Trolley				
15.	Others:				

TERMINAL FACILITIES (TFs)		SCORE			
B	**TFs associated with departure lounge**	**10%**	**20%**	**30%**	**No change**
1.	Airline boarding counter				
2.	Airline boarding pass control machine				
3.	Airline shop				
4.	Contact stand				
5.	Bureau de change				
6.	Café or restaurant				
7.	Cash machine				
8.	Seating				
9.	Convenience shop				
10.	Product promotional area				
11.	Smoking area				
12.	Television				
13.	Other:				

TERMINAL FACILITIES (TFs)		SCORE			
C.	**TFs associated with baggage reclamation and arrival halls**	**10%**	**20%**	**30%**	**No Change**
1.	Information counter				
2.	Baggage reclaim display				
3.	Bus ticket counter				
4.	Café or restaurant				
5.	Cash machine				
6.	Left luggage counter				
7.	Lost and found counter				
8.	Automatic baggage handling carousal				
9.	Seating				
10.	Convenience shop				
11.	Product promotional area				
12.	Taxi counter				
13.	Others:				

TERMINAL FACILITIES (TFs)		SCORE			
D.	**Others:**	**10%**	**20%**	**30%**	**No change**
1.	Air conditioning				
2.	Wayfinding				
3.	Baby changing facilities				
4.	Disabled facilities				
5.	Flight Information Display System (FIDS)				
6.	Information counter				
7.	Prayer room				
8.	Public telephone				
9.	Public waiting area				
10.	Smoking area				
11.	Staff restroom				
12.	Toilet				
13	Others:				

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Table 1 Selection of TFs in Check-in area

Terminal Facilities	Core Facilities (ρ-values)	Secondary Facilities (ρ-values)
Check-in area		
Air conditioning	0.011	
Airline ticketing counter	0.003	
Information counter	0.034	
Baby changing facilities		0.881
Trollies		0.059
BDC	0.046	
Café or restaurant	0.050	
Cash machine		0.965
Disabled facilities		0.101
FIDS	0.037	
Manual check-in counter	0.007	
Prayer room		0.124
Promotional area		0.698
Seating	0.034	
Self-service check-in machine	0.027	
Shop		0.051
Smoking area		0.881
Telephone	0.028	
Television		0.657
Toilet	0.004	
Wayfinding		0.088

Table 2 Selection of TFs in Departure Lounge

Terminal Facilities	Core Facilities (ρ-values)	Secondary Facilities (ρ-values)
Departure Lounge		
Air conditioning	0.015	
Baby changing facilities		0.105
BDC	0.041	
Café or restaurant	0.010	
Cash machine	0.033	
Children plays area		0.061
Disabled facilities		0.148
FIDS	0.012	
Information board	0.031	
Internet	0.018	
Prayer Room		0.308
Product promotional area		0.331
Public telephone		0.106
Seating	0.001	
Self- service vending machine	0.023	
Shop	0.050	
Smoking area		0.110
Television		0.057
Toilet	0.021	
Viewing deck		0.101
Wayfinding		0.114

Table 3 Selection of TFs in Baggage reclamation and arrival hall

Terminal Facilities	Core Facilities (ρ-values)	Secondary Facilities (ρ-values)
Baggage reclamation and arrival hall		
Air Conditioning	0.046	
Information counter	0.025	
Baby changing facilities		0.521
Baggage reclamation signage	0.050	
Trollies		0.542
BDC		0.149
Bus counter		0.866
Café or restaurant		0.685
Car hire counter	0.045	
Cash machine		0.133
Disabled facilities		0.740
FIDS	0.007	
Hotel reservation counter	0.025	
Left-luggage service	0.006	
Lost and found counter		0.096
Prayer room		0.561
Seating	0.026	
Self- service vending machines	0.028	
Shop	0.026	
Taxi counter	0.010	
Telephone		0.916
Television	0.049	
Toilet	0.044	

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Table 1 Selection of TFs in Check-in area

Terminal Facilities	Core Facilities (r-values)	Secondary Facilities (r-values)
Check-in area		
No. manual check-in counter	0.016	
Hand baggage check-in		0.438
Airline office		0.518
Ticketing counter	0.024	
Self-service check-in	0.005	

Table 2 Selection of TFs in Departure Lounge

Terminal Facilities	Core Facilities (r-values)	Secondary Facilities (r-values)
Departure Lounge		
Airline boarding counter		0.190
Airline shop		0.112
Boarding pass control machine		0.364
Airbridge		0.797
Standing area		0.364
Seating	0.024	

Table 3 Selection of TFs in Baggage reclamation and arrival hall

Terminal Facilities	Core Facilities (r-values)	Secondary Facilities (r-values)
Baggage reclamation and arrival hall		
Baggage reclaim display		0.051
Number of baggage reclaim carousals	0.012	
Lost and found counter		0.097

Table 4 Selection of other TFs

Terminal Facilities	Core Facilities (r-values)	Secondary Facilities (r-values)
Other facilities		
Air conditioning		0.797
Disabled facilities	0.018	
FIDS		0.197
Information counter		0.797
Wayfinding		0.147
Café or restaurant		0.518
Promotional area		0.240
Toilet	0.021	