

# A review of Kuala Lumpur International Airport (KLIA) as a competitive South-East Asia hub

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**Abstract.** This paper is aimed to determine the strengths and weaknesses of Kuala Lumpur International Airport (KUL) against its competitors in Southeast Asia countries. Due to the geographical and market relevance issues, several airport hubs around KUL are chosen for comparison: Changi International Airport (SIN), Suvarnabhumi International Airport (BKK) and Soekarno-Hatta International Airport (CGK). Strengths, weaknesses, opportunities and threats (SWOT) analysis is used to evaluate the comparative situation between the airports in relation to changing industry and market environment. The study discovers some competitive edges for KUL. Nonetheless, the airport still has to be improved to face future challenges and it is under imminent threat of new aircraft technology.

## 1. Introduction

The airport or aerodrome has been defined by the International Civil Aviation Organization (ICAO) as an area intended to be used either wholly or in part for the arrival, departure and the surface movement of aircraft. Airport can be considered as an operation system comprising of infrastructure, equipment, personnel, operating and management procedures that collectively provide services to its customer. The airport standard reflects on its own management efficiency, whether it is adaptable to the current changes or maintains its own management system. Management decisions on future strategic direction will influence the infrastructure facilities and capacities, and the future of the airport [1].

The main objective of this study is to establish the strengths and weaknesses of the Kuala Lumpur International Airport (KUL) against its competitors within the Southeast Asia region. Few competitor airport hubs have been chosen for comparison, which include the Changi International Airport (SIN), Suvarnabhumi International Airport (BKK) and the Soekarno-Hatta International Airport (CGK). The factors that contribute to the strengths and weaknesses are also identified.

## 2. Methodology

To conduct this study, the strengths, weaknesses, opportunities and threats (SWOT) analysis is applied as suggested by Ref. [2], which adopts both the environment focus school of thought [3] and resources based view [4]. The idea is to identify each airport's competitive factors based on the identified criteria for a good airport hub. In evaluating these factors, the industry environment and resources are assessed as an opportunity or a threat that the airport management needs to mitigate to enhance its strength in the weakness areas or address the threats.



There are different methods to measure the service quality. It is rather insufficient to only review the economic performance of an airport to evaluate its overall performance. An airport hub acts as a centre point that connects anyone to anywhere. Airports Commissions London states that airport hubs enable a virtuous circle of connectivity by aggregating the demand for passengers and freight, drawing on origin/destination and transfer traffic, and a comprehensive mix of short-haul and long-haul flights [5]. Hubs continue to play a key role in aviation because they serve the economic interests of airlines and meet the connectivity needs of passengers and freight. An effective hub airport with the sufficient spare capacity will maximise passenger choices and also promote airline competition, enabling new entrants, routes and frequencies [5]. According to Airport Council International (ACI), the best airport can be examined according to the passenger numbers and its excellence and achievement in facilities, customer services, operations, retail, environmental awareness and community relations [6]. However, in this study, the review is done through the selective sub-areas as tabulated in Table 1.

Table 1: Selective criteria of best airport by ACI Europe

<b>Criteria</b>	<b>Description</b>
Facilities	Accessibility to all users; assistance to and accessibility for persons with reduced mobility; public transport access; cleaning facilities; parking facilities; check-in processes, including self-service check-in; information desks and VIP areas.
Customer Service (Passengers)	Food and beverage; banking facilities; lounges/meeting infrastructure; internet access; toilets; luggage trolleys and baggage reclaim; WIFI Internet Access; variety of additional services, for example, children's nurseries/post office/beauty facilities; car park/park & ride facilities; staffing levels; monitoring of customer satisfaction and customer service improvements and specific initiatives undertaken to enhance the passenger experience.
Customer Service (Airlines)	Developing long term partnerships; attracting new airline partners; marketing support and incentives offered

Meanwhile, a successful airport hub has to possess a certain quality level to ensure its operational efficiency and attractiveness towards the airlines and passengers. Airports Commissions from London has outlined some characteristics that determine the effectiveness of airport hub operation and they are sufficient capacity, optimized facilities and also capability to support relatively unrestricted 24 hours operations, without dire impacts on local communities [5]. The capacity of an airport hub is crucial since this allows the launching of new routes and flight frequencies, which subsequently enables the hub carriers to organise their flights in connecting flights that minimise transfer times for passengers. Without sufficient capacity, the airport hub cannot provide such slots. One of the factors that airlines are concerned with is the runway capacity of the airport that is measured to provide an estimate on how many aircraft movements can be performed on the runway system during specific unit of time (especially in one hour) [7]. The runway configurations also affect the types of aircraft that could be served in the airport and the required separation between aircraft needs to be considered for safety reasons. Therefore, to achieve a successful hub, the airport operators need to be good in planning its operation 10 to 20 years ahead in the future. Furthermore, facilities are among the services provided by the airport and they have become one of the competitive factors among rival airports. Optimizing the facilities includes minimizing the costs, turnaround times for airlines and the processing times for freight and passengers. This should help the airport hub to maximize its operation and provide better quality of experiences that passengers expect. Last but not least, it is essential for a hub to be effective in supporting passenger and freight operations, specifically early morning long-haul arrivals and night-time freighter services. Mostly applied in the European countries, the standard eight hours night period

applied to most noise sources, also known as curfew (including road and rail traffic), is between 2300-0700 hours. Specifically for this paper, selective scopes of facilities and operational categories of an airport hub are chosen for comparison and they include connectivity, facilities, traffic flows, locations and durations, free Wi-Fi, banking, baggage, duty free outlet, transportation and medical centre.

### 3. Results and Discussion

Connectivity says a lot about an airport. Table 2 shows the connections of each considered airport to each various regions' busiest airport hubs in a year. The data are collected from the airport's departure schedule, followed with the airlines and aircraft model that the airlines used.

Table 2: Flight frequencies and capacity of each airport in a year [8-11]

<b>Airport</b>	<b>Europe (London)</b>	<b>Middle East (Dubai)</b>	<b>United States (Los Angeles)</b>	<b>Australia (Sydney)</b>
KUL	2,704 flights 1,099,280 pax	2,548 flights 1,179,828 pax	-	1,872 flights 642,096 pax
CGK	52 flights 16,536 pax	832 flights 317,304 pax	-	780 flights 205,452 pax
BKK	1,456 flights 531,076 pax	3,640 flights 1,264,900 pax	-	936 flights 321,516 pax
SIN	2,288 flights 859,976 pax	2,184 flights 892,528 pax	728 flights 272,636 pax	2,964 flights 983,216 pax

The direct route to Los Angeles is advantageous to SIN since it is the only hub to currently provide this connection. The next highest flight frequency provided from SIN is to Sydney. This shows SIN has high connectivity in two regions compared to other airports with only one. The highest frequency flights to Europe (London) are from KUL whereas the most frequent route to Dubai is offered from BKK. In contrast, CGK's flights to each region are not as frequent as others and one of the reason for this situation is that CGK has more domestic flights than international flights. Operators should be aware that getting a connection to the region's busiest airport hub is not easy. There is a reason for passengers heading for the busiest airport, whether it is for business, further study or VFR. Having a connection to the busiest airport is a confirmation in the industry that the airport is growing and has the capability to cater the increasing demands. KUL should attract more international routes to cover its weakness of not flying to Los Angeles even though it already has the highest frequency for London. This can be done by increasing the frequencies for existing routes or making marketing segmentation for future demands.

Furthermore, Figure 1 illustrates the comparison of population, tourists flow and passenger handled among KUL, SIN, CGK and BKK airports. The passengers handled in KUL and SIN have been higher than their own population and tourists flow, respectively. This proves that the airport users are getting more mobility than ever. Passengers now can access any destination easily through the airport hub's connectivity and can reach any airport by direct or indirect connectivity of a hub. As discussed before, one of the keys to improve an airport's performance is to enhance its connectivity. The more choices the airport can provide, the higher the willingness of passengers to choose the airport. In other words, the level of convenience of an airport affects its performance. The level of convenience that an airport hub brings to passenger does not only limited to the provision of various routes but also includes the facilities and services in the hub. Since local population and tourists have been shown to be in contrast with the passenger flow, the airport operator should target the purpose of every passenger. Different types of passengers have different demands and the operator has to identify which categories of the passengers occupy the bigger ratio of the total passenger flow such that strategies could be planned. The airport revenue does not only depending on aeronautical but also non-aeronautical. Therefore, the segmentation of target market (passengers) is vital to generate more revenue. As passengers increase

their dwelling time in airport, the higher the possibility for them to spent money in airport. So, various outlets that can fulfil requirements of different types of passengers (business traveller, leisure, further studies, etc.) should be provided in airport. For the other two airport hubs, CGK and BKK, the number of tourists and passenger handled are lower than their own population. Based on the results, it is more suitable for CGK and BKK to build a hub in its own population to cater the high number of its own population to increase their competitiveness. KUL and BKK have more advantages to focus in tourism aspect as the tourist flows are higher than SIN and CGK. The right marketing strategy must be planned to attract passengers such that the airport could compete with others. Referring to the forecast from Airbus and Boeing, Asia Pacific has the highest potential market growth and based on this projection, KUL should consider some focused routes to China or India.

On the other hand, cargo movements for each airport did not show any big changes. Based on the data provided, all airports have maintained their rank. Some cargo movements of airports like BKK and KUL have fluctuated a little but that did not affect their overall performance. Cargo movements for most airports have suffered a slight down slope in 2016 as indicated in Figure 2 but SIN is the only airport to increase its cargo movements from 1,847,423 tons to 1,867,784.

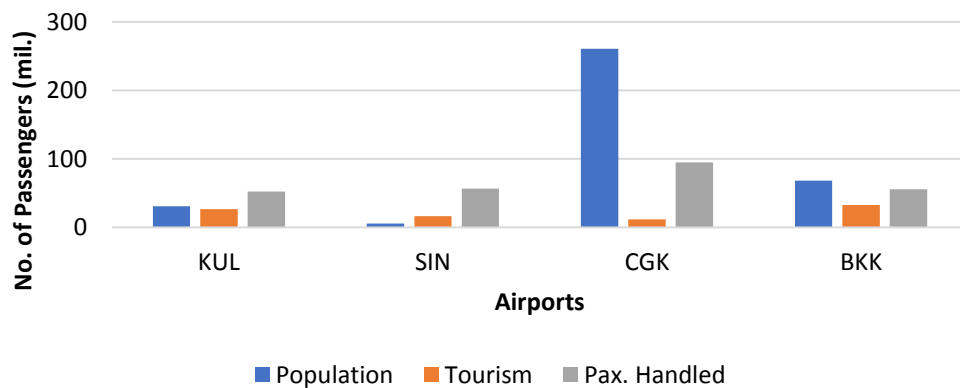


Figure 1: Comparison of population, tourists flow and passenger movements for 2016 [8-11]

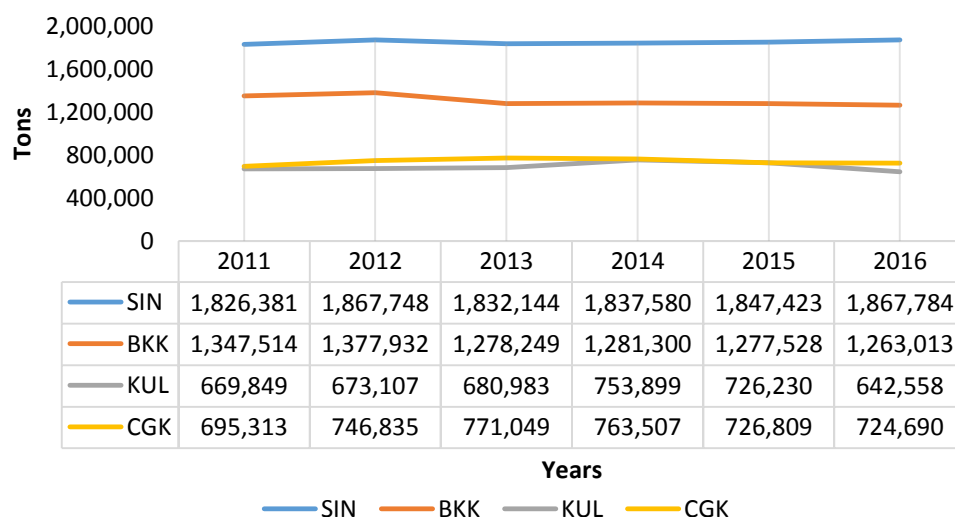


Figure 2: Cargo movements from 2011 to 2016 [8-11]

Cargo movements are part of the supply chain. Singapore has topped the list of ASEAN countries on Logistics Performance Index (LPI) for 2016, ranking fifth globally. This shows that Singapore has

major logistic firms operating their regional and global functions there, and their consistent efforts to drive the operational excellence through public-private collaborations [12]. Although this includes the other modes of transportation, air cargo performance is the best proof for the firms' logistic industry. According to latest biannual report published by World Bank Group, Singapore, Malaysia, Thailand and Indonesia have all outperformed the East Asia and Pacific regional average. Indonesia, Vietnam and Philippines are ranked among the top 10 of lower middle-income countries [13]. Table 3 tabulates the global LPI ranking for Malaysia, Thailand, Singapore and Indonesia in 2016. It should be noted that this international score uses six key dimensions to benchmark the performance: infrastructure, customs, international shipments, logistics competence, tracking and tracing, and timeliness.

Table 3: Global LPI ranking and score [12]

Country	LPI Rank	LPI Score
Malaysia	32	3.43
Singapore	5	4.14
Thailand	45	3.26
Indonesia	63	2.98

In addition, Table 4 tabulates the flight duration between each hub. The flight duration shown is for direct and connecting flights. The purpose of showing these flight duration is to highlight how aircraft technology will affect the competitiveness of an airport hub. The current longest scheduled flight by flying the Boeing 777-200LR aircraft with 259 seats for 17 hours and 30 minutes, 9,032nm is from Doha hub to Auckland, New Zealand. It is the new service offered by Qatar Airways on 5th February 2017 [14]. As for Airbus aircraft, the current longest range is by A340-500 with capacity of 293 seats and 9,000nm range that can fly more than 18 hours [15]. Boeing is currently innovating B777x, which is expected to be introduced in the market by 2019 [16]. As the technology in aviation industry further develops, it also indirectly endangers the airport's competitiveness. The longer an aircraft can fly, the lower the competitiveness of an airport will be, especially for transit airports. For instance, consider the case study of Colombo Airport in Ref. [1]. The airport is in a geographically advantageous position to become a hub in South Asia since its geographical location makes it suitable to cater lots of airlines that need technical stop or transit. As the aircraft performance improves by time, the duration of long-haul flights become longer and the possibility of serving long-haul direct flights is also getting higher. Subsequently, its geographical location advantage has become invalid.

Table 4: Flight duration from each airport to different region [8-11]

AIRPORT	LONDON (LHR)	DUBAI (DXB)	SYDNEY (SYD)	LOS ANGELES (LAX)
KUL	13hrs 30mins – 17hrs 50mins	7hrs – 10hrs 20mins	8hrs 15mins – 11hrs 45m	17hrs 40mins – 23hrs 50mins
CGK	16hrs 15mins – 20hrs 50mins	8hrs – 10hrs 40mins	6hrs 50mins – 10hrs 55mins	18hrs 35mins – 24hrs
BKK	12hrs 25mins – 6hrs 30mins	6hrs 40mins – 9hrs 30mins	9hrs – 12hrs 20mins	16hrs 55mins – 22hrs
SIN	13hrs 35mins – 17hrs 45mins	7hrs 20mins – 10hrs 30mins	7hrs 45mins – 11hrs 10mins	18hrs – 23hrs 30mins

For KUL, it is located in the centre of these four airports and thus has the advantage of the flight duration to become a hub between Europe and Australia. The flight from KUL to London needs 13 hours and 30 minutes while the flight from KUL to Sydney requires 8 hours and 15 minutes. The total flight duration of both destinations is within the current aircraft range, which makes KUL a more suitable stop for operating airlines. However, for BKK and CGK, total flight duration for both regions

exceeds the aircraft range. In other words, KUL is indeed strategically placed in between these two regions. With new aircraft technology that enables airlines to have only one stop during the flight, many passengers prefer direct flights than connecting flights since the former will save more time and provide a hustle-free long-haul flight experience. An aircraft that could operate longer distance and time will benefit the airlines by saving their expenses in airport charges and resources. However, without a stop in between the entire flight, transit airports will lose their competitiveness as airlines will stop flying into them. In nutshell, airport hubs might face a crisis in the market for the transit or technical stops. A proper strategy must be planned to prevent this situation from happening to support the hub's revenue and performance.

In the meantime, Figure 3 shows the passenger flow for each airport from 2011 to 2016, with CGK is ranked in first place by handling 95,100,000 passengers in 2016. All airports have shown increments of the passenger flow but the gap between them and CGK is maintained. Airports other than CGK have similar number of passenger flows for 2016, which is about 50 million passengers. This six-year trend shows some changes in the passenger flow for each airport. BKK was second among the airports at the beginning before it suffered a slight drop in 2014 and finally, it is placed behind SIN in 2016. The performance of SIN has gradually increased within the past six years. As for KUL, the increment is very little and this indicates that its performance is slightly weaker than the others.

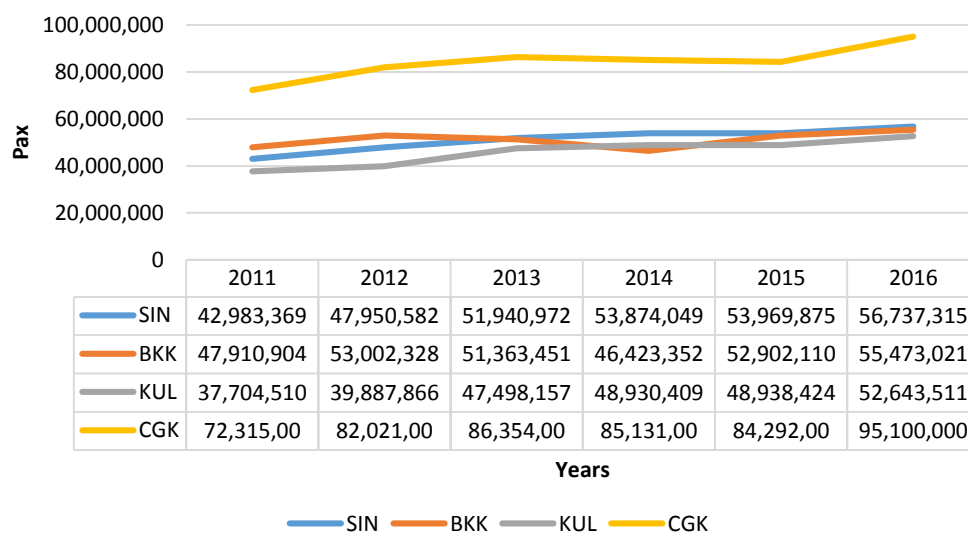


Figure 3: Passenger movements from 2011 to 2016 [8-11]

Table 5 lists the capacity of passengers and aircraft in each airport. The airport that owns the largest capacity is SIN, having 67 million passenger capacity per year and 123 parking bays. In second place is BKK, with capacity of 45 million passengers per year and 120 parking bays, followed by KUL and CGK. Comparing the capacity and the actual number of passengers handled for the airports, both CGK and KUL are currently handling doubled the amount of its passenger capacity. This situation is further illustrated by Figure 4. One of the airport hub criteria is to have adequate capacity and able to expand or increase it if necessary. A sufficient capacity helps in maximizing passengers' choice and promoting airline competition, enabling new entrants, routes and frequencies [17]. Among the four airport hubs, the only airport that is over capacity is SIN, which reaches 85% in 2016. For the other three airports, CGK has the highest over utilization rate with 432%. This is followed by KUL, with over utilization rate of 227% and BKK with 124%. Over utilization is an issue that disturbs the whole flying progress. The consequences could be dreadful for both the airport and its users. For instance, London Heathrow lost a lot of traffic to Dubai due to its inability to serve the growing connections [18]. Facing the same problems, Jeddah airport has been demanded by its authority to avoid delays and crowded problems



[19]. Insufficient capacity of an airport will decrease its capability to reach high service quality and it will slowly lose one of the major criteria as the best airport hub. Flight delays, crowded airport and the long queues are consequential issues that could affect airport performance. Flight delays and crowded airport frustrate both the airlines and passengers easily. Capacity in an airport affects the queuing time and terminal seating, which are the two major contributing factors to rate an airport in SKYTRAX. SIN has been rated as a five star airport, BKK and CGK both have three star rating while KUL has not been rated. As for the queuing time and seating, BKK, CGK and KUL are rated with three stars. This shows that capacity in airport plays an important role in airport performance. One of the criteria for a good airport is to be flexible enough to expand its terminal to cater for future demands. KUL should forecast the demands and have suitable terminal expansion plan to avoid overutilization of its terminal.

Table 5: Terminal capacity for the considered airports [8-11]

Airport	Terminal 1	Terminal 2	Terminal 3	Total Capacity
KUL	5 million passengers per annum	(Satellite) 20 million passengers per annum	-	25 million passengers per annum
	43 parking bays	41 parking bays	-	84 parking bays
CGK	9 million passengers per annum	9 million passengers per annum	4 million passengers per annum	22 million passengers per annum
	21 parking bays	21 parking bays	28 parking bays	70 parking bays
BKK	45 million passengers per annum	-	-	45 million passengers per annum
	120 parking bays	-	-	120 parking bays
SIN	21 million passengers per annum	23 million passengers per annum	22 million passengers per annum	67 million passengers per annum
	45 parking bays	36 parking bays	42 parking bays	123 parking bays

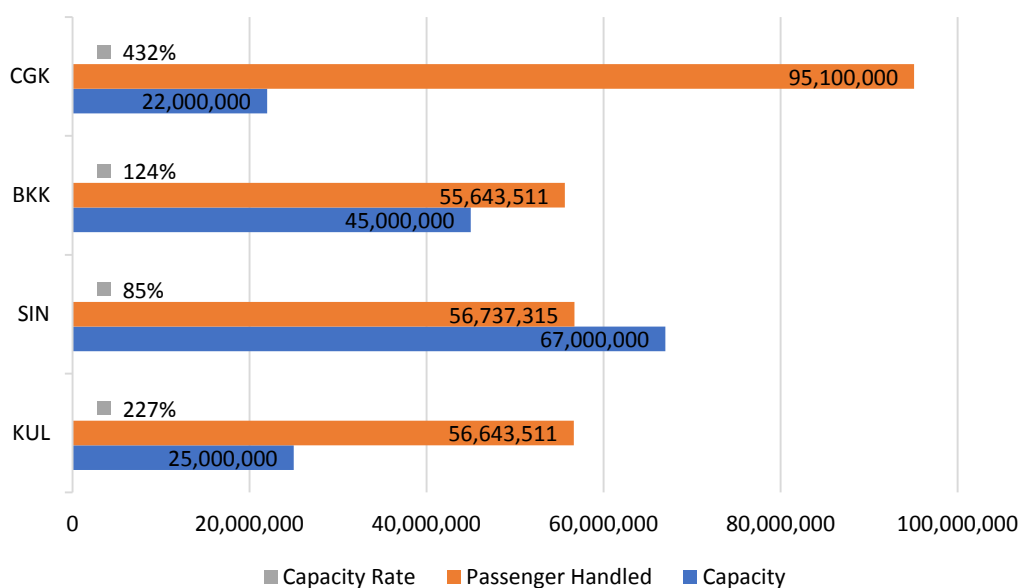


Figure 4: Terminal capacity and passenger handled for each airport [8-11]

Figure 5 represents all aircraft movements for the airports in six years. In 2016, CGK is ranked in first place with 763,395 aircraft movements, followed by KUL with 356,614, SIN with 351,059 and lastly BKK with 333,263. Meanwhile, the capacity for runway per hour is shown in Table 6 and it can be seen that the highest utilization among these airports is 89% for BKK. However, SIN is yet to open its third runway to cater for growing demands. The lowest rate of runway utilization is KUL, which is only 65% that could be categorized as average utilization. Comparing aircraft movements with cargo and passenger flows, the data shows a contrast especially for KUL. The aircraft movements are higher than BKK and SIN, but the passengers and cargo movements for KUL are the lowest among these four airports. This proves that the aircraft using KUL are not as fully loaded as others or the aircraft model used are smaller.

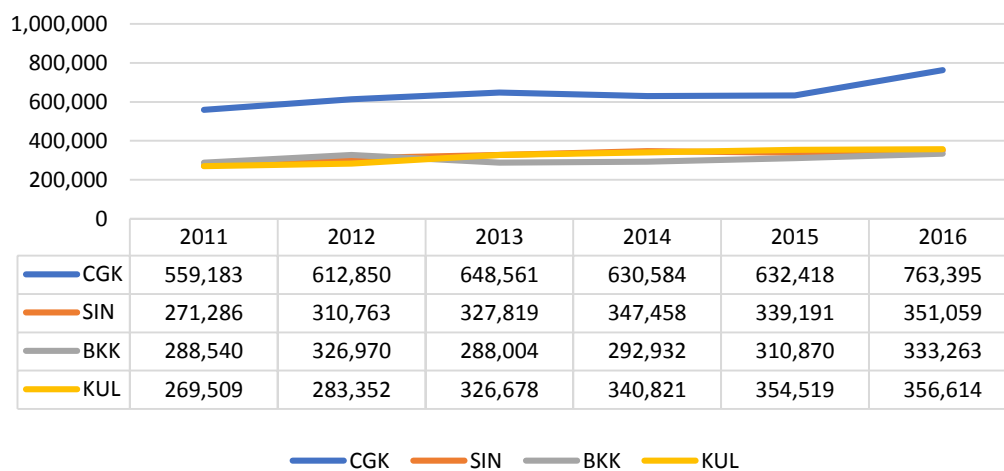


Figure 5: Aircraft movements from 2011 to 2016 [8-11]

Table 6: Runway capacity and actual handled aircraft per hour [8-10]

Airport	KUL	CGK	BKK	SIN
Runway Capacity (per hour)	120 (78 in actual) 65%	86 (72 in actual) 84%	76 (68 in actual) 89%	N/A (42 in actual) -

All airports have been documented to have free Wi-Fi, duty-free shopping outlets, medical centers, and necessary facilities for special-needs visitors. Other facilities, however, differ in terms of not just the availability, but also in terms of the names of companies / brands offered. The basic facilities and services provided for airlines and passengers are listed in Table 7 and 8, respectively. It can be seen that all airports provide similar services and facilities to airlines and passengers. When every airport is doing the same thing, how can they compete among themselves? Therefore, SIN has started to focus into its passenger's experience. Due to high capacity of SIN, the airport provides a total of 18 lounges that caters for different categories of airlines passengers. In addition to that, various types of gardens, entertainment deck, movie theatres and others are built in the airport to maximize the passengers time spent in the terminal. A modernized airport focused on how a passenger or airport user feels when they are in the airport. The operator will try their best to make them feel comfortable and enjoyable while spending time in an airport. Airport operator should know the way to help passengers to kill their time while waiting to board their flights, and also for non-passenger and arriving passengers. Since airport experience is one of the major challenges in the aviation industry, it is suggested KUL could provide facilities or services that can make passengers to prefer staying a longer time in the terminal.



Table 7: Facilities and services prepared for airlines [8-11]

Facility	KUL	SIN	BKK	CGK
Lounges	12	18	5	11
Curfew	None	None	None	None
Aircraft Maintenance	KLAS Engineering Services Sdn. Bhd.  Sepang Aircraft Engineering Sdn. Bhd.	SIA Engineering Company  Singapore JAMCO Services Pte Ltd	THAI Technical	GMF AeroAsia  FL Technics
Runway Type	2 Parallel 32L 14R 32R 14L	2 Parallel 02L 20R 02C 20C	2 Parallel 01R 19L 01L 19R	2 Parallel 07L 25R 07R 25L

Table 8: Facilities and services prepared for passengers [8-11]

Facility	KUL	SIN	BKK	CGK
Banking (money exchange, ATM)	CIMB, Maybank, Hong Leong, Bank Muamalat, Al Rajhi Bank, Public Bank	OCBC, Maybank, UOB, HSBC, DBS, POSB	KasiKorn Bank, The Siam Commercial Bank	Bank Mandiri, PT. Bank Rakyat, Bank Bca, Bank Bukopin, CIMB, Bank Danamon
Baggage Services	Super Strap, Baggage Storage	Porter Service, Baggage Storage	Bellugg, Wrapping services	Porter Service
Transportation	Bus, Taxi, Car Rental, ERL, Car Park	Bus, Taxi, Car Rental, Train, Car Park	AOT Limousine, Bus, Public Van, Airport Rail Link, Car Rental, Car Park, Shuttle Service	Shuttle Service, Bus, Car rental
Passengers Experience	Jungle Boardwalk	Gardens, Swimming Pool, Entertainment Deck, Movie Theatre, The Slides, The Social Tree	None	None

#### 4. Conclusion

This paper reviews the selective facilities and operational aspects of an airport hub focusing on KUL amongst its competitors. Throughout the paper, it highlights that the existing competitiveness of KUL is inadequate to face future challenges, especially in the designed capacity and passenger's experience. Better strategies are needed to protect and further enhance this competitiveness.

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