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A product and organisational architecture analysis of the performance of Southeast Asian airlines

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ABSTRACT

In this study, the operating environment's attributes and its influence on the performance of airlines in Southeast Asia are assessed through a comprehensive literature review and performance analysis. As a first step, a Pareto Analysis is performed to assess the capacity contribution of registered airlines in the Southeast Asia region, totalling 65 in 2019. Then, seven of the largest Southeast Asian airlines, representing 80% of total capacity in the region, are taken forward into an in-depth benchmarking and Product and Organisational Architecture (POA) performance analysis. The research pinpoints key differences between Full-Service Carriers and Low-Cost Carriers in the region through a series of 13 metrics applied in the POA. It was found that the region's FSCs scored better at Product Architecture, which includes convenience, comfort and connectivity, whilst the LCCs strength was in the Organisational Structure component, namely fleet and labour productivity, sales and distribution, and airport attractiveness, especially in the case of AirAsia.

1. Introduction

The Asia Pacific region is responsible for the largest share of the global air traffic, registering 36% of global traffic in 2018, followed by Europe and North America with 26% and 23% of global air traffic respectively (IATA WATS, 2020). In pre-Covid times, aviation contributed 3.6% of the world's GDP, but it is expected that this figure was set to double to a projected $5.7 trillion by 2036, of which a third of all the aviation traffic and economic activity was forecasted to be contributed to by the Association of Southeast Asian Nations (ICAO, 2019; Joyce et al., 2021). This isconsidering that within Asia itself, Southeast Asia has been the second largest contributor to air traffic over the last decade, receiving more than 25% of aircraft deliveries destined for the Asia-Pacific region. The commercial fleet was forecast to grow 5.7%, requiring 4,500 new aircraft between 2019 and 2038 (Boeing, 2019). Traffic growth within Southeast Asia was growing at 10% each year, particularly triggered by the surge in low cost carrier penetration across the region. Asia is now home to more than 56% of the global population and is quickly shifting from low to middle-income status within a single generation, making Asia the global centre of gravity and a fertile breeding ground for air carriers, particular for low-cost carriers to flourish and prosper (Tonby et al., 2019; Joyce et al., 2021).

One notable example is AirAsia. Existing literature on the carrier has focused on airline choice (Ong and Tan, 2010), passenger perceptions (O'Connell and Williams, 2005), service quality (Jiang, 2013), crisis-response effectiveness (Gerken et al., 2016), branding satisfaction (Wong and Musa, 2011) and its business model (Lawton and Solomko, 2005; Shuk-Ching Poon and Waring, 2010) but very little on the wider competitive landscape of carriers based in the same region as AirAsia. Between 2010 and 2019, AirAsia was able to maintain an average net profit margin of 12.6% (AirAsia, 2020). This contrasts with the meagre average financial results of the global airline industry, despite operating in an environment of unrelenting competition from both Low Cost and Full-Service Carriers (LCCs & FSCs). A thorough investigation is needed, therefore, to determine the underlying elements and factors determining the performance of airlines in Southeast Asia, including that of AirAsia. To date, there has been no systematic quantification or scoring model of Southeast Asian carriers that takes account of temporal and benchmark carrier considerations. Moreover, the airline business is notoriously complex and a more holistic model of performance encompassing a greater range of parameters should be considered to produce a more comprehensive picture of carrier performance in the context of the Southeast Asian operating region.

The overall aim of the research is to determine the performance of

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major airlines operating in the Southeast Asia market with AirAsia set as a reference carrier to facilitate and enrich comparisons between carriers. The aim has been broken down into the following objectives:

- Evaluate the Southeast Asian air transport environment, drawing out the market potential and challenges for carriers operating in the region.
- Determine the overall performance of the largest Southeast Asian airlines, representing 80% of the total capacity in the region by capacity, through a POA model
- Examine AirAsia as a reference carrier against other large Southeast Asian carriers featured in the POA analysis

The rest of the paper is divided into the following sections: Section 2 considers literature to date on the Southeast Asian air transport market and carrier performance; Section 3 outlines the selected POA methodology; Section 4 details the main POA results and findings; Section 5 outlines the overall conclusions.

2. The Southeast Asian market environment - liberalisation policy framework and the competitive landscape

2.1. The Southeast Asia air transport market

Southeast Asia is comprised of 10 independent countries: Brunei, Cambodia, Indonesia, Laos, Malaysia, Myanmar, Philippines, Singapore, Thailand, and Vietnam and collectively are known as the Association of Southeast Asian Nations (ASEAN). The ASEAN region is a dynamic market with some 668 million consumers, representing around 9.1% of world's total population and ranks as the eighth strongest economy in the world (EU Commission, 2021). This region extends to around 4.5 million km^2 and has an impressive linguistic diversity where more than eight main languages are spoken (Kratz, 1996; Worldometer, 2020). The region had witnessed increases in Gross Domestic Product (GDP) over the last decade with a 4.4% improvement in 2019, making the region one of the fastest growing in the world (Boeing, 2019). The region has risen to prominence in recent years as a generator of tourism, challenging the traditional dominance of other parts of the world and it significantly contributes to other sectors such as trade, logistics, and high-tech manufacturing. This ensemble has led to exponential growth in both domestic and international air traffic over recent years, making it the second largest aviation market in Asia, after China. The air travel business in Southeast Asia grew significantly over the 2009–2018 period and is the region with a number of LCCs and FSCs achieving growth over that period. Over 426.7 million passengers were carried in 2018, 38.8% higher than in 2009 (ASEANStats.org, 2019). The rise of LCCs, exponential growth in local economies, expanded middle-class populations and partial moves towards liberalisation have all contributed to the massive growth in air traffic demand.

Due to the uneven demographic and economic distribution across Southeast Asia, air transport capacity is not equally distributed. Most of the air capacity is highly focused on Singapore, Thailand and Indonesia. With the exception of Singapore, these countries have relatively large populations in comparison to other states in Southeast Asia. Table 1 provides a snapshot of capacity, economy and population data for all Southeast Asia states for the year 2019. Myanmar and the Philippines have low seat capacity (1% and 10% of the region's total) in comparison to their respective populations (8% and 16% of the region's total), but this is aligned with the relative size of these two countries' GDP (2% and 12% of the region's total). On a much smaller scale Brunei punches above its weight in terms of capacity (0.5% of region's total) in comparison to its population (0.06% of region's total), though again this more aligned with its relative economic size (0.42% of region's total). Overall, the top 5 Southeast Asia states in terms of ASK in 2019 represented 86% of total air transport supply, which was marginally greater than their economic contribution (83%) and substantially greater than their population contribution (71%). The major driver for this in Singapore and Malaysia is the channelling of international and intercontinental capacity through the Changi and KLIA hubs.

Boeing (2019) forecasted that Southeast Asia would see average traffic growth of 5.9% as opposed to saturated markets such as North America and Europe, with only 3.2% and 3.6% forecasted growth respectively. This is counterbalanced, however, by its challenges, including inferior infrastructure, weak currencies against the US dollar that impacts jet fuel prices, a lack of resources as well as technological developments, increased costs due to government policies, and a refusal to adopt a fully open skies policy. The ASEAN region has around 370 airports. With twice the population of the US, it only has a third of its airports (Leong, 2019).

2.2. Liberalisation policy framework

Governmental policies, such as liberalisation and deregulation support aviation growth (O'Connell et al., 2020; Doganis, 2019; Meichsner et al., 2018). Flag carriers and their governments, while highly supportive of liberal regimes on long-haul markets, had previously shown no such enthusiasm regarding short-haul services. The region's fleets were predominantly widebody aircraft, totally unsuited to high frequency, short-haul low cost (not just low priced) services. If carriers based in the region wanted to grow outside their relatively small domestic markets, they had to overcome national boundaries as well as nationally owned and controlled flag carriers, whose governments often had a strong vested interest in securing their interests – and not those of

Table 1
Distribution of air transport capacity, economy and population across Southeast Asia 2019.

Country	Traffic			Economy			Population		
	Seat capacity	ASKs (Million)	ASK % (i)	GDP per capita (US$)	GDP (US$ Mil)	GDP % (ii)	Population	Pop. % (iii)	Seats/ Population
Thailand	159,534,829	371,491	24.95	7808	543,650	16.99	69,625,582	10.38	2.29
Singapore	85,314,182	298,558	20.05	65,233	372,063	11.63	5,703,569	0.85	14.96
Indonesia	178,551,930	250,405	16.81	4136	1,119,191	34.98	270,625,568	40.35	0.66
Malaysia	106,501,171	199,824	13.42	11,415	364,702	11.40	31,949,777	4.76	3.33
Vietnam	95,415,965	159,681	10.72	2715	261,921	8.19	96,462,106	14.38	0.99
Top 5			**85.95**			**83.19**		**70.72**	
Philippines	78,920,999	158,353	10.63	3485	376,796	11.78	108,116,615	16.12	0.73
Cambodia	16,057,214	21,142	1.42	1643	27,089	0.85	16,486,542	2.46	0.97
Myanmar	12,494,628	13,811	0.93	1408	76,086	2.38	54,045,420	8.06	0.23
Brunei Darussalam	2,887,269	7831	0.53	31,087	13,469	0.42	433,285	0.06	6.66
Laos	4,805,639	4276	0.29	2535	18,174	0.57	7,169,455	1.07	0.67
Top 10			**99.75**			**99.19**		**98.49**	

Notes: (i) ASK %: Percentage of ASEAN region's total ASKs, (ii) GDP %: Percentage of ASEAN region's total GDP. Total GDP in 2019: US$8,495,893mn, (iii) Pop. %: Percentage of ASEAN region's total population. Total Population: 671 Million in 2019, (iv) There are 12 Southeast Asia states in total with East Timor and Papua New Guinea representing only 0.25% of total capacity in 2019. Sources: OAG, 2020; The World Bank, 2020.

the wider travel industry and its consequent vast economic impact (CAPA, 2020). As time evolved, over 50 different agreements between ASEAN member countries have been signed at a bilateral, trilateral, and multilateral level. Initially, Air Service Agreements (ASAs) were not made between all ASEAN countries, rather it was between sub-regional groups and most of them only involved a partial relaxation of restrictions within bilateral frameworks. In 1995, an expansion of MoU related air linkages was ratified between Indonesia, Malaysia and Thailand (IMT-GT member countries), which provided limited air services freedoms. In 2003, Cambodia, Laos, Myanmar and Vietnam (CLMV sub-region) signed a multilateral agreement on air services, which granted 3rd, 4th, and 5th freedom rights to member country registered carriers. This agreement also lifted restrictions on flight capacities, flight frequencies, routes structures, designated carriers and non-scheduled flights within the CLMV group (Forsyth et al., 2006; ICAO, 2003). The Multilateral Agreement for the Liberalisation of Air Passenger Services (MALPAS) was signed by Brunei, Singapore and Thailand in 2004, following on from an initial agreement concerning cargo services. MALPAS granted these countries 3rd and 4th freedom rights to designated carriers only (Tan, 2016). Later in 2007, the Brunei, Indonesia, Malaysia and Philippines, east ASEAN Growth Area (BIMP-EAGA) also concluded an MoU concerning the expansion of air links. The participating parties were allowed to operate air services subject to 3rd, 4th and 5th freedom traffic rights, but were authorized to only operate designated airlines by governments (BIMP-EAGA.Asia, 2007).

Table 2 shows timeline pathways to liberalisation in the region. From 1995 to 2007, most agreements that were in effect were between a few countries instead of the whole ASEAN area, although some restrictions were lifted and agreements were amended from time to time between sub-regional countries. The 'ASEAN Air Transport Integration and Liberalisation 2005–2015 Action Plan' aimed to form a Single Aviation Market within Southeast Asia by 2015 (Lenoir and Laplace, 2018). In line with developing and enhancing the air transport industry in Southeast Asia, ASEAN members concluded two landmark multilateral agreements. In 2009, the Multilateral Agreement on Air Services (MAAS) was ratified by all member countries, followed by a Multilateral Agreement for the Full Liberalisation of Passengers Air Services (MAFLPAS) in 2011 (ICAO, 2016). While MAAS has six protocols granting 3rd, 4th and 5th freedom rights between capital cities, MAFLPAS has four protocols removing the restrictions of 3rd, 4th and 5th freedoms among all other cities across the ASEAN bloc (Tan, 2016). These freedoms are proving fruitful as Zhang et al. (2008) described the unfolding events before and after LCC entry as the one-way fares on the Kuala Lumpur-Singapore route dropped from around $180 before LCC entry to around $80 as a result of the new competition posed by the new LCC entrants.

Bowen (2016) argued that deregulation triggered LCCs to flourish and their low fares have made air travel affordable for the first time to a growing proportion of Southeast Asia's middle classes. However, unlike in Europe, 6th freedoms and above are not permitted at the ASEAN level. Nevertheless, ASEAN members are contemplating the removal of restrictions to 7th, 8th and 9th freedoms by 2023. Despite not reaching a more advanced stage of intra-regional deregulation,[1] ASEAN pushed their agenda by reaching out to third countries in Europe, Japan and Korea. One notable third country agreement that ASEAN has signed as a bloc was with China in 2011, which marked a milestone for ASEAN's air liberalisation process and produced a considerable opportunity for LCCs in the region.

2.3. Competitive landscape within Southeast Asia

Southeast Asia is concentrated and dominated by only a few distinct carriers. The total number of airlines serving the region has declined despite rising air transport capacity. This is attributed to the highly competitive environment that led to a number of airline collapses, as outlined in Fig. 1. In addition, many of the major carriers in the region initiated joint ventures to circumvent the restrictions on foreign ownership and cross-border ownership. NokScoot Airlines, for example, was a JV between Thai Airways and Singapore Airlines but which subsequently folded. The penetration and expansion of LCCs since 2008 has also weakened the business case for new FSC or LCC start-ups due to the increasingly dominating market position of a few larger LCCs present in the region.

In order to illustrate levels of carrier concentration across the region, a Pareto Analysis was performed to determine market share concentrations using ASKs as the chosen capacity indicator (OAG, 2020). The Pareto principle states that a small amount of input might have the largest impact on output. This is based on the 80/20 rule, that 20% of the inputs can cause 80% of the outputs (Craft and Leake, 2002; MBN, 2022). Fig. 2 shows the market share of all 65 Southeast Asia airlines by ASKs in 2019. The largest 8 carriers represented 80% of total capacity across the region. Fig. 2 clearly illustrates that the aviation market of Southeast Asia was dominated by six FSCs, namely Singapore Airlines, Thai Airways International, Garuda Indonesia, Philippine Airlines, Vietnam Airlines and Malaysia Airlines, accounting 56% of total capacity and two LCCs, namely AirAsia Group and Lion Air, representing a further 24% of total capacity in 2019. If the next 5 largest carriers (Vietjet, Cebu Pacific Air, Batik Air, Malindo Airways and Swirijaya Air) are further aggregated to the above list, then these carriers combined controlled 86% of the market (OAG, 2020). Batik Air, Malindo Airways and Wings Air are part of the wider Lion Air Group of LCCs and if combined into one entry, would position Lion Air into third largest, above that of Thai Airways, further concentrating the total market into the hands of a few conglomerates. Overall, there were 21 LCCs and 44 FSCs in Southeast Asia. Out of the 21 LCCs, there were only eight independent airlines whereas the remaining 13 were all subsidiaries of FSCs, or joint ventures/franchises of wider LCC groups. Despite the low number of independent low-cost airlines, together, they contributed around 40% of the total capacity offered in Southeast Asia in 2019 (OAG, 2020).

Notes: Singapore Airlines includes Singapore Airlines (SQ), Scoot Tigerair (TR) and SilkAir (MI). Thai Airways International includes Thai Airways (TG) and Thai Smile Airways (WE). Philippine Airlines includes Philippine Airlines (PR) and PAL Express (2P). Malaysia Airlines includes Malaysia Airlines (MH) and Firefly (FY). Garuda Indonesia includes Garuda (GA) and Citilink (QG). AirAsia Group includes AirAsia (AK), AirAsia X (D7), Thai AirAsia (FD), Thai AirAsia X (XJ), Indonesia AirAsia (QZ), Philippines AirAsia (Z2) and Indonesia AirAsia X (XT).

The low-cost business model was introduced into the region in the early 2000s, initiated by LCCs such as AirAsia and Cebu Pacific (Gross and Luck, 2013). The rapid growth of LCCs made Southeast Asia the most developed region for the low-cost business model in Asia (Zhang et al., 2008). LCCs began to dominate the domestic markets of ASEAN with as much as 70% of capacity being occupied by LCCs in Thailand and the Philippines by 2019, and 50% in Indonesia, Malaysia and Vietnam. Meanwhile on international markets, the expansion was even faster than domestic growth. Malaysia alone had 50% of its intra-regional market offered by LCCs. In Thailand, Indonesia, Singapore, the Philippines and Vietnam, it was between 30% and 40%

[1] According to the World Trade Organization Air Liberalisation Index (ALI), none of the ASEAN member states scored (out of a maximum of 50) a particularly high level of bilateral liberalness with other states with Brunei being the highest at 18.5/50; Singapore, 15.3; Indonesia, 13.5; Philippines, 13.1; Malaysia, 12.0; and Thailand, 10.0; Vietnam, 8.2; Cambodia, 8.1; Myanmar, 7.1, Laos, 0.1 (WTO, 2020). Governments in ASEAN continued to enforce airline ownership restrictions to prevent unwanted and excessive penetration of foreign investors in domestic markets. Thus, airlines were forced to set up franchise structures (e.g. AirAsia Indonesia, AirAsia Philippines, Jetstar Asia) and joint ventures in order to bypass ownership restrictions and allow foreign investment.

Table 2
Timeline and progression of liberalisation within ASEAN states.

Status of Liberalisation between Sub-Regions										
Agreements	Year	Degree of Air Freedom								
		1st	2nd	3rd	4th	5th	6th	7th	8th	9th
IMT-GT	1995	✓	✓	✓	✓	✓	×	×	×	×
CLMV	2003									
MALPAS	2004					×				
BIMP-EAGA	2007					✓				

Status of Air Freedoms within the ASEAN bloc											
Agreements	Year	Degree of Air Freedom									Condition
		1st	2nd	3rd	4th	5th	6th	7th	8th	9th	
MAAS	2009	✓	✓	✓	✓	✓	×	×	×	×	Capital cities only
MAFLPAS	2011										All cities

Sources: ICAO, 2003; Tan, 2016; BIMP-EAGA.Asia, 2007; IMG-GT, 2018; ASEAN.org, 2020

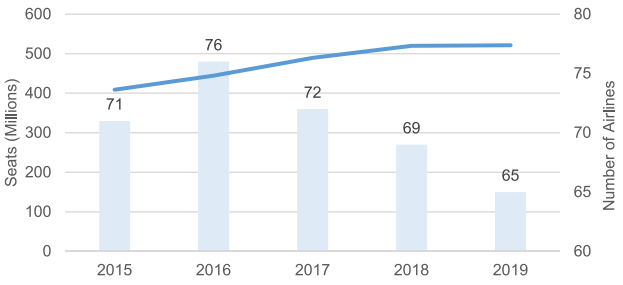

Fig. 1. Growth of seats and number of airlines in Southeast Asia from 2015 to 2019.
Source: OAG, 2020

and close to 30% in Cambodia and Myanmar. Smaller markets such as Brunei and Laos had 15% and 22% of international seats offered by LCCs respectively (CAPA, 2019). AirAsia's rise is evident when considering that it increased its fleet from 174 in 2016 to 246 by 2019, by which point it had become the largest LCC in Asia both by capacity and fleet size. It operated approximately 10,000 scheduled flights per week to 160 destinations in 23 markets supplying 74,642 million ASKs and carrying over 51 million passengers (AirAsia, 2020).

Over the last decade, the weaker ASEAN domiciled FSCs struggled to compete in this marketplace. Malaysia Airlines setup a LCC subsidiary called Firefly but it struggled to gain traction against AirAsia. It maintained a market presence by unbundling flight products, uplifting the quality of service and focussing on schedule punctuality (Ong and Tan, 2010; Pearson et al., 2015). Malaysia Airlines had been in financial trouble since 2011 and the two accidents of MH370 and MH17 in 2014 had spiralled the incumbent into producing a major net loss margin of almost 36% in 2015, which precipitated its nationalisation (Corbet et al., 2021). Meanwhile, Garuda Indonesia's financial results were affected by local currency depreciation against the dollar and political instability. Thai Airways was also affected by political instability, which resulted in its highest losses over the past decade. It was very vulnerable to LCCs due to its high cost structure, bureaucracy, inefficiencies, complex fleet structure and a crowded air transport sector in Thailand, leading to severe overcapacity. It added additional capacity and complexity by setting up two LCC subsidiaries, Thai Smile and Nok Air. Despite Nok Air being the most profitable airline in Thailand, Thai Airways' strategic

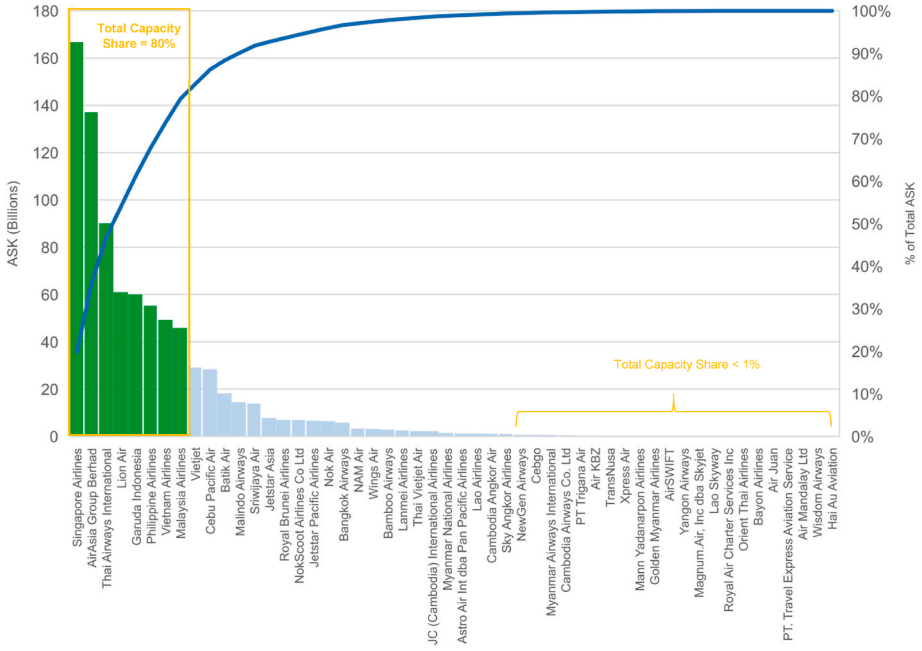

Fig. 2. Pareto Analysis: Carriers serving the Southeast Asia market in 2019.
Source: OAG, 2020

capability was still below average (Pearson et al., 2015). Asia's oldest carrier, Philippine Airlines, was also struggling to regain its historical significance and was continuously loss making as all the large LCCs converged on the market, including AirAsia who set up a division known as AirAsia Philippines. O'Connell and Vanoverbeke (2015) argued that Philippine Airlines LCC subsidiary known as PAL Express could not compete against AirAsia's low unit costs and efficiency and continuously lost market share to foreign carriers. Research by Pearson et al. (2015) found that Vietnam Airlines had the most strategic capability among other Asian carriers to contest against LCCs. The airline is heavily protected, as more than 75% its equity is owned by the government. Vietnam Airlines also possesses a 70% stake in a strong LCC Qantas subsidiary known as Jetstar Pacific, a carrier that had already proved its worth in other Asian markets. It also applied focus on product differentiation and embarked on growing revenues from its ancillary businesses.

Although air travel has represented excellent value for passengers, returns for airlines and investors have been low. Airline performance and profitability have always been distressed and the long-term average net profit margin for the global airline industry in pre-pandemic times was only 1.1% (IATA, 2020). Fig. 3 shows the operating margins of the major players in Southeast Asia over the ten-year period ending in 2019. FSCs such as Malaysia Airlines, Thai Airways International and Philippine Airlines have underperformed with years of losses. There were many underlying factors, which resulted in the weak financial performance exhibited by these dominant players in the region, chiefly among them the typically high cost structures of the region's legacy carriers. However, the overall performance of AirAsia stands out, demonstrating double digit positive margins over the period, – while the average operating margin in global airline industry stood at 5.1% (IATA, 2020).

3. Data and methodological approach

In order to determine and identify the overall performance of airlines in Southeast Asia, a Product and Organisational Architecture (POA) method has been selected, as it considers comparative business model characteristics. Product architecture relates to elements relevant to consumer preferences and service quality, while organisational architecture assesses an airline's distribution choices, vertical structure and production (Mason and Morrison, 2008). The main elements contributing to an airline's profitability is clearly depicted using this unbundling framework.

POA has been employed in several previous studies focussing on benchmarked airline performance, including Mason and Morrison (2008) and O'Connell et al. (2020). New components have been added to previous POA structures. For example, evaluation of airline ancillary structures was developed to take fuller account of reduced costs, efficiencies, and increased airline profits due to the roll out of ancillary products and services. Furthermore, O'Connell et al. (2020) enhanced the model by adding financial and external factors affecting airline operational performance into a revised POA model. The 2020 POA framework considered macroeconomic factors and political issues, making it more comprehensive than previous versions. The POA model proposed by O'Connell et al. (2020) has therefore been applied in this research and is depicted in Fig. 4.

The model is divided into four categories: Product Architecture, Organisational Architecture, Financial Indices and External Factors. Three components are evaluated under Product Architecture: connectivity, convenience and comfort. Organisational Architecture assesses five elements: fleet, labour, airports, sales and marketing and market structure. Four components, namely operating revenue, costs, ancillary revenues and profitability, fall under financial indices. External factors surrounding the airline are evaluated as having a varied impact on airline profit. Table 3 summarises a list of designated indices and metrics for each POA model concept as described diagrammatically in Fig. 4.

The first category listed in the POA model in Table 3 is financial and there are many important commercial orientated indexes associated with this metric. The operating profitability index, for example, is measured using the operating margin of the airline. This margin represents the operating profit an airline generates out of every $1 of revenue. The operating revenue structure of an airline is measured by yield, which is quantified by the average ticket price paid by a passenger per kilometre. The revenues are further enhanced by elaborating upon the percentage of ancillary revenue over total operating revenue and average ancillary revenue an airline makes from each passenger, which is particularly important for LCCs. The Cost per Available Seat per Kilometre (CASK) and fuel expenses per ASK measure the efficiency of an airline's operating cost structure.

Under product architecture, four main indexes are measured. Level of connectivity is particularly important for FSCs as their hub and spoke mechanism is determined by their bank structure together with its route network and that are all complemented further by its extensive code sharing capability. Secondly, the convenience factor is an important consideration for passengers as they want frequencies that are on-time when opting to choose a particular carrier, which affects an airline's perceived service quality and customer choice. The journey taken by

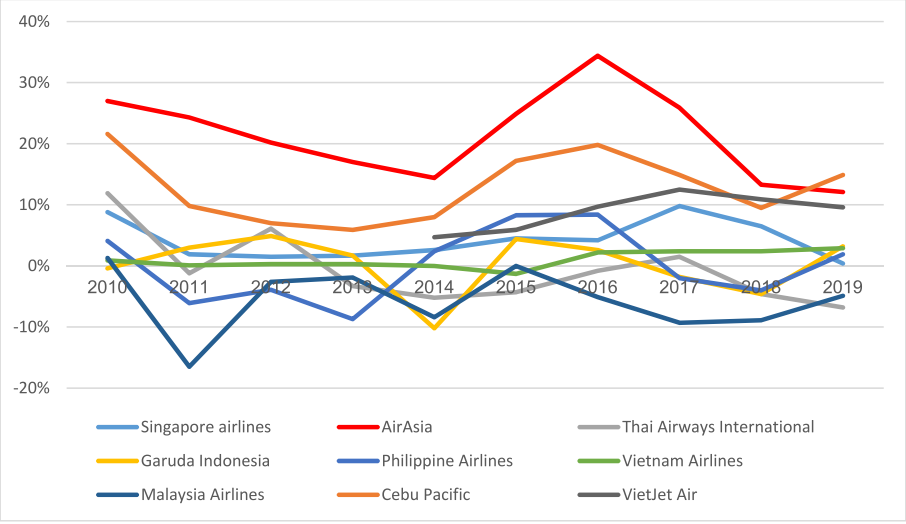

Fig. 3. Operating margins for selected Southeast Asian carriers 2010–2019.
Source: Cirium, 2020

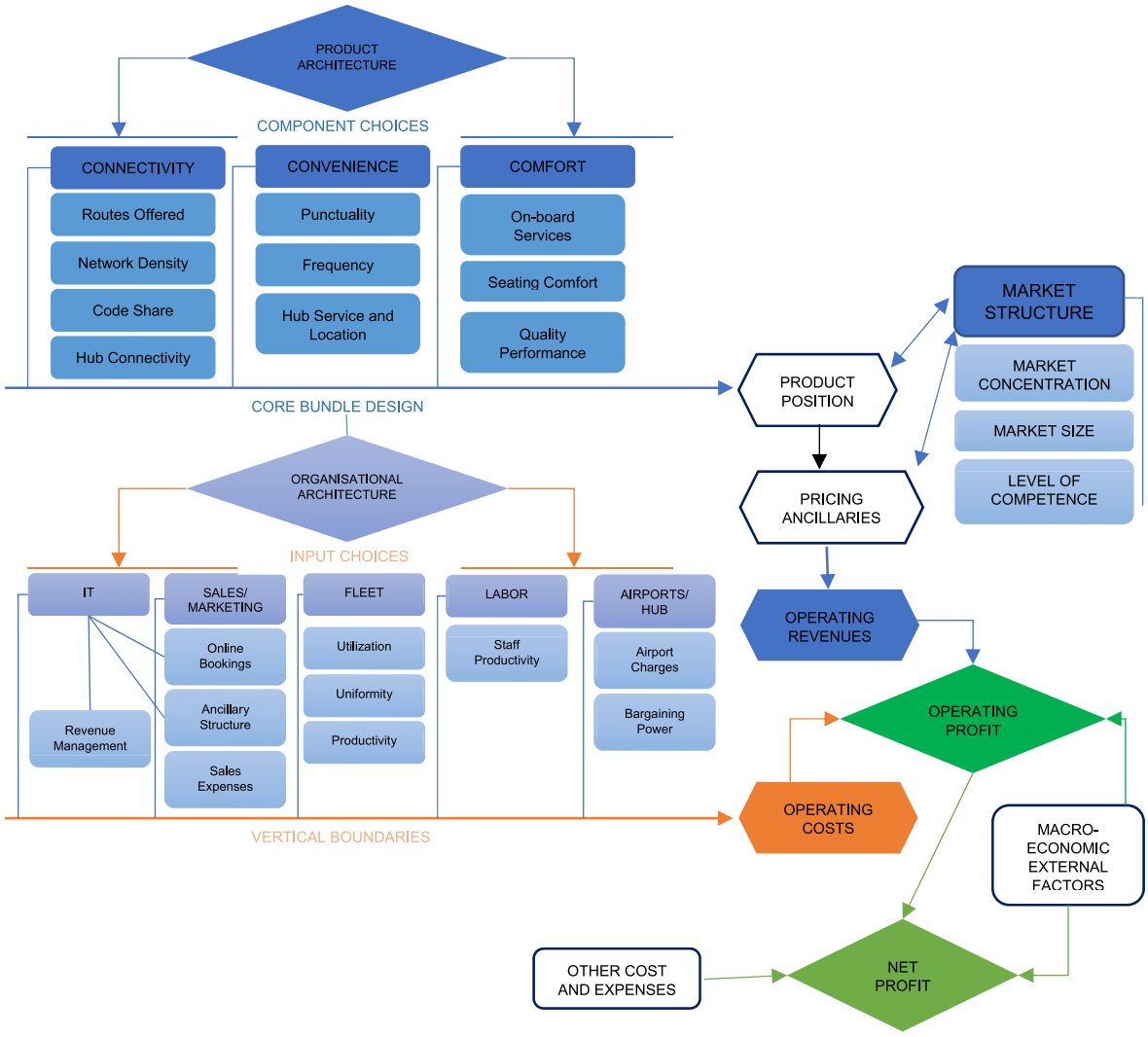

Fig. 4. Adapted POA Model for evaluating airline performance.
Source: O'Connell et al. (2020).

business passengers is often paid for by the company they work for. Subsequently, they wish to travel in a high service level cabin such as a business class cabin rather than an economy cabin and visit the airport lounge – these add incremental points to the convenience index. Lastly, comfort level is an important constituent when travelling as the seat itself needs to have a certain level of spaciousness and the overall journey is influenced by the onboard service levels that include staff, food and beverage, and value for money. Availability of on-board entertainment and Wi-Fi also affects the comfort index score. The degree of comfort is shown by Skytrax (2020) customer ratings of an airline's service.

Organisational architecture has many entities that shape and define a carrier's efficiencies. Within this framework, the sales and distribution structure is determined as a high percentage of online bookings implying lower sales costs as GDS fees are reduced while the transactional costs to purchase a ticket are much lower. Meanwhile, the index relating to fleet productivity is an important driver as a higher daily utilization rate means that more sectors are generally covered, and the asset is optimised. Airlines with diverse and old fleets add complexity and cost to a plethora of aspects that include maintenance, spare parts, and crewing. Those with a single aircraft type simplify the process as economies of scale become evident, contributing to efficiencies. Labour productivity is another measure whose indices are important, namely the number of passengers that are carried and the number of aircraft in the fleet per employee as well as its total capacity in terms of ASKs per employee, which allows it to be easily benchmarked to other competitors. The metric involving airport attractiveness focuses on market concentration in terms of number of passengers at a particular airfield, which also encapsulates any traffic generated by alliance partners. It also covers the cost to land an aircraft as well as the passenger charge that an airport imposes – this can be a big differentiator between FSCs and LCCs. Lastly market structure illustrates the level of competitive intensity in the marketplace between the different players that range from a monopolistic operator to multiple carriers. The final metrics in the POA are the external factors that are influenced by the wider macro-economics in a country or geographical region. These include a number of elements such as exchange rates weighted against the US dollar. ASEAN based carriers must purchase aircraft, fuel and spare parts, for example, in US dollars, leading to a financial penalty if the currency of the home country falls in value. Weighted GDP per capita of an airline's market is also recorded and for airlines with widespread operating locations (e.g. AirAsia Thailand, AirAsia Indonesia), the average GDP per capita of the region is used. High inflation rates can also affect an airline's profitability and consumer spending power. Finally, unemployment rates of an airline's domiciled countries are a strong indication of propensity to travel.

Table 3
Summary of POA indicators and measures.

Category	Index	Metrics
Financial	Operating Profitability	➢ Operating ratio
	Operating Revenue	➢ Yield
	Operating Cost	➢ CASK
		➢ Fuel expenses/ASK
	Ancillary	➢ % of ancillary revenues
		➢ average ancillary revenue per passenger
Product	Connectivity	➢ Average departures/hour at hub
		➢ Number of routes operated
		➢ Number of code share routes
		➢ Flight waves at hub
	Convenience	➢ Average weekly frequencies/route
		➢ Punctuality
		➢ Average business seats %/route
		➢ Airport service and customer satisfaction
	Comfort	➢ Customer service rating,
		➢ Economy seat pitch,
		➢ Economy seat width,
		➢ In-flight Wi-Fi availability
Organisational	Sales and Distribution	➢ Online booking %
		➢ Average ticketing, sales and promotion cost/passenger
	Fleet Productivity	➢ Average aircraft utilization rate
		➢ Average aircraft sectors per day
		➢ Aircraft type uniformity
		➢ Aircraft average age
	Labour Productivity	➢ Passenger/employee
		➢ Employee/aircraft
		➢ ASK/employee
	Airport Attractiveness	➢ Airport and navigational charges per passenger
		➢ % of traffic controlled by airline alliance at hub
		➢ Average annual passengers at hub
	Market Structure	➢ % of monopolized route pairs
		➢ Average number of operators/route
		➢ Seats share/route
External Factors	External Factors	➢ Local currency exchange rate towards US$
		➢ GDP per capita
		➢ Inflation rate
		➢ Unemployment rate

Source: O'Connell et al. (2020).

The POA calculations followed O'Connell et al. (2020) guidelines. There were four steps of calculations required in order to determine the overall relative performance of the observed airlines:

i) Data Collection

Data and information from different sources were gathered to calculate each selected indicator as shown in Table 3. Appendix A shows the performance of the top airlines representing 80% of traffic from the Pareto Analysis stage (see Figs. 6 and 7) in both 2016 and 2019 to show variation over time.

ii) Benchmark Ratios Calculation

In this section, a further developed version of the "best in class" methodology in O'Connell et al. (2020) is adopted to benchmark the data and grade carriers from 0 to 1. The "best in class" airline is decided by the highest or lowest scores, depending on the nature of the data. For instance, a lower figure of CASK indicates better performance in unit costs. Each corresponding case was assessed with the revised equations shown below:

$$B.R._{MAX} = \frac{Airline\ X\ performance - Worst\ in\ class}{Best\ in\ class - Worst\ in\ class}$$

$$B.R._{MIN} = \frac{Worst\ in\ class - Airline\ X\ performance}{Worst\ in\ class - Best\ in\ class}$$

where:

$B.R._{MAX}$: Benchmark Ratio when MAXIMUM score is "best in class".

$B.R._{MIN}$: Benchmark Ratio when MINIMUM score is "best in class".

Source: O'Connell et al. (2020).

The highest value of 1 represents the best performer while the lowest is 0 and is registered as the worst performer. The score for the remaining airlines is relative to the best and worst performers. The benchmark ratios calculation results are shown in Appendix B.

iii) Weighted Ratios Calculation

After obtaining the benchmark ratios, each calculated ratio value is weighted by the correlation between each POA component and reported airline profitability. Weights ranging from 0 (lowest correlation with profit) to 1 (highest correlation with profitability) are applied to previous outcomes using the equation shown below:

$$Weighted\ Index\ Score = \frac{\sum w_i x_i}{\sum w_i} (w\ is\ the\ weight\ and\ x\ is\ the\ benchmark\ item\ score)$$

Source: O'Connell et al. (2020).

Each metric was correlated with airline profit outcomes using Pearson's Correlation Coefficient. The results of weight calculations are shown in Appendix C.

iv) Final Ratios Calculation

Results from the previous step are benchmarked against the best performing airline according to each component of the POA analysis. The final ratios are calculated through the below equation:

$$Final\ Index\ Score = \frac{(weighted\ score)}{(best\ weighted\ score)} \times 10$$

Source: O'Connell et al. (2020).

The results of final index scores for each airlines' performance are shown in Appendix D.

Secondary data sources have been applied to enrich the data further, including Cirium, Official Airline Guide (OAG) and Sabre MIDT, which are all subscription based and applied to the POA analysis. The Cirium dashboard provides a wide ranging and deep toolset covering latest news, analysis, financial result and traffic statistics. OAG is a comprehensive subscription database recording 96% of global passenger itineraries, flight equipment types, route pairs, seat capacities, ASKs, flight frequencies and route distances. OAG has been used in various academic papers (e.g. Corbet et al., 2019; Lei and O'Connell, 2011; Warnock-Smith et al., 2021). Daily supply data reported by origin-destination (O-D) pairs from January 2016 to December 2019 were collected. The Sabre AirVision Market Intelligence Data Tapes (MIDT) was used for information on passenger demand, fares, airline revenues and online sales over the same time period. Scholars have used this database extensively (e.g. in Suau-Sanchez et al., 2016; and O'Connell et al., 2020).

4. POA analysis results and main findings

The Pareto Analysis found that eight carriers controlled almost 80% of air traffic in Southeast Asia. These airlines compete extensively with each other. However, three of these carriers have not been included in the evaluation despite featuring within the top 80% of traffic in the Pareto Analysis due to lack of data. These included Malaysia Airlines, which was nationalised after the two accidents in 2014, while Philippine Airlines and Lion Air were privately owned but lacked reliable data. Instead, the next two major carriers in terms of Available Seat-

Kilometres (ASKs) were included in the POA analysis, namely VietJet Air and Cebu Pacific. This led to a final batch of carriers comprising four Full-Service Carriers (FSCs): Singapore Airlines, Thai Airways, Garuda Indonesia and Vietnam Airlines, and three Low-Cost Carriers (LCCs); AirAsia, VietJet Air and Cebu Pacific.

Fig. 5 highlights the results from the POA analysis pitting the FSCs and LCCs against each other on each of the various POA indices for 2019. It shows that the FSCs perform better in the product architecture section. They outshine the observed LCCs in areas of better connectivity, higher levels of comfort and the best possible convenience to passengers. They tend to score lower in organisational architecture indicators, including labour productivity, fleet productivity and sales and distribution efficiency. Despite having high scores in operating revenues and adequate ancillary revenue earnings, their profitability is poor, which is particularly influenced by their high operating costs and inefficient work practices. Meanwhile, the observed LCCs performed better in the organisational architecture section, showing efficient fleet operations, appropriate distribution of labour and optimum online ticket sales. Additionally, LCCs tend to operate more to secondary airports as a cost reduction measure and this strategy improves their bargaining power and also reduces airport taxes and charges. Another highlight of the LCC's operations is their revenue structure. The observed carriers generated much higher levels of ancillary revenues from their fare unbundling strategies and commission-based practices such as hotels and car rental sales on their websites. In some cases, this reached 27.5% out of total revenues (VietJet Air, 2020).

Fig. 6 amasses the 13 indices from the POA for both the FSCs and LCCs to show their benchmarked performance in 2019. Vietnam Airlines and Garuda Indonesia did not perform well in convenience and connectivity factors due to having lower weekly flight frequencies. Vietnam Airlines features comparatively well in the market structure section, due to it having 49% of its routes operated as a monopoly with fewer competitors in the market, especially to secondary cities in China (OAG, 2020; Vietnam Airlines, 2020). Meanwhile, the connectivity index for Singapore Airlines is the highest, mainly due to its extensive network that also encapsulates its subsidiary carriers as well as its code share routes, whose optimised banking structure at Changi airport accommodates this achievement. Singapore Airlines also outperforms because of its high comfort levels with its spacious seats, award winning inflight entertainment system with a vast depository of content, superior service and excellent good customer service ratings. The Singaporean incumbent also performed well in the external factors POA component due to its base being domiciled in the strongest and most stable economy in Southeast Asia, with prosperous GDP as well as low inflation and unemployment levels.

Regarding the observed LCCs, AirAsia had the lowest cost structure among all studied airlines and the highest airport attractiveness score, given that they control 49% of air traffic at their main KL hub. It also had the lowest sales cost per passenger, at only US$0.69. Ancillary revenues scored high, representing 23% of its total revenue, which ranked them second in the region for this indicator after VietJet Air (27%). Although AirAsia was not the most profitable airline in 2019, it managed to maintain a high level of competitiveness in the region, largely due to having a favourable market structure and external factors. AirAsia's unit costs (CASK) were low at just 3.6 cents and subsequently was the cost leader in the region while its labour and aircraft productivity also surpassed other carriers in the region.

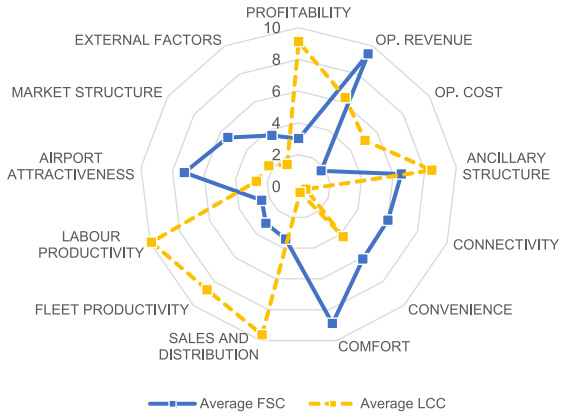

Fig. 5. POA results for FSC and LCC carriers in Southeast Asia, 2019
Source: Authors

Another metric where the region's LCCs thrive is in their sales and distribution platform, as an average of 81% of tickets are booked online through their official websites. This has proven to be one of the most effective and cheapest channels to distribute flight tickets as it bypasses expensive third-party Global Distribution System (GDS) providers. Additionally, carriers like AirAsia are using advanced Yield Management Systems (YMS) to anticipate the purchasing behaviour of passengers to further reduce marketing expenses (Cheing, 2012) and is evidenced is in the observed LCCs sales distribution index POA scores. With regards to comfort levels, AirAsia had a higher score compared to the other two observed LCCs. This is primarily due to positive customer feedback, relatively bigger seats and its in-flight Wi-Fi service. It has won several awards including Skytrax's 'World's Best LCC' for 11 consecutive years (Skytrax, 2020). Cebu Pacific, on the other hand, attained the credential as being the most profitable carrier in 2019, which was bolstered by the following aspects: first, the airline had the highest labour productivity score, with 58 employees per aircraft as compared to 100–200 for the observed FSCs. Secondly, the airline ranked second in average aircraft age and aircraft utilization, which was 5 years and 12.8 h, respectively. Lastly, it achieved the second lowest CASK of only US$0.05, due to its optimised sales, distribution and operations to secondary airports. VietJet Air also showed impressive ancillary structures, together with strong labour productivity and sales distribution. These elements helped the carrier achieve a high operating profit margin of 11% in 2019.

Regarding the temporal comparison, Fig. 7 shows that there was little variation in overall patterns detected amongst FSCs and LCCs between 2016 and 2019. There has been a steady improvement in the profitability indicator for both FSCs and LCCs, despite the fact that the economic environment in 2016 was more favourable for all the observed airlines, suggesting that external factors did not have a significant impact on the Southeast Asian carriers' ability to generate value. For the LCCs, the lack of secondary airports in Asia has negatively impacted their scores as any expansion of the network forces more aircraft into higher cost airports. However, these scores would have been even more negatively impacted by 2019 if carriers like AirAsia had not pushed airports to re-engineer expensive terminals into Low-Cost Carrier Terminals (LCCT), such as that seen at its largest base at Kuala Lumpur International Airport (KLIA). Terminal 2 is designed to accommodate 10 million passengers annually, plus 30 aircraft parking slots on the apron.

Fig. 8 illustrates the performance of the two largest airlines by capacity in Southeast Asia, notably Singapore Airlines and AirAsia, for both 2016 and 2019. Both airlines show steady performance with only slight changes between 2016 and 2019. This is partly explained by the maturity of both airlines with Singapore Airlines being in operation for 48 years and AirAsia 26 years (AirAsia, 2020; Singapore Airlines, 2020). Singapore Airlines improved from a profitability and fleet productivity perspective. The Singaporean incumbent benefitted from its 5 star status and carried more high yield business traffic and also transported more cargo in the belly of its aircraft while at the same time keeping average age of its fleet to just under 6 years, making it one of the youngest fleets in Southeast Asia. These next generation aircraft that it deploys are highly fuel efficient, while the improvement in market structure for Singapore Airlines also boosted its financial results.

AirAsia held on to its core strengths of cost optimisation and sales

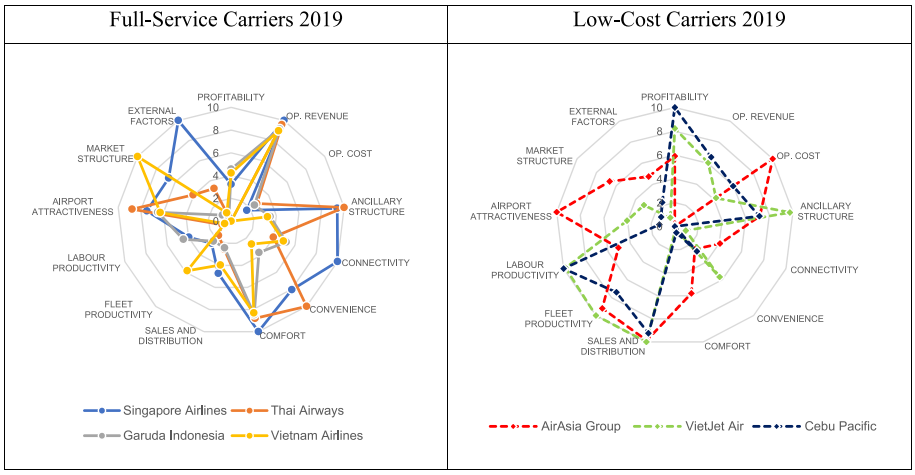

Fig. 6. Results for FSCs and LCCs in 2019
Source: Authors

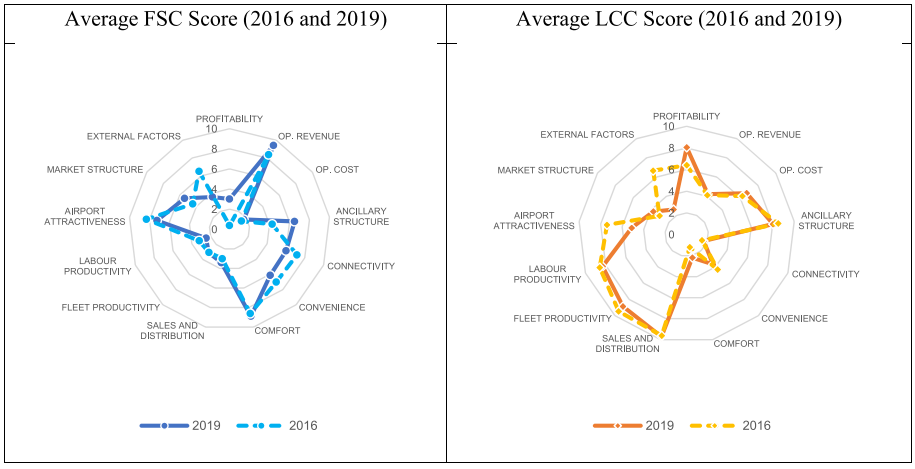

Fig. 7. Evolution of Airline performance between 2016 and 2019.
Source: Authors

distribution, becoming the first airline in the world to sell tickets through SMS. Since then, passengers have been able to book flights, check flight updates and receive promotions from the airline via SMS and its Mobile App. From a digital point of view, it scored a Digital Airline Score (DAS) of 122, making it one of the highest performers according to SkaiBlu (2018). AirAsia pursues a low-cost supply chain where 35.1% of its suppliers are local. This not only helped the carrier to ensure product quality, but also minimises cost and supply chain risk.

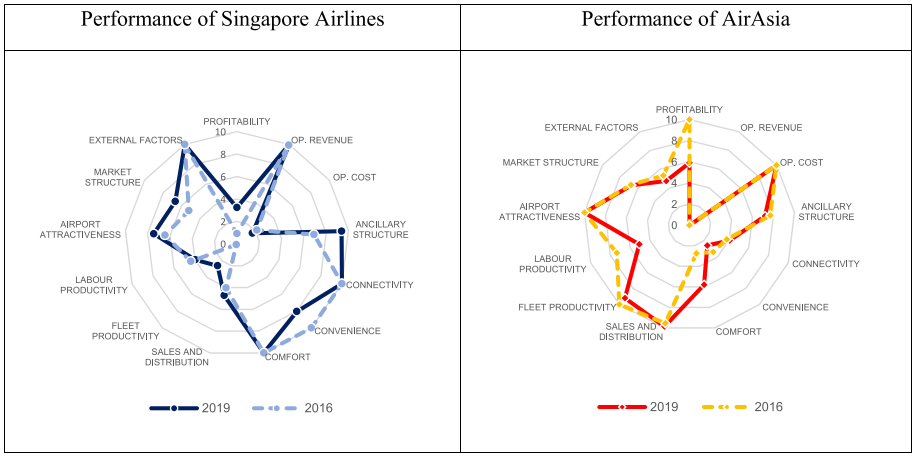

Fig. 8. Performance of Singapore airlines and AirAsia.
Source: Authors

AirAsia uses a modern, uniform and efficient A320 family of aircraft with an average age of 6.1 years, compared to a global average of 11.3 years old. The airline also contained cost through effective fuel hedging activities (AirAsia, 2020) and partnered with General Electric's Flight Efficiency Services to implement cost savings by effective fuel management (GE, 2020). It achieved On-Time Performance (OTP) of above 80%, making it one of the top 20 most punctual airlines in the world according to OAG (OAG, 2020). Its profit began to drop off as it was ramping up its aircraft deliveries whose cost of capital was high and its unit cost (CASK), which was the lowest amongst airlines in the region, increased 33% between 2016 and 2019 (AirAsia, 2020). It also faced intense competition with an average of three operators per route, though it still retained a monopoly on over 37% of its routes. This was somewhat compensated by the carrier's diversified revenue mix through its ancillary revenues that represented around 23% of its total operating revenue by 2019. These ancillaries are broken down into three different categories, firstly its core ancillaries that include baggage handling, seat selection, ticket cancellation fees and priority boarding, secondly its in-flight sales, and lastly its commission based products and services. A weakness is found in its labour productivity, which deteriorated from 2016 to 2019 primarily because it tripled its number employee numbers to 21,059 by 2019 as it required human capital to resource its operations as it continued to stretch the footprint of its network across Asia. Around 90% of its revenues are generated from operations in Southeast Asia. AirAsia Malaysia is the main contributor in the group with 38.72% of total operating revenue. Malaysia has one of the highest GDP per capita, superior to some countries in the region, which helped the carrier to generate solid revenues in this market.

5. Managerial implications and conclusions

This study aimed to detail the performance of Southeast Asian airlines and to conduct a comparative assessment within the Southeast Asian air transport market. A few large carriers dominate capacity. A Pareto Analysis identified that the largest eight airlines in Southeast Asia accounted for 80% of the capacity across the region, which included both FSCs and LCCs.

A POA analysis was then applied on a final batch of four large FSCs and three large LCCs to determine which indices the observed carriers outperformed on, shaping their overall performance. The POA analysis found that the region's FSCs scored better at Product Architecture, which includes convenience, comfort and connectivity. Meanwhile, LCCs strength was in the Organisational Structure component, namely fleet and labour productivity, sales distribution and developing a strong cost position at their main airports (the airport attractiveness indicator). The average LCC in the region also returned a high score in ancillary revenue structure. The POA and insights into the reference carrier, AirAsia found that it has good scores relative to other regional LCCs in operating cost structure, airport attractiveness and sales & distribution. VietJet and Cebu Pacific returned higher profit levels than AirAsia in 2019, however, and benefitted from an even higher focus than AirAsia in on-line bookings and ancillary revenues.

This comprehensive assessment of the Southeast Asian airline market also contains some insightful managerial and policy implications. From the POA Analysis, Airlines in the region can clearly observe the impact of business decision-making on their competitive position in the region from an overall network perspective. The benchmarking exercise allows the region's carriers to pinpoint relative areas of strength and weakness and how they align with their operating profit performance, to inform future managerial decision-making. From a policy perspective, the analysis of the Southeast Asian market context as outlined in Section 2, clearly points to a partially liberalised regulatory and trading environment, in which the region's carriers have had to operate and this has led to the evolution of the observed market concentration over time as well as the formation of trans-national carrier groups like Air Asia Group and Lion Air Group, who have been able to use their scale and purchasing power to partly circumnavigate the comparatively restrictive ownership rules that exist within the region.

There are some limitations to the research. Information for some carriers owned by governments were not accessible, despite featuring in the top 80% in the Pareto Analysis. A more comprehensive and deeper analysis of other notable carriers in the region such as Batik Air, Malindo Airways, Sriwijaya Air and Jetstar Asia was not feasible due to the lack of publicly available data as large volumes of information was required to input into the POA model. Future research focussing on the market environment post-Covid would be highly beneficial, with the results in this study acting as an important comparative baseline.

Author statement

Foong Jia Jun: Research topic initiation and scoping, data collection, data analysis, editing and revision. John F, O'Connell: Research topic scoping, data collection support, data analysis and data editing. David Warnock-Smith: Data analysis, reviewing, editing and submission. Marina Efthymiou: Data analysis, reviewing and editing.

Appendix A. POA Model Data - Performance Ratios

Scores for 2019 and 2016

Index	Metric	Singapore Airlines		AirAsia Group		Thai Airways		Garuda Indonesia		Vietnam Airlines		VietJet Air		Cebu Pacific	
		2019	2016	2019	2016	2019	2016	2019	2016	2019	2016	2019	2016	2019	2016
PROFITABILITY	Operating Margin	0.37	4.19	6.1	30.2	−6.58	2.24	3.24	2.56	2.5	1.55	11.11	9.71	14.88	19.8
OP. REVENUE	Yield (US cents)	8.29	8.93	4.52	4.77	8.13	8.96	7.97	6.93	7.9	8.3	6.8	8.5	7	6.2
OP. COST	CASK (US cents)	6.82	6.76	3.62	2.72	6.43	6.43	6.42	5.87	7.5	6.6	5.2	6.3	5.1	3.9
	Fuel/ASK (US cents)	1.99	1.37	1.36	0.95	1.9	1.7	1.97	1.51	2.1	1.6	2.1	1.4	1.7	1.3
ANCILLARY STRUCTURE	% of ancillary revenues	0.6	0.2	23	18.39	4.59	1.73	1.9	1.65	1	0.8	27.5	22.6	20.49	18.41
	average revenue/ passenger (US$)	327.29	345.1	55.56	62.61	307.87	312.5	143.37	110.4	144.97	118.95	87.28	84.04	77.81	68.73
CONNECTIVITY	departures/ hour	10.88	9.13	11.46	8.71	6.21	6.67	8.25	9.46	4.5	4.5	3.21	1.63	1.42	1.46

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Index	Metric	Singapore Airlines		AirAsia Group		Thai Airways		Garuda Indonesia		Vietnam Airlines		VietJet Air		Cebu Pacific	
		2019	2016	2019	2016	2019	2016	2019	2016	2019	2016	2019	2016	2019	2016
	No. Routes	407	273	915	543	180	186	510	406	382	327	191	111	180	179
	Code share routes	294	175	37	10	154	131	110	81	172	173	26	10	0	0
	Waves at hub	7	7	5	5	5	5	6	5	6	6	5	5	5	5
CONVENIENCE	Frequencies/ route/week	8.99	9	10.57	12.01	11.12	10.97	8.14	12.04	8	8.14	14.24	13.74	12.08	11.41
	Punctuality	85.34	84.34	81	75.92	72.37	72.19	95.03	69.55	71.29	70.56	83.4	83.57	64.53	55.87
	Business %/route	0.03	0.03	0	0	0.04	0.04	0.01	0.01	0.01	0.01	0	0	0	0
	Airport satisfaction	7	7	4	4	4	4	5	5	6	6	6	6	4	4
COMFORT	Customer service	7	7	5	5	7	7	8	8	6	6	3	3	4	4
	Econ. seat pitch	32.31	32.31	29.8	29.8	32.04	32.04	32.5	32.5	32	32	29	29	28.75	28.75
	Econ. seat width	18.5	18.5	17.7	17.7	17.83	17.83	17	17	17.88	17.88	17	17	16.96	16.96
	Wi-Fi	1	1	1	0	1	1	1	1	1	0	0	0	0	0
SALES AND DISTRIBUTION	Online bookings %	22.19%	19.63%	75%	72%	52.59%	42.42%	6.00%	4.00%	8.13%	7.50%	84.38%	84.23%	84.06%	82.63%
	Cost/passenger sales (US$)	6.85	7.06	0.69	0.49	17.33	16.36	10.75	8.86	6.81	7.56	1.73	1.58	3.72	3.46
FLEET PRODUCTIVITY	Utilization rate	7.97	7.89	13	12.4	11.19	11.21	7.42	8.58	9.1	8.43	11.28	10.44	12.8	12.7
	Sectors per day	2.65	2.56	5.8	5.54	3.09	3.32	3.5	4.1	4.89	4.95	4.94	5.82	4.13	5.14
	Type uniformity	0.24	0.15	0.88	0.85	0.19	0.21	0.35	0.38	0.54	0.6	1	1	0.61	0.63
	Average age	5.92	6.67	6.1	6.5	10	8	8	4.62	6	5.7	3.2	3.03	5	4.91
LABOUR PRODUCTIVITY	Passengers/ employee	1296	1254	2448	3468	909	826	1864	2091	1375	2315	4890	5770	5163	4640
	Employee/ aircraft	136.05	141.54	85.61	43.76	207.45	231.56	81.46	85.38	201.58	112.67	65.28	59.39	58.03	72.33
	ASK (mn)/ employee	6.2	6.1	3.5	5.3	4.2	3.9	3.3	3.5	2.5	4.1	7.3	6.9	6.7	6.3
AIRPORT ATTRACTIVENESS	Airport & en-route fees/ passenger (US$)	18.26	18.85	8.24	7.33	7.26	9.4	12.08	9.54	3.93	3.81	0.75	0.58	8.5	7.09
	% of traffic controlled by airline alliance at hub	37.77	37.4	49.05	44.03	38.54	41.37	27.37	32.3	43.25	53.09	26.56	24.83	26.55	39.27
	Annual passenger at hub (Mil)	68.3	58.7	62.34	52.6	65.4	55.89	66.91	58.2	29.2	20.6	29.2	20.6	12.66	8.77
MARKET STRUCTURE	% of monopoly routes	0.34	0.37	0.37	0.39	0.22	0.28	0.2	0.21	0.49	0.5	0.24	0.2	0.13	0.17
	Operators/ route	2.87	2.72	2.73	2.53	2.97	3.09	2.86	3.06	2.28	2.16	2.99	3.04	2.88	2.81
	Seats share/ route	64.6	65.57	62.17	69.47	59.23	57.94	45.05	49.65	68.77	74.02	54.12	46.9	50.85	51.43
EXTERNAL FACTORS	Exchange rate	0.742	0.733	0.243	0.242	0.033	0.032	0.00007	0.00007	0.000043	0.00004	0.000043	0.00004	0.0197	0.021
	GDP per capita	101,376	89,386	29,526	25,546	19,228	16,619	12,302	10,494	8374	6573	8374	6573	9277	7704
	Inflation rate	0.09%	0.70%	0.08%	1.66%	0.75%	2.66%	1.60%	2.44%	1.79%	1.11%	1.79%	1.11%	0.76%	1.28%
	Unemployment rate	4.11%	4.08%	3.32%	3.44%	0.75%	0.69%	4.69%	4.30%	2.01%	2.08%	2.01%	2.08%	2.15%	2.71%

Appendix B. POA Model Data - Benchmark Ratios

Scores for 2019 and 2016

Metric	Best in Class	Singapore Airlines		AirAsia Group		Thai Airways		Garuda Indonesia		Vietnam Airlines		VietJet Air		Cebu Pacific	
		2019	2016	2019	2016	2019	2016	2019	2016	2019	2016	2019	2016	2019	2016
Operating Margin	Max Score	0.32	0.09	0.59	1.00	0.00	0.02	0.46	0.04	0.42	0.00	0.82	0.28	1.00	0.64
Yield	Max Score	1.00	0.99	0.00	0.00	0.96	1.00	0.92	0.52	0.90	0.84	0.60	0.89	0.66	0.34
CASK	Min Score	0.18	0.00	1.00	1.00	0.28	0.08	0.28	0.22	0.00	0.04	0.59	0.11	0.62	0.71
Fuel/ASK	Min Score	0.15	0.44	1.00	1.00	0.27	0.00	0.18	0.25	0.00	0.13	0.00	0.40	0.54	0.53
% of ancillary revenues	Max Score	0.00	0.00	0.83	0.81	0.15	0.07	0.05	0.06	0.01	0.03	1.00	1.00	0.74	0.81
average revenue/passenger	Max Score	1.00	1.00	0.00	0.00	0.93	0.88	0.32	0.17	0.33	0.20	0.12	0.08	0.08	0.02
departures/hour	Max Score	0.94	0.96	1.00	0.91	0.48	0.65	0.68	1.00	0.31	0.38	0.18	0.02	0.00	0.00
No. Routes	Max Score	0.31	0.38	1.00	1.00	0.00	0.17	0.45	0.68	0.27	0.50	0.01	0.00	0.00	0.16

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Metric	Best in Class	Singapore Airlines		AirAsia Group		Thai Airways		Garuda Indonesia		Vietnam Airlines		VietJet Air		Cebu Pacific	
		2019	2016	2019	2016	2019	2016	2019	2016	2019	2016	2019	2016	2019	2016
Code share routes	Max Score	1.00	1.00	0.13	0.06	0.52	0.75	0.37	0.46	0.59	0.99	0.09	0.06	0.00	0.00
Waves at hub	Max Score	1.00	1.00	0.00	0.00	0.00	0.00	0.50	0.00	0.50	0.50	0.00	0.00	0.00	0.00
Frequencies/route/week	Max Score	0.16	0.15	0.41	0.69	0.50	0.51	0.02	0.70	0.00	0.00	1.00	1.00	0.65	0.58
Punctuality	Max Score	0.68	1.00	0.54	0.70	0.26	0.57	1.00	0.48	0.22	0.52	0.62	0.97	0.00	0.00
Business %/route	Max Score	0.75	0.75	0.00	0.00	1.00	1.00	0.25	0.25	0.25	0.25	0.00	0.00	0.00	0.00
Airport satisfaction	Max Score	1.00	1.00	0.00	0.00	0.00	0.00	0.33	0.33	0.67	0.67	0.67	0.67	0.00	0.00
Customer service	Max Score	0.80	0.80	0.40	0.40	0.80	0.80	1.00	1.00	0.60	0.60	0.00	0.00	0.20	0.20
Econ. seat pitch	Max Score	0.95	0.95	0.28	0.28	0.88	0.88	1.00	1.00	0.87	0.87	0.07	0.07	0.00	0.00
Econ. seat width	Max Score	1.00	1.00	0.48	0.48	0.56	0.56	0.03	0.03	0.60	0.60	0.03	0.03	0.00	0.00
Wi-Fi	Max Score	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	0.00	0.00	0.00
Online bookings %	Max Score	0.21	0.19	0.88	0.85	0.59	0.48	0.00	0.00	0.03	0.04	1.00	1.00	1.00	0.98
Cost/passenger sales	Min Score	0.63	0.59	1.00	1.00	0.00	0.00	0.40	0.47	0.63	0.55	0.94	0.93	0.82	0.81
Utilization rate	Max Score	0.10	0.00	1.00	0.94	0.68	0.69	0.00	0.14	0.30	0.11	0.69	0.53	0.96	1.00
Sectors per day	Max Score	0.00	0.00	1.00	0.91	0.14	0.23	0.27	0.47	0.71	0.73	0.73	1.00	0.47	0.79
Type uniformity	Max Score	0.06	0.00	0.85	0.82	0.00	0.07	0.20	0.27	0.43	0.53	1.00	1.00	0.52	0.56
Average age	Min Score	0.60	0.27	0.57	0.30	0.00	0.00	0.29	0.68	0.59	0.46	1.00	1.00	0.74	0.62
Passenger/employee	Max Score	0.09	0.09	0.36	0.53	0.00	0.00	0.22	0.26	0.11	0.30	0.94	1.00	1.00	0.77
Employee/aircraft	Min Score	0.48	0.48	0.82	1.00	0.00	0.00	0.84	0.78	0.04	0.63	0.95	0.92	1.00	0.85
ASK/employee	Max Score	0.77	0.77	0.22	0.51	0.36	0.10	0.18	0.00	0.00	0.17	1.00	1.00	0.88	0.82
Airport & en-route fees/passenger	Min Score	0.00	0.00	0.57	0.63	0.63	0.52	0.35	0.51	0.82	0.82	1.00	1.00	0.56	0.64
% of traffic controlled by airline alliance at hub	Max Score	0.50	0.44	1.00	0.68	0.53	0.59	0.04	0.26	0.74	1.00	0.00	0.00	0.00	0.51
Annual passenger at hub (Mil)	Max Score	1.00	1.00	0.89	0.88	0.95	0.94	0.98	0.99	0.30	0.24	0.30	0.24	0.00	0.00
% of monopolies	Max Score	0.58	0.61	0.67	0.67	0.25	0.33	0.19	0.12	1.00	1.00	0.31	0.09	0.00	0.00
Operators/route	Min Score	0.17	0.40	0.37	0.60	0.03	0.00	0.18	0.03	1.00	1.00	0.00	0.05	0.15	0.30
Seats share/route	Max Score	0.82	0.69	0.72	0.83	0.60	0.41	0.00	0.10	1.00	1.00	0.38	0.00	0.24	0.17
Exchange rate	Max Score	1.00	1.00	0.33	0.33	0.04	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.03
GDP per capita	Max Score	1.00	1.00	0.23	0.23	0.12	0.12	0.04	0.05	0.00	0.00	0.00	0.00	0.01	0.01
Inflation rate	Min Score	0.99	1.00	1.00	0.51	0.61	0.00	0.11	0.11	0.00	0.79	0.00	0.79	0.60	0.70
Unemployment rate	Min Score	0.15	0.06	0.35	0.24	1.00	1.00	0.00	0.00	0.68	0.61	0.68	0.61	0.64	0.44

Appendix C. POA Model Data - Weighted Scores

Scores for 2019 and 2016

	Singapore Airlines		AirAsia Group		Thai Airways		Garuda Indonesia		Vietnam Airlines		VietJet Air		Cebu Pacific	
	2019	2016	2019	2016	2019	2016	2019	2016	2019	2016	2019	2016	2019	2016
PROFITABILITY	0.324	0.092	0.591	1.000	0.000	0.024	0.458	0.035	0.423	0.000	0.824	0.285	1.000	0.637
OP. REVENUE	1.000	0.993	0.000	0.000	0.958	1.000	0.915	0.516	0.897	0.842	0.605	0.890	0.658	0.341
OP. COST	0.168	0.216	1.000	1.000	0.274	0.042	0.249	0.236	0.000	0.086	0.421	0.254	0.596	0.622
ANCILLARY STRUCTURE	0.521	0.422	0.399	0.469	0.555	0.413	0.191	0.109	0.178	0.100	0.540	0.610	0.397	0.479
CONNECTIVITY	0.962	0.851	0.391	0.321	0.381	0.431	0.497	0.441	0.473	0.718	0.095	0.028	0.000	0.037
CONVENIENCE	0.576	0.714	0.183	0.241	0.716	0.532	0.264	0.406	0.193	0.348	0.406	0.547	0.200	0.137
COMFORT	0.936	0.929	0.543	0.255	0.823	0.857	0.792	0.894	0.777	0.524	0.024	0.026	0.050	0.053
SALES AND DISTRIBUTION	0.455	0.389	0.951	0.923	0.246	0.241	0.232	0.235	0.382	0.298	0.963	0.966	0.891	0.897
FLEET PRODUCTIVITY	0.231	0.008	0.818	0.879	0.148	0.355	0.209	0.292	0.517	0.425	0.889	0.818	0.658	0.800
LABOUR PRODUCTIVITY	0.387	0.424	0.494	0.711	0.083	0.028	0.438	0.392	0.059	0.397	0.956	0.967	0.973	0.813
AIRPORT ATTRACTIVENESS	0.643	0.478	0.861	0.741	0.755	0.706	0.559	0.682	0.540	0.597	0.348	0.553	0.113	0.355
MARKET STRUCTURE	0.667	0.520	0.666	0.673	0.407	0.183	0.094	0.072	1.000	1.000	0.316	0.051	0.140	0.190
EXTERNAL FACTORS	0.905	0.613	0.428	0.326	0.294	0.441	0.039	0.045	0.075	0.496	0.075	0.496	0.206	0.402

Appendix D. POA Model Final Scores

Scores for 2019 and 2016

	Singapore Airlines		AirAsia Group		Thai Airways		Garuda Indonesia		Vietnam Airlines		VietJet Air		Cebu Pacific	
	2019	2016	2019	2016	2019	2016	2019	2016	2019	2016	2019	2016	2019	2016
PROFITABILITY	3.239	0.921	5.909	10.000	0.000	0.241	4.576	0.353	4.231	0.000	8.243	2.848	10.000	6.370
OP. REVENUE	10.000	9.928	0.000	0.000	9.576	10.000	9.151	5.155	8.966	8.425	6.048	8.902	6.578	3.413
OP. COST	1.676	2.157	10.000	10.000	2.742	0.416	2.487	2.365	0.000	0.855	4.214	2.541	5.960	6.223
ANCILLARY STRUCTURE	9.389	6.914	7.197	7.695	10.000	6.763	3.452	1.783	3.218	1.633	9.739	10.000	7.160	7.853
CONNECTIVITY	10.000	10.000	4.064	3.771	3.964	5.062	5.164	5.180	4.915	8.442	0.983	0.328	0.000	0.433
CONVENIENCE	8.044	10.000	2.551	3.381	10.000	7.455	3.684	5.688	2.697	4.870	5.679	7.656	2.793	1.921

(*continued on next page*)

(*continued*)

	Singapore Airlines		AirAsia Group		Thai Airways		Garuda Indonesia		Vietnam Airlines		VietJet Air		Cebu Pacific	
	2019	2016	2019	2016	2019	2016	2019	2016	2019	2016	2019	2016	2019	2016
COMFORT	10.000	10.000	5.799	2.745	8.800	9.224	8.466	9.622	8.304	5.638	0.252	0.279	0.539	0.571
SALES AND DISTRIBUTION	4.722	4.031	9.867	9.560	2.550	2.493	2.408	2.433	3.967	3.081	10.000	10.000	9.254	9.286
FLEET PRODUCTIVITY	2.595	0.088	9.201	10.000	1.669	4.041	2.350	3.318	5.818	4.837	10.000	9.313	7.400	9.106
LABOUR PRODUCTIVITY	3.974	4.383	5.072	7.354	0.854	0.289	4.497	4.056	0.607	4.109	9.827	10.000	10.000	8.408
AIRPORT ATTRACTIVENESS	7.464	6.454	10.000	10.000	8.769	9.527	6.496	9.207	6.274	8.054	4.042	7.460	1.312	4.786
MARKET STRUCTURE	6.668	5.203	6.660	6.726	4.066	1.826	0.940	0.718	10.000	10.000	3.156	0.511	1.398	1.903
EXTERNAL FACTORS	10.000	10.000	4.734	5.314	3.246	7.204	0.435	0.729	0.829	8.100	0.829	8.100	2.276	6.569

References

AirAsia, 2020. Annual reports [Accessed 25/05/22]. https://capitala.airasia.com/misc/FlippingBook/ar2020/index.html.

Singapore Airlines, 2020. Annual Reports [Accessed 25/05/22]. https://www.singaporeair.com/en_UK/sg/about-us/information-for-investors/annual-report.

Vietnam Airlines, 2020. Annual reports [Accessed 25/05/22]. https://www.vietnamairlines.com/fr/en/vietnam-airlines/investor-relations/financial-reports.

OAG, 2020. OAG analyser [Accessed 25/05/22]. http://analytics.oag.com/analyser-client/home.

Bimp-eaga.asia, 2007. Memorandum of understanding between the governments of Brunei Darussalam, Indonesia, Malaysia and the Philippines on expansion of air linkages [paretied 25/05/22]. https://bimp-eaga.asia/sites/default/files/publications/MOU%20of%20BE%20AirLinkages%20120107.pdf.

Boeing, 2019. Commercial Market Outlook 2019-2038. Boeing.

Bowen Jr., J.T., 2016. Now everyone can fly"? Scheduled airline services to secondary cities in Southeast Asia. J. Air Transport. Manag. 53, 94–104.

CAPA, 2019. Southeast Asia Airline 2019 Outlook: in this fast growth market low costs are essential [Accessed 25/05/22]. https://centreforaviation.com/analysis/airline-leader/southeast-asia-airline-2019-outlook-in-this-fast-growth-market-low-costs-are-essential-457920.

CAPA, 2020. Is AirAsia too big to fail? It should be [Accessed 25/05/22]. https://centreforaviation.com/analysis/reports/is-airasia-too-big-to-fail-it-should-be-530828.

Cheing, W.L., 2012. An Exploratory Study on AirAsia's Critical Internal Success Factors: A Resource Based View of Sustainable Competitive Advantage of Low-Cost Airline Business Model. MSc Thesis. Open University Malaysia.

Corbet, S., Efthymiou, M., Lucey, B., O'Connell, J.F., 2021. When lightning strikes twice: the tragedy-induced demise and attempted corporate resuscitation of Malaysia airlines. Ann. Tourism Res. 87, 103109.

Craft, R.C., Leake, C., 2002. The Pareto principle in organizational decision making. Manag. Decis. 40 (8), 729–733.

Doganis, R., 2019. Flying off Course Airline Economics and Marketing, fifth ed. Routledge, London.

EU Commission, 2021. Association of south east asian Nations (ASEAN) [Accessed 25/05/22]. https://policy.trade.ec.europa.eu/eu-trade-relationships-country-and-region/country -and-regions/association-south-east-asian-nations-asean_en.

Forsyth, P., King, J., Rodolfo, C.L., 2006. Open skies in ASEAN. J. Air Transport. Manag. 12, 143–152.

Gerken, F., Van der Land, S.F., van der Meer, T.G., 2016. Crisis in the air: an investigation of AirAsia's crisis-response effectiveness based on frame alignment. Publ. Relat. Rev. 42 (5), 879–892.

Gross, S., Luck, M., 2013. The Low Cost Carrier Worldwide. Routledge, London.

IATA, 2020. Economic performance of the airline industry, 9th June. Available at: [Accessed 25/05/22]. https://www.iata.org/en/iata-repository/publications/economic-reports/airline-industry-economic-performance-june-2020-report/.

IATA WATS, 2020. World Air Transport Statistics. Material No, 8288-64, Montreal, Canada.

ICAO, 2003. Sub-regional cooperation on air transport among Cambodia, Lao people's democratic republic, Myanmar and Vietnam (CLMV) [Accessed 25/05/22]. https://www.icao.int/sustainability/CaseStudies/StatesReplies/CLMV_Cooperation_En.pdf.

ICAO, 2016. Overview of regulatory and industry developments in international air transport [Accessed 25/05/22]. https://www.icao.int/Meetings/a39/Documents/Overview_of_Regulatory_and_Industry_Developments_in_International_Air_Transport.pdf.

ICAO, 2019. Aviation benefits report [Accessed 25/05/22]. https://www.icao.int/sustainability/Documents/AVIATION-BENEFITS-2019-web.pdf.

IMG-GT (2018), On-line Statistics, [Accessed 25/05/22] https://imtgt.org/.

Jiang, H., 2013. Service quality of low-cost long-haul airlines–The case of Jetstar Airways and AirAsia X. J. Air Transport. Manag. 26, 20–24.

Joyce, S.C., Meerana, A., Agrawal, A., 2021. A global population-driven perspective on South-East Asia's air transport growth prospects in the 21st Century. Transport. Res. Procedia 56, 79–87.

Kratz, E Ulrich (Ed.), 1996. Southeast Asian Languages and Literatures: a Bibliographical Guide to Burmese, Cambodian, Indonesian, Javanese, Malay, Minangkabau, Thai and Vietnamese. Tauris Academic Studies, London.

Lawton, T.C., Solomko, S., 2005. When being the lowest cost is not enough: building a successful low-fare airline business model in Asia. J. Air Transport. Manag. 11 (6), 355–362.

Lei, Z., O'Connell, J.F., 2011. The evolving landscape of Chinese aviation policies and impact of a deregulating environment on Chinese carriers. J. Transport Geogr. 19 (4), 829–839.

Lenoir, N., Laplace, I., 2018. Liberalization in Southeast Asia: who is capturing the markets. Jul 2016, Shanghai, China. Available at:. In: WCTR 2016, World Conference on Transport Research [Accessed 25/05/22]. https://hal.archives-ouvertes.fr/hal-01727424/document.

Leong, L.M., 2019. Designing and Operating Airports: A Complex System of Systems (Singapore).

Mason, K.J., Morrison, W.G., 2008. Towards a means of consistently comparing airline business models with an application to the 'low cost' airline sector. Res. Transport. Econ. 24, 75–84.

MBN, 2022. What Is the Pareto Principle? Definition and Meaning. MBN Market Business News [Accessed 08/07/2022]. https://marketbusinessnews.com/financial-glossary/pareto-principle/.

Meichsner, N.A., O'Connell, J.F., Warnock-Smith, D., 2018. The future for African air transport: learning from Ethiopian Airlines. J. Transport Geogr. 71, 182–197.

O'Connell, J.F., Williams, G., 2005. Passengers' perceptions of low cost airlines and full service carriers: A case study involving Ryanair, Aer Lingus, Air Asia and Malaysia Airlines. J. Air Transport. Manag. 11 (4), 259–272.

Ong, W.L., Tan, A.K., 2010. A note on the determinants of airline choice: the case of Air Asia and Malaysia Airlines. J. Air Transport. Manag. 16 (4), 209–212.

O'Connell, J.F., Vanoverbeke, K., 2015. Philippine airlines, flying in a changing landscape. J. Tourism Econ. 21 (6), 1295–1307.

O'Connell, J.F., Avellana, R.M., Warnock-Smith, D., Efthymiou, M., 2020. Evaluating drivers of profitability for airlines in Latin America: a case study of Copa Airlines. J. Air Transport. Manag. 84, 101727.

Pearson, J., O'Connell, J.F., Pitfield, D., Ryley, T., 2015. The strategic capability of Asian network airlines to compete with low-cost carriers. J. Air Transport. Manag. 47, 1–10.

Shuk-Ching Poon, T., Waring, P., 2010. The lowest of low-cost carriers: the case of AirAsia. Int. J. Hum. Resour. Manag. 21 (2), 197–213.

SkaiBlu, 2018. Digital Airline Score (DAS) Benchmarking Reports [Accessed 25/05/22]. http://skaiblu.com/benchmarking-research-reports/.

Skytrax, 2020. Airline and Airport Customer Reviews [Accessed 25/05/22]. https://www.airlinequality.com.

ASEAN Statistical Yearbook 2019 [Accessed 25/05/22]. https://www.aseanstats.org/publication/asyb-2019/.

Suau-Sanchez, P., Voltes-Dorta, A., Rodríguez-Déniz, H., 2016. Measuring the potential for self-connectivity in global air transport markets: implications for airports and airlines. J. Transport Geogr. 57, 70–82.

Tan, A.K.J., 2016. Toward a single aviation market in ASEAN: regulatory reform and industry challenges [Accessed 25/05/22]. https://www.eria.org/publications/toward-a-single-aviation-market-in-asean-regulatory-reform-and-industry-challenges/.

The World Bank, 2020. GDP per capita, PPP (current international $) [Accessed 25/05/22]. https://data.worldbank.org/indicator/NY.GDP.PCAP.CD.

Tonby, O., Woetzel, J., Choi, W., Rajat, E., Jeongmin, D., Seong, J., Wang, P., 2019. The Future of Asia: Asian Flows and Networks Are Defining the Next Phase of Globalization. McKinset Global Institute [Accessed 25/05/22]. https://www.mckinsey.com/~/media/mckinsey/featured%20insights/asia%20pacific/the%20future%20of%20asia%20asian%20flows%20and%20networks%20are%20defining%20the%20next%20phase%20of%20globalization/mgi-future-of-asia-flows-and-trade-discussion-paper-sep-2019.pdf.

VietJet Air, 2020. Annual reports [Accessed 25/05/22]. https://ir.vietjetair.com/Home/Menu/annual-reports.

Warnock-Smith, D., Graham, A., O'Connell, J.F., Efthymiou, M., 2021. Impact of COVID-19 on air transport passenger markets: examining evidence from the Chinese market. J. Air Transport. Manag. 94, 102085.

Wong, K.M., Musa, G., 2011. Branding satisfaction in the airline industry: a comparative study of Malaysia Airlines and Air Asia. Afr. J. Bus. Manag. 5 (8), 3410–3423.

Worldometer, 2020. South eastern asia population live [Accessed 25/05/22]. https://www.worldometers.info/world-population/south-eastern-asia-population.
WTO (2020) Air Transport Services [Accessed 25/05/22] https://www.wto.org/english/tratop_e/serv_e/transport_e/transport_air_e.htm.
Zhang, A., Hanaoka, S., Ishikura, T., Inamura, H., 2008. Low-cost carriers in Asia: deregulation, regional liberalization, and secondary airports. Res. Transport. Econ. 24, 36–50.