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Creating a competitive advantage in the global flight catering supply chain: a case study using SCOR model

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Creating a competitive advantage in the global flight catering supply chain: a case study using SCOR model

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ABSTRACT

Flight catering is a complex food service industry that caters to a wide range of airlines. Meals provided to passengers are a measure of in-flight service on an airplane. In the case of the airline industry, flight catering companies are responsible for preparing the meal that flight crews serve it at a voyaging altitude. This case study examines Emirates Kitchen Flight Catering (EKFC), a jointly owned entity of Dubai Civil Aviation (10%) and the Emirates Group (90%). Based on existing literature, international archival reports, company publications and participant observations of EKFC, the paper examines how EKFC reached the top of the catering supply chain by offering the best-in-class quality services and food to its passengers. The paper addresses the persistent growth of EKFC's operations and investigates relevant strategies that reinforce EKFC's fundamental competencies through the application of Supply Chain Operations Reference framework. Offering a combination of on-board excellence, quality, and fresh and delicious food while controlling costs across the supply chain is an important differentiator of EKFC's flight catering business, thereby setting a benchmark for other businesses.

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1. Introduction

With breakthrough advancements in the aviation industry, the business environment has become competitive and difficult for the airline operations. The emergence of low-cost airlines has markedly impacted airline businesses, which had been leading the aviation industry for years. Nevertheless, new entrants tend to lag in their progress towards effective supply chain operations. Over the past few decades, the organisational structure of several multinational airline companies has experienced drastic changes while attempting to integrate or centralise core functions, imposing encountered challenges threatening economic periods. As the aviation industry has become increasingly competitive and dynamic, players within the supply chain have realised the need for efficiency and responsiveness. Hence, in this industry, order winners are those who have sustained competitive advantages in their supply chain processes and services.

Historically, the beginning of what can be considered 'in-flight catering' was in the 1920s, when Imperial Airways initiated the 'flight catering services of sandwiches' with coffee or tea (Franklin 1980). Nevertheless, low altitude flying airlines, in combination with restricted space and services, limited past developments in catering (Jones 1995). Currently, the airline catering industry serves both passengers and airlines on board with a wide variety of meals that range from modest meals in short haul 'economy class' to 'five-star gourmet meals' within 'long-haul first class'. Modern airline catering companies not only produce meals, but they also provide comprehensive logistic

solutions and other in-flight services. Flight services are most likely the complicated airline system worldwide (Jones 2005). Today, in-flight catering is a key aspect for the success of airline industries.

The Arabian supply chain (2015) reported that the International Travel Catering Association (ITCA) addressed the standards of in-flight catering, which are considered to be among the top three deciding factors for passengers booking and selecting airlines. Preparing meals for every passenger on every flight is a challenging task, making it very important for the flight catering company to plan, control and design its supply chain. In addition, integration with logistical and cross-functional drivers in a manner provided high-quality service by maximising the overall value generated strategic alignment (El-deen, Hasan, and Fawzy 2016).

Managing the flow of meals from the kitchen to the airplane, along with the reverse flow of waste items and cleaning up is a very challenging and a complicated process (Kumar, Sharma, and Agarwal 2015; Tanco, Jurburg, and Escuder 2015). Although the primary difficulties faced by the airline industry include growing fuel costs, cargo security, cargo service, and being on time, considerably, in-flight catering tends to be an equally important service.

In-flight catering began in 1919, when the Handley Page Transport Company (a.k.a Imperial Airways), a plane that served the first in-flight meal aboard from London to Paris. The meal was pre-packed in a lunch box for serving to both the crew and passengers (Jones 2012). Subsequently, few airlines served meals to attract customers. In the late nineties, Emirates Airline started its operation as one of the largest airline kitchen facilities, however 'Emirates Flight Catering', with the potential to prepare more than 163,000 meals per day for its flight took off from Dubai International Airport in 2015 (Townsend 2016). According to Jose (2012), operations in in-flight catering are quite complex given the large number of simultaneous take-offs and landings, indicating that in-flight catering is 80% logistics and 20% cooking. Therefore, companies must use supply chain logistics to ensure efficient and effective operations.

This paper addresses the persistent growth of EKFC operations and investigates the relevant strategies that reinforce its fundamental competencies, by which its catering operations are driven. The paper aims to report on how EKFC competes with other service providers to provide Best-In-Class (BIC) quality food services to their passengers. Furthermore, the research case study also demonstrates the historical development, recent growth and a roadmap for EKFC. A SCOR model is used as the most promising supply chain strategic decision-making framework to examine EKFC's supply chain stages, including planning, sources, making meals, delivery and returns. In the SCOR model, a 4-phase top-down approach has been demonstrated for EKFC processes from a high level 1 (level 1) to an elemental level 4 (level 4) mapping, along with identifying strategic improvement opportunities by introducing best practices and performance benchmarking.

2. The in-flight catering industry

2.1. Literature review

The in-flight catering industry has become a focus in the recent years. The actual food production level for in-flight catering, compared to the logistics, has decreased from 90% in the early 1980s to only 10% of total activity (Gou, Shen, and Chai 2013). Recently, the airline catering kitchen operations remarkably depended on buying ready-to-use products and modern cooking technologies, such as cook freeze, sous vide and cook chill, to increase effectiveness. The movement towards a 'logistic driven business' often requires dichotomous work within catering kitchens, such as skilled/de-skilled and re-skilled practices and work. Often an airline considers several different aspects in regard to the planning processes of in-flight catering. It mainly consists of the nature of the product with regard to the destination of the flight. Carmichael (2005) suggested that food services are one of the two bottom-line operations through which an airline tends to cut costs in order to be efficient. Currently, one such trend is to limit the frequency of meal service and the content of what will be served. Hence, regardless of an industry deciding to cater to their clients, liquor,

as well as food in one form or the other, is assumed to be a part of the service of commercial airlines (Lee and Ko 2016).

From the downstream side, the expectations of travellers are continuously changing in the modern airline industry. In the past, there was mainly a division in the services provided to economy or first class, with each class offering a different menu (Mills and Clay 2001). Food is considered to be a segment of in-flight service that is provided, and it plays a crucial role in the marketing communications of airline carriers. Some of these airlines provide a 'buffet service' for longer flights that offer a component of choices not being offered with traditional plated meals (O'Hara and Strugnell 1997). Buffets service have now been expanded to short flights (domestic), with Lufthansa beginning a 'buffet service gate' that enables travellers to choose their personal food at the gate of departure, taking it on board with them to their specific seat. Passengers also specify specific requirements for menus while booking seats. The majority of individuals are mostly aware of the requirements of vegetarians, but there are also clients who have specific dietary or spiritual requirements, such as gluten free, low sodium, halal and kosher (Mills and Clay 2001). Hence, with the unit of catering, which produces approximately '12,000 to 25,000 tray-sets in a day', meals that conform to spiritual needs are primarily bought from expert providers. Others are mainly created in-house, and these 'specialist tray-sets' require cautious costing to ensure that the caterer does not sustain a loss. As clients become more aware that 'airline carriers' will and can cater to special dietary needs, the quantity of the meals made by caterer's increases (King 2001; Ho and Leung 2010).

Fulfilling the specifications of a product is a part of the contract of the flight caterer. Thus, stock-outs can cause contract loss or penalty payments. Conversely, holding significant stock adds costs to business and is detrimental to the flow of cash. For the airline catering industry, Lin (2017) recommended to have a more nuanced understanding of supply chain capitalism that focuses not only on the overt circulation of goods but also on the production of mobilities as logistical orders. Manufacturers usually purchase few items from airlines and pay to the caterer to store them in the unit of flight production. Therefore, the stock is separately held to enable stock checks (Power 2005). Within the logistical constraints of offering meals to passengers on the aircraft, the designers of the system have some choices. Hot food can be either frozen or chilled and reheated at the place or time of serving. Various packaging methods and techniques during transportation, delivery equipment and thermal constitution techniques are also available to the designer of the system. Therefore, several different options are required, some of which are suitable for the use by the 'in-flight caterer'.

In today's always competitive aviation industry, the quality of in-flight meals can make a difference in customer satisfaction (Jose 2012). According to Khan (2010), airline passengers currently have expectations regarding the quality, variety and consistency of in-flight menus, causing operators to ensure that they have special meals to suit different diets and cultures. To address cultural and national differences among its customers, regional catering managers in the catering industry are tasked with designing menus that fitting their environments and cultures. Additionally, to keep up with changing tastes and preferences, the company relies on customer feedback, whereby disliked menus and dishes are withdrawn as soon as complaints reach catering managers (Sahoo 2012).

In recent years, airlines have realised that consumers' tastes change for religious and health reasons. Therefore, they have started offering specialised meals, such as gluten-free and low-calorie meals (Jose 2012). The catering industry must ensure that all of its meat products are Halal compliant to meet the requirements of the Islamic religion (Al Halaseh and Sundarakani 2012). Furthermore, customers can order special meals while booking their flights 24 hours in advance (Emirates 2016). Passengers today demand more for less; therefore, the industry strives to ensure that in-flight catering services offered by Emirates Airline provides a competitive edge by ensuring that they meet the demands and requirements of the consumers (Shubbar 2012). According to Jose (2012), given that competition is very high among airline carriers in the Middle East, operators use in-flight catering to remain competitive. This can be achieved by in-flight caterers who adopt key supply chain techniques to make their service exceptional.

In this context, Gou, Shen, and Chai (2013) suggested that the airline catering firms are currently not solely producing meals but have also become established providers of comprehensive in-flight service solutions with multifaceted logistic processes and supply chains. However, room exists for more strategic approaches to 'supply chain management' across different sectors of catering processes, according to O'Donovan, Quinlan, and Barry (2012). Globally, in-flight catering is probably the utmost complex operational system (Bata et al. 2006; Szymanski 1995). Alternatively, Szymanski (1995) stated that, irrespective of these complexities, the supply chain contributes to increase in spending. Conversely, catering companies tend to face pressure from airlines to cut production costs while maintaining quality and focusing on client satisfaction, as demonstrated by Pedrick, Babakus, and Richardson (1993). Law (2011) affirmed that in-flight catering is now entering a competitive environment, in which services are streamlined and automated despite the heavy cost of labour being considerably manageable. The production of food is a single stage during the operation process (Loughlin 1991). There are numerous consequent deliveries in addition to assembly stages, such as trolley loading, bar cart assembly, tray assembly and dish assembly (for instance, assembly of other dishes and hot entrees from their components, such as assorted vegetables, rice, fish and meat).

In the new economy, majority of catering providers contract to supply different airlines because these are limited to airports, where a particular airline has sufficient flights to justify limited use of a kitchen, excluding the 'hub airports of major carriers' (Nyberg and Wiklund 2017). Hence, in the business of flight catering, there are a substantial number of meal deliveries required during flights (long or short haul), to different type of airlines (such as executive, low-cost, charter and scheduled), and for different times of day (such as breakfast, mid-morning, lunch, mid-afternoon, dinner) and seat classes (such as charter flight, economy, business and first class), thus ensuring that recurrent flyers are not usually served similar menus using a menu on rotation basis. In total, there are 26 different kinds of menus, for example, vegetarian, low-salt, low-fat, halal and kosher. Hence, research conducted by Hasachoo and Masuchun (2016) revealed that the airline catering industry is among the immensely 'nervousness-sensitive industries' because its forthcoming demand is primarily not deterministic but is rather a non-stationary stochastic demand and random due to the exact order quantity being based on the number of passengers, which is confirmed only minutes before the departure time.

Due to the surge in the scope of sustainability in recent years, Accorsi et al. (2014) proposed the application of a 'life cycle assessment' (LCA) based method for the analysis of substitute systems for food packaging. Furthermore, their study also focused on distribution and packaging issues to address a sustainable food chain. More recently, Sel, Soysal, and Çimen (2017) proposed a green model for designing a catering supply chain encompassing service management and production constraints. The results of the model focused on the 'sustainable development' of catering supply chains, revealing the potential advantages of outsourcing (such as limiting waste costs by 23% and total cost by 36%), thus emphasising on some process improvements.

Review from a quality perspective, Basfirinci and Mitra (2015) proposed integration of the Kano model and Servqual in this industry context. The attributes of service quality for airlines with respect to their impact on customer satisfaction in a cross-cultural environment was explored. In contrast, Ho and Leung (2010) used a metaheuristics approach to address basic manpower scheduling issues of the air catering industry, and they noted ways of achieving profitability through a reduction of supply chain costs by understaffing and overstaffing.

2.2. Research gaps

Most of the literature reviewed in the past has analysed the impact of supply chain management on business performance only (Nataraja and Al-Aali 2011; Law 2011). However, the ways to improve catering quality in order to exceed consumer needs to be studied. Most researchers limit their study to understand the internal supply chain operations that often lack consumer perspective (Law 2011 & Warde (1999), as highlighted in Table 1.

Table 1. Identification of the research gap.

Author	Title	Research method	Research objectives	Major research findings	Identified research gaps
205 210 Law (2011)	Airline catering service operation, schedule nervousness and collective efficacy on performance: Hong Kong evidence	Quantitative	The study aimed to explore the association between the schedule determinants and schedule nervousness that impacts the concerns of individuals during airline catering operations in Hong Kong	Positive relationship between customer and internal operations are identified which affects the efficacy of work at the collective level.	Lack of understanding with regard to consumers and anticipation with respect to a specific service in airline catering operations
215 220 Nataraja and Al-Aali (2011)	The exceptional performance strategies of Emirate Airlines	Literature review	To investigate the competitive advantages as well as strategies of Emirate Airlines that have led to the Airlines performance.	This review-based research compared the performance outcome of the Emirate Airlines and its phenomenal growth with other airlines.	Implementation and formulation of appropriate frameworks and strategies are needed
225 Nyberg and Wiklund (2017)	Impossible meals? The food and meal situation of flight attendants in Scandinavia : A qualitative interview study	Qualitative + Semi-structured Interview	The study aimed to investigate how the organisation of work, time and place, influence the food and meal situation of flight attendants, when at work, focusing on patterns, and social context of the meals.	The results demonstrated how work organisation, place and time influence the meal and food situation of flight attendants during work. It mainly focused on the social context and patterns of meals.	Gaps identified including how the organisation of work, time, place, and also social relations, affect food and meal behaviour and attitudes towards food. Further studies are needed in terms of quantitative aspects of meal patterns.
230 235 Warde (1999)	Convenience food: Space and timing	Quantitative + Census	A census of retail outlets selling food was carried out in a deprived area within a 2 km radius from a central point of study area. Information on the price and availability of 'healthy' food lists, acceptable to each of the four major ethnic groups in the area were targeted.	Results identified the geographic location of areas with inadequate access to food. Food shops were mapped in terms of food availability and price indices	Qualitative studies are needed in future to investigate deeper issues for identifying the geographic location of food list with inadequate access.
240 245 Divecha (2015)	Case study: flight catering	Case study	The study aimed to re-invent Qantas total economy experience, not only from a food perspective, but also from a service perspective	The research evaluated the Qantas team performance and their customer satisfaction through service feedback	Series of recommendations were suggested and no further scope was disclosed
250 Lin (2017)	Catering for flight: Rethinking	Secondary data analysis +	The research focused to investigate the production of	The paper identified some dimensions that logistically shape	There is a need to rethink overt

(Continued)

Table 1. Continued.

Author	Title	Research method	Research objectives	Major research findings	Identified research gaps
	aeromobility as logistics	Archival records	airline food, in-flight catering, and the various technocratic processes of value chain coordination	in-flight catering. The paper warrants for a more nuanced understanding of catering supply chain operations	circulation of goods in-flight logistics

More recently, Nyberg and Wiklund (2017) have suggested that the aviation industry tends to face a number of challenges such as in-flight services during the travel experience, media perception regarding quality of meals, logistics and supply chain issues such as circulation of goods. It is difficult for the airline industry to prioritise supply chain issues while developing relevant strategies that reinforce its fundamental competencies by which catering operations are driven. Based on this identified research gap, the process of successfully implementing SCOR model was found to solve some complex operational issues while simultaneously proving novel academic contribution.

Another major gap as identified from the literature review is the need for winning from sustainable competition in the in-flight catering industry (Divecha 2015). Any reduction in service quality thus impacts the industry critically. Moreover, case study seemed to be an appropriate method of research for critically examining a particular phenomenon of industry for which quantitative research method are unviable, as evidenced by Eisenhardt (1989), Voss, Tsikriktsis, and Frohlich (2002), Gunasekaran, Ngai, and Cheng (2007), Villarreal et al. (2017) and Sternberg and Harispiru (2017). Thus a qualitative case-study-based research in measuring operational excellence of in-flight catering through the application of SCOR model is found to be of paramount importance for sustaining competitive advantage.

Hence, the remainder of the paper is organised as follows. First, the uniqueness of Emirates Airline is discussed in the following section. Then, the EKFC case study is discussed critically based on the research conducted in the case environment. The SCOR model is used as a framework for the assessment of EKFC's facility mapping, organisations, systems and processes. Finally, the case concludes with some performance improvement highlights that could be used by similar catering supply chain providers.

3. Uniqueness and operation scope of Emirates airlines

Dubai as a city is mainly situated at the centre of the Middle East, which connects the Western economy from the rising Asian economies. Due to surging demand in this route, different airlines have managed to tap the market from both sides (Direction 2012). Because of the fastest growing and most densely populated world economies, such as India and China, that are at closer reach to the Emirates, the operational scope of these states, as well as the region, has enhanced noticeably for Emirates Airlines (Sundarakani 2017). Generally, the Asian continent is currently witnessing an economic boom, and the airline has considerably benefitted from this opportunity. In 2010, Emirates operated more than 2400 passenger flights per week to 105 cities in 62 countries across 6 continents. Emirates has more than '28,000 employees including 13,000 cabin crew members of more than 120 nationalities', who are able to converse in '60 different languages' (Nataraja and Al-Aali 2011).

Emirates Airline is well known for trends in the market such that it pioneers fresh ideas that are contrary to the views of 'conventional industry' with numerous notable services, including personal entertainment systems, the introduction of smart landing, mobile phones on-board usage, private first-class suites and smart runway safety solutions. Hence, the success of Emirates Airline is mainly driven by the ambitious approach articulated by the Dubai government to convert Dubai into a 'regional hub of tourism and trade' in the Middle East (Sundarakani 2017). The formula for the

success of Emirates is based primarily on its creative and innovative service in the airline market and thus taking of opportunities as they arise. In this regard, EKFC as a subsidiary company supports the Emirates group in being able to lead with their strategic roadmap. The following sections describe the persistent growth of the EKFC supply chain and operations.

4. EKFC – case study

4.1. EKFC service background

Emirates Kitchen Flight Catering (EKFC) is a jointly owned company of Emirates Group (90%) and Dubai Civil Aviation (10%). The company operations are based next to Dubai International Airport and stand on a 56,000 m² facility in Dubai (Emirates 2016). Plans are under way to build an additional 50,000 square foot extension to manage surging demand (Gazzar 2014). The EKFC facility officially opens in 2008, began with 33 flights a day and propagated to 375 flights a day. The facility is responsible for supplying 40 million meals for Emirates flights and 8 million meals for other airlines per year (Gazzar 2014). In 2003, Emirates began catering out of Emirates Abela Catering Company. Later, in 2005, operations began at a new food point facility in Dubai Investment Park (DIP). Currently, the EKFC facility is based both at Dubai International Airport and a food point facility located in DIP for serving its client (Emirates Flight Catering 2017a). Catering supply chain of EKFC seemed to be very complex, the following section discusses the key elements of the supply chain at EKFC, including purchasing, operations, distribution and integration based on a standard framework. This research case presents how SCOR model-based process mapping helps to reduce the complexities of EKFC business process and thus enables to benchmark with global BIC players such as Singapore-based SATS.

4.2. The supply chain process mapping

The supply chain measure of EKFC beholds an extensive collaboration with Emirates Airline to enhance its supply chain performance. The process is initiated at the incoming material receiving rooms of the EKFC facility, which is the docking area where all of the food and other ingredients enter the facility. To ensure that there is no contamination, materials that enter into the facility by an Emirates-owned and certified pallet and therefore anything of a different pallet is transferred out by a sorting machine, Simpsoe (2016). In addition, the facility owns an X-ray machine that detects any unwanted food items. In conjunction with the receiving part of the inbound docking facility is the delivery area for thousands of used catering carts that come in from the flights. The facility also has a devoted disposal team that addresses the trash, leftover food and any other waste. Every used piece of cutlery and glassware is washed at a specific temperature using a conveyor-belt-washer machine, minimising the workload for the staff. Additionally, the facility has a vacuum-powered waste system that works efficiently to clean all of the previous leftovers remaining from the flights.

The EKFC catering facility in Dubai is one of the most modern and largest of its kind in the world, with a design capacity of 115,000 meal trays per day. The capacity has now reached more than 175,000 meals per day, and it is also expected to reach 190,000 meals per day before the end of 2017 (Emirates Flight Catering 2017b). The facility operates with high levels of automation, including a 2.55 km electric monorail system that transports meal carts, a bin conveyor system and a vacuum waste system. In addition, EKFC offers its catering services to other airlines operating at Dubai International Airport. Aside from its in-flight catering, Emirates Group also offers F&B services (airport), event catering, VIP & private jet catering, linen craft and food points, as shown in Figure 1.

Because the catering supply chain is so complex and time sensitive, involving all activities of the business process and integrating them between the supply chain and other business functions, it is difficult to evaluate the performance because it lacked an end-to-end scope. Hence, this paper uses

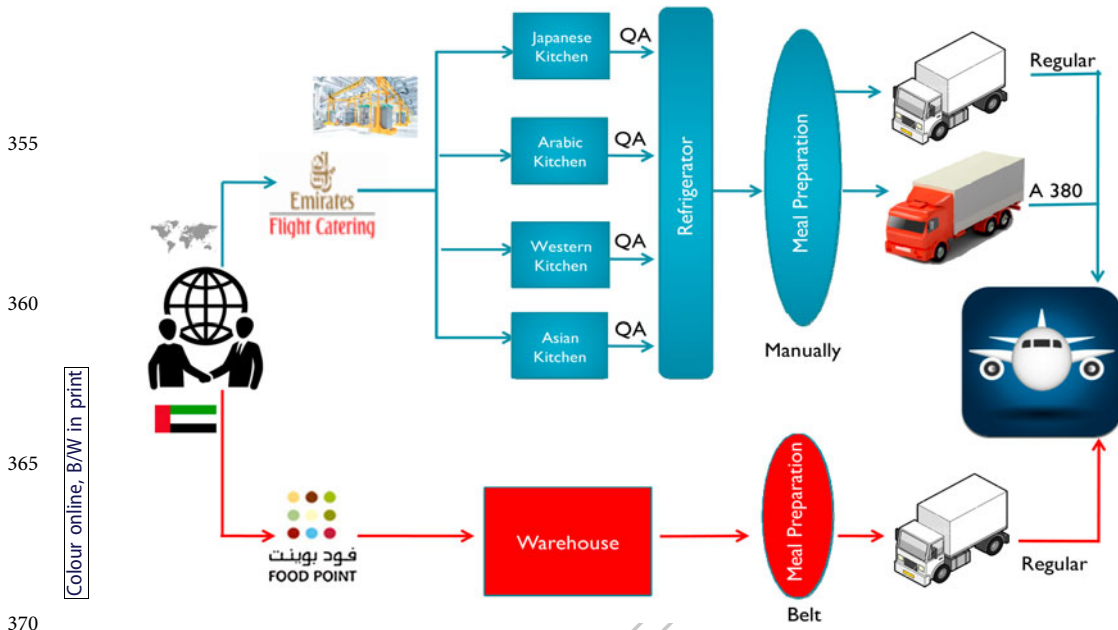


Figure 1. The supply chain process map.

the Supply Chain Operations Reference (SCOR) model as a framework to examine the process architecture of EKFC and to measure its supply chain performance.

4.3. SCOR model

SCOR is a process modelling pillar, based on six different management processes, including ‘plan, source, make, deliver, return and enable’. Using these six building blocks, the model can be utilised to describe supply chains that are considerably complex (Apics 2018). Because the case company’s supply chain lacked an end-to-end scope, these practices of mapping processes enable the organisation to improve its overall supply chain transparency and thus its delivery performance.

The SCOR model is built around different processes that are mapped as interlinking flows from a very high level (strategic level) to elemental level (nano level) of supply chain processes (Apics 2018). The model aims to present standard metrics that can be utilised for benchmarking, as well. The proposed framework helps to measure the supply chain performance from suppliers to final consumers, enclosing both actors from upstream to downstream and then downstream to upstream. Therefore, when choosing suppliers, such measures are examined by purchasing managers in their purchase orders. Although a variety of metrics are in place from the SCOR model, the most widely used metrics are cost, price, flexibility, delivery, quality, number of products being delivered and time for delivering the product and service. The following section details SCOR adoption in the EKFC supply chain processes.

4.3.1. Plan

In the first step, level 1 focuses on the key strategic supply chain processes of plan, source, make, deliver, return and enable to define the overall scope of the EKFC supply chain. The plan also involves determining the rules of business to measure the performance indicators, as well as to improve the efficiency of the EKFC supply chain. These types of business rules span demand planning, logistics planning, location planning, inventory planning and staff planning through the

regulatory compliance of EKFC operations. This business strategic planning correspondingly must be aligned with the company's financial planning.

As depicted in Figure 2, one of the critical operations activities at EKFC is demand planning, in which the company focuses on meeting the needs of its passengers. The major challenge in demand management at EKFC is to match the ever-increasing demand with its limited available capacity. Because high-quality food preparation is the main activity at EKFC, the meal contents vary based on regional variations, indicating that the food prepared for flights to India is different from that prepared for Japan. Quality control is also a major operation activity to ensure that the food is prepared, handled and reaches the customer at the right specifications (Townsend 2016). For example, hot food should be consumed within 72 hours after cooking. Therefore, the timing between preparation and consumption must be precise. One of the major factors that render operations at EKFC effective, is the timely communication. If Emirates Airline anticipates that there will be flight delays, it tends to communicate with the catering department to ensure that preparation timing is adjusted accordingly (Sahoo 2012).

4.3.2. Source

Level 1, source, examines the raw material, meat product acquisitions and infrastructure. Level 1 also explains how supplier performance, agreements, supplier networks and kitchen equipment are managed. In addition, level 1 addresses various activities and their ways of handling payments of suppliers to transfer, verify and receive products. With regard to flight catering, level 1 includes raw food materials, fruits, vegetables, meat products, kitchen equipment, cooking staff (chefs and food masters) and administrative staff.

As a leader in the Middle East flight catering industry, EKFC has established long-term relationships with suppliers to ensure that supplies reach establishments on time and in the correct quantity and quality (Simpson 2016). For instance, the company sources its wines from various vineyards from more than 11 countries worldwide, and the company has long-term relationships with some French vineyards, so that they can book the vineyards before harvest. These strong relationships with wine suppliers ensure that the company has the best picks for its customers (Townsend 2016).

To ensure that there is improved performance in supplier management, EKFC first conducts supplier evaluations to determine supplier capabilities in supplying a particular product. When necessary, some suppliers are certified to ensure that their product and service are in compliance with

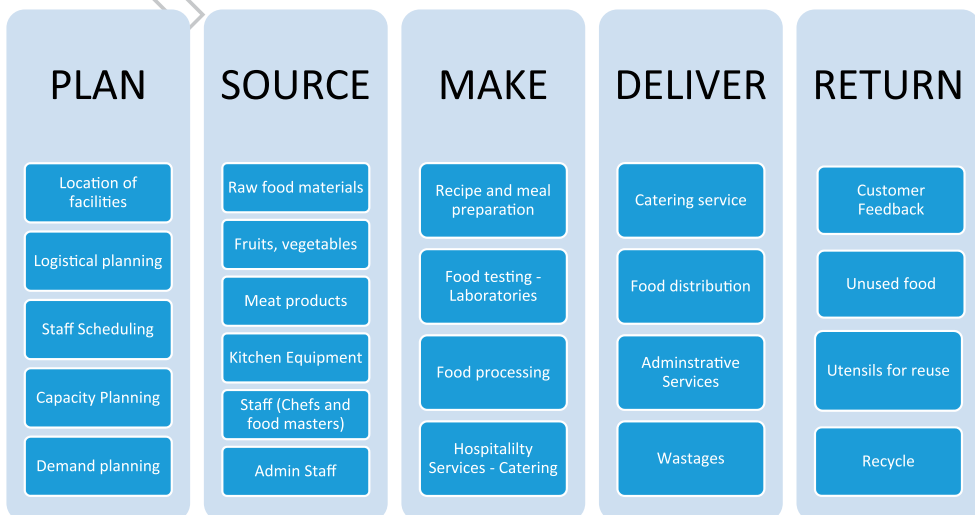


Figure 2. SCOR Model Level 1 mapping of EKFC.

EKFC (Emirates Flight Catering 2017a). According to Jose (2012), strategic partnerships with suppliers are essential in supply chain management because they enable the company to build trust and long-lasting relationships with the best suppliers. Similarly, at EKFC, most food supplies are sourced from abroad and to cushion the company against fluctuations in prices, the company and suppliers fix food prices one year in advance (Sahoo 2012).

4.3.3. Making meals

Manufacturing and production are believed to be the primary focuses of this step. This step consists of packaging, product staging, releasing and production activities. Manufacturing also consists of production networks, equipment and facilities, in addition to transportation. In this case, with regard to flight catering, manufacturing also includes recipe and meal preparation, food testing laboratories, food processing and hospitality services catering.

Integration is also important for the smooth operation of the EKFC supply chain, and the company must ensure that all participants work together to fulfill common goals. For instance, by means of supplier certification, a company often commits to suppliers that supplies will be delivered on time, in the right quantity, and of the best quality (Townsend 2016). Furthermore, Emirates Airline must communicate in advance the demand for various meals to ensure that everything is catered for within the strategic plan.

As shown in Figure 3, the ‘make’ process begins with the order verification stage. When customer from Emirates and other airlines place their orders (D2.1), the order is verified and then passes through the subsequent flow of source planning SP 2.2 and catering M2.2 and is made to order (MTO). To avoid any delay, as soon as all of the ingredients are acquired, they are sent to the kitchen for meal preparation. Therefore, the supplied food is fresh with no preservatives used. The supply of food is not delayed in EKFC before being transferred to a flight after the flight service carts are verified D2.1, and sealed off. Therefore, every food bin and carton is tagged with a colour code for different days of the week. If the food stays longer than its sticker allows, it will be disposed off in order to ensure the best quality of food is served to the passengers. In Level 3, the catering delivery processes seem to be very complex, from EM2.2.1 to D2.2.3; thus, this process mapping helps the case

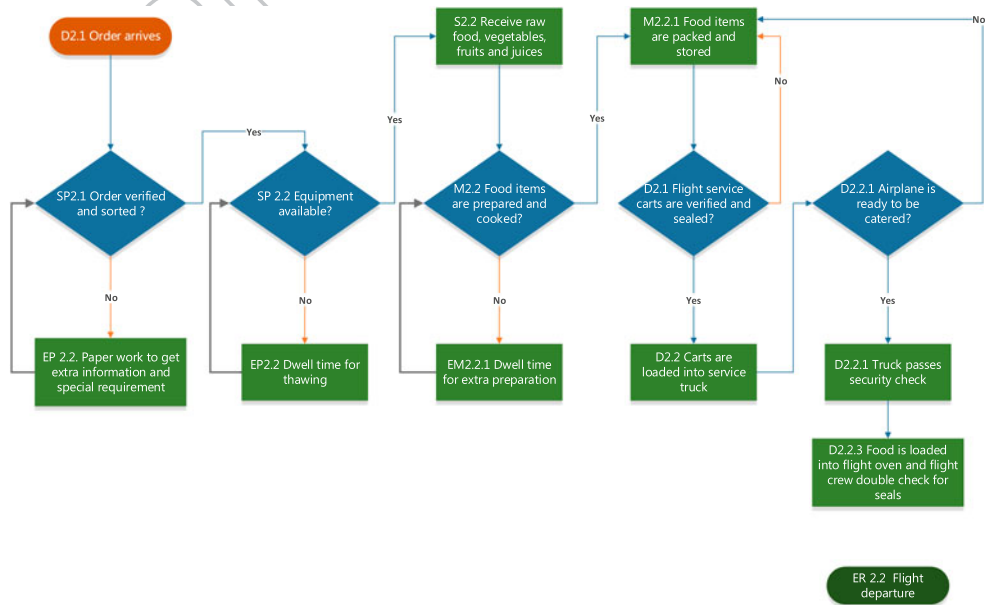


Figure 3 . SCOR: Level 2–Level 3 of EKFC catering ‘make’ process map.

company to reduce its complexity and streamline its supply chain. Moreover, the analysis eliminates redundant activities and thus reduces the dwell time (EP 2.2) of the process.

4.3.4. Delivery

Delivery includes management of orders and warehousing, as well as transportation. It also takes account of receiving orders from clients, along with invoicing as soon as any product is received. This step includes management of 'completed inventories, assets, transportation, product life cycles, importing, and exporting'. In terms of flight catering, it includes, catering services, food distribution, administrative services and waste disposal management (Simpson, 2015).

Although food catering was found to be the core activity of EKFC, transportation of carts to flight departure (Enable delivery and Return ER 2.2) gates is performed internally by EKFC to ensure that the food arrives at the destination on time and in the right condition. Similarly, timing of food delivery for the flight is critical to ensure that everything is ready and on board before departure. The process of delivering the flight supplies begins two hours before departure, when trolleys full of supplies leave the facility en-route to the flight-loading bay. Security at the service roads is heightened to ensure that no hitches occur because they might delay the entire flight (Khan 2010). Here-with, modern technology plays an enormous role in ensuring that there is coordination in distribution, whereby most processes are automated.

EKFC serves approximately 90,000 fresh meals per day for first-class and business class passengers from the Dubai Airport facility. Furthermore, EKFC serves 60,000 meals to economic class that are de-frozen and packed by a food point facility located in DIP, in the UAE. EKFC has an automated, customised overhead cart transport system (monorail system), where the approximate time required for offloading each aircraft and loading it again for the next flight is 35 minutes, which renders the delivery D2.1/D2.2 time bound and thus requires utmost perfection.

4.3.4.1. Warehouses. Warehousing for EKFC falls under D2.1/D2.2 depending upon the type of products, whether delivering stocked products (D2.1) or delivering MTO products (D2.2), as shown in



Figure 4. SCOR: Level 3 mapping – Delivery warehouse operations.

Figure 4. In total, EKFC has three warehouses in the main building, which are currently close to the Dubai airport terminals, and an additional warehouse for economy class-ready meals located in DIP, Dubai. Packaging delivery (D2.1.2) begins in the receiving room, where food and other materials come into the facility through a constantly arriving and departing fleet of vehicles. The capacity of the warehouse is 1900 Euro pallets, and 60–70% are used, totalling approximately 1200 pallets. To reduce the chance of food contamination, the lot enters the facility on an Emirates-owned and certified pallet. In this process, the materials are moved on a different pallet transferred by a machine. At this point, the food or amenity product is then scanned by dual-view X-ray machine to identify and quarantine any item with any unwanted contaminants. The receiving area for all first-, business and economic class flights from all over the world includes 50 receiving zones for each flight, separating food waste that will go for recycling, and washing machines. As soon as trolleys are received from flights, they are segregated into food, beverages, duty-free trolleys and dirty equipment, which are specifically washed or recycled. Alongside the receiving facility is the delivery point for thousands of used catering carts. Emirates Airlines manages to move 7500 carts through the facility every day as indicated by Sundarakani (2017). These carts are emptied from the previous flight's leftovers and are mechanically washed by a bespoke system tuned to work at maximum effectiveness and also most efficiently clean any spillage or bacteria from the carts' aluminium bodies.

Emirates Airlines possesses 221 planes in its current operational fleet, 59 of which are the massive Airbus A380, indicating large volumes of passengers and food, resulting in the production of waste. This fact suggests that waste, leftover food, half-drunk drinks and the wrapping from complimentary blankets and headphones must be removed from the carts and disposed off by Emirates' dedicated garbage disposal team and vacuum-powered waste system.

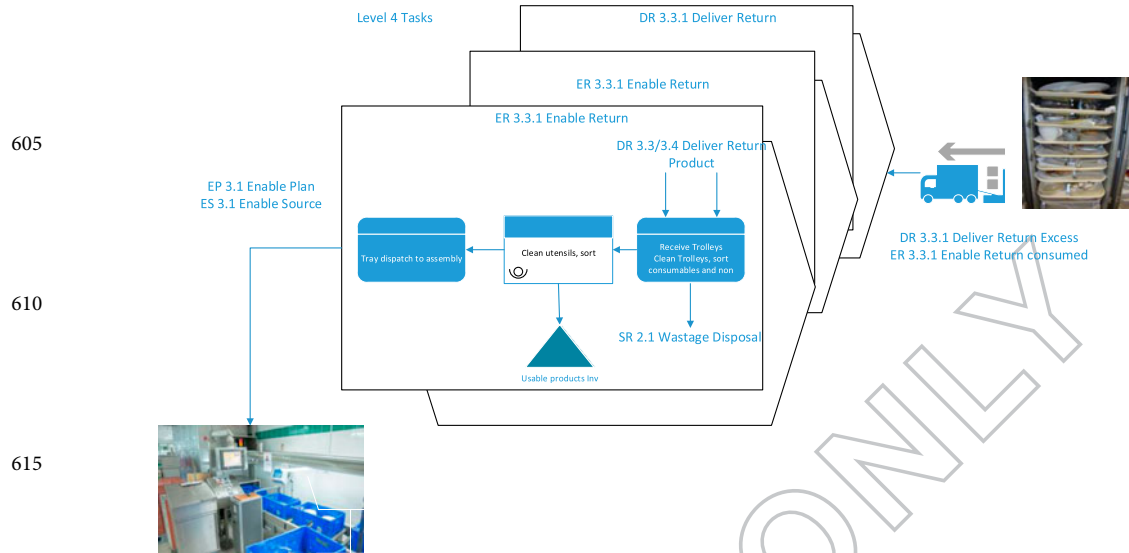
4.3.4.2. Food ingredients warehouse. The ingredients required for meal preparation are stored in the ingredients warehouse and are sent to the kitchen based on the daily meal preparation plan. This warehouse is the largest one in terms of capacity, having 3000 pallets divided into three sub-warehouses based on the temperature required for each item. Initially, in process D2.1.2, the room temperature is controlled for basic ingredients such as rice, cooking oil and flour. Secondly, the chilled room (19–22°C) is controlled for fresh food, such as fruits, vegetables and dairy products. Finally, the frozen room (–18°C) is controlled for chicken, meat and fish products according to Halal standards.

All fruits and vegetables are pre-washed and sanitised. As soon as the food is transferred to the warehouse, it enters a short-term storage unit. The flight catering facility does not possess or require a complex computerised warehouse management system. The inventory mainly includes fresh food that cannot stay in the warehouse for more than 8 to 9 hours because it must be consumed within a specific amount of time.

4.3.4.3. Non-food warehouse. Items that are not used in cooking are considered as non-food ingredients and, therefore, are stored in a separate area. This storage bay is the final stage before meal preparation, during which they are transferred to subsequent flights with other food products such as water, juices and gift chocolates. The capacity of the warehouse is approximately 2000 pallets. It flows into the same procedure for delivery and storage, based on 6-hour flight intervals.

4.3.5. Return

Modern industries are most often prepared for handling and return packaging, defective products and return of used containers. This process includes business rules such as, return of inventory, transportation and regulatory requirements for safe disposal. In terms of flight catering, it includes customer feedback, unused food, utensils for reuse and recycling, which are measured with SCOR level 4 mapping elements as depicted in Figure 5. In level 4, there is a delivery of return products of in-flight leftovers, for both excesses (DR 3.3.1) and to enable other consumables, such as food



620 **Figure 5.** SCOR: Level 4 delivery returns products – elements.

trays, and other usables through the return process (ER3.3.1). A series of elemental level maps for return-related delivery activities are observed to measure operational performance.

625 In practice, the crew and passengers are expected to provide feedback about the meals on a daily basis to ensure that customer needs are being satisfied and not overlooked. Moreover, regional catering managers must design menus appropriate for their regions, considering customer feedback and communicating this information to the chefs on a timely basis to start ordering the ingredients. Therefore, supervision of all these processes by supply chain managers is critical to ensure that all of the procedures are working and to eliminate any bottlenecks as quoted by Simpstone (2016).

630 **4.5. Enable – supply chain**

635 Overall, EKFC requires 16,396 tonnes of food ingredients on a yearly basis to be used in-flight meals. Moreover, from the home carrier, Emirates Airline management requires changing the food menu for all destinations approximately every week as a part of its competitive strategy to satisfy its passengers around the world and to differentiate itself from other airlines. This particular competitive advantage creates many challenges across the whole supply chain process by selecting the best ingredients, most of which are not available in local markets but are purchased from overseas, resulting in the building of an inventory for these items that retains a very short shelf life and the managing of more suppliers from different countries around the globe. The chart in Figure 6 shows the amount of ingredients EKFC requires on a yearly basis, which ensures to sustain its competitive advantages.

640 To comply with its standard, EKFC selects strategic suppliers based on several factors: first, the quality of ingredients required to maintain the image of Emirates Airlines worldwide and to satisfy its other customers; second, the level of service to ensure that the suppliers are delivering the right quantities at the right time with no shortages or backlog. Finally, the price range, which must be monitored to ensure the economy of scale for the high volume of goods purchased every year.

645 **4.5.1. Functional strategies**

650 For a successful supply chain, the lead organisation must ensure that competitive and supply chain strategies perform well that are aligned with other functional strategies appropriately. The firm only succeeds if all of its functional strategies are capable of co-operating and are integrated end-to-end.

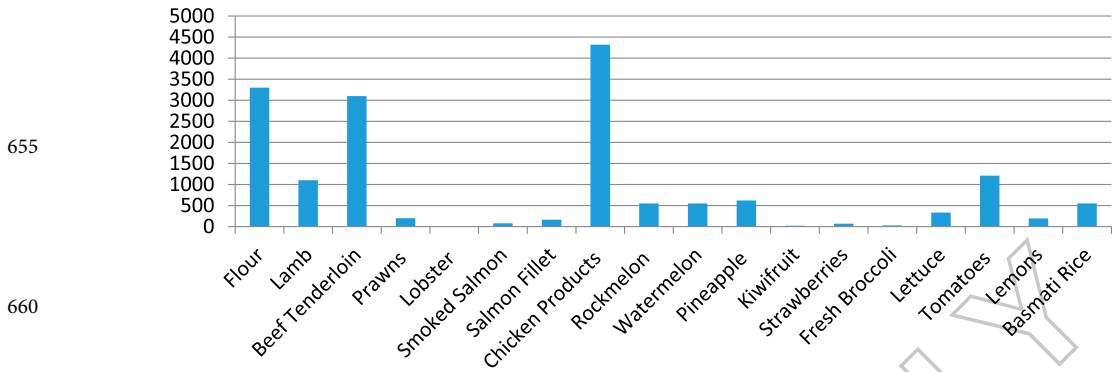


Figure 6. Yearly volume (tonnes) of food ingredients consumed.

Currently, Emirates Airline has a strategically well-designed and developed system for its supply chain strategy, including its hub system, which permits the airline to be more flexible in its routes. However, some areas as highlighted earlier such as the procurement and operations department need to collaborate effectively to manage the prospective challenges occurring in this industry. This system is crucial in the supply chain so that it can work well. The airline possesses a hub, which helps to monitor the flight supply chain services and patterns, together with being centralised at a single airport, making it easier to make decisions when all activities are being monitored from a single point.

4.5.2. Competitive strategy

The competitive strategy aims to satisfy customer needs through products and services delivery using one or more competitive advantages. Theoretically, to achieve a successful competitive strategy, a firm must create edges across the STAR framework illustrated in Figure 7 by identifying all five edges/dimensions, yet it must be sufficiently nimble to change market requirements.

EKFCs critical asset seems to be providing food catering services to all of its Emirates Airlines flights outbound from Dubai to various destinations worldwide, as well as for other major airlines transiting through Dubai. Having said that, EKFC's competitive strategy focuses on satisfying the needs of the customer by using innovation to deliver quality food at an optimal cost, thus harnessing the supply chain to sustain a competitive advantage. One more major aspect of retaining a competitive strategy involves the use of colour-coded storage boxes that aim to save time and reduce costs. In addition, EKFC uses in-line cooling curtains that control the temperature of the food so that it does not undergo many temperature fluctuations, and it stays fresh when served. It is now clear that Emirates Catering focuses on the quality and freshness of the food being served to customers over and above the widespread use of innovative automation systems. The company also aims to save time in

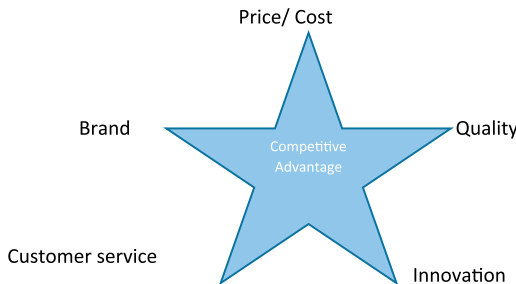


Figure 7. Competitive advantage of EKFC in relation to its edges.

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production and storage, reduce waste and energy and optimise its productivity. The bottom line is to excel on the basis of competition by these means of differentiation.

4.5.3. Supply chain strategy

Executing a good supply chain strategy and achieving the right strategic fit are imperative aspects of determining the success of a company. Therefore, there must be perfect consistency between the competitive strategy and the supply chain strategy that minimise any unnecessary variations along the supply chain. As recommended by Chopra and Meindl (2016), to achieve a strategic fit, the company must first understand the uncertainty of the supply chain, along with the supply chain efficiency and responsiveness, while EKFC catering has been split into different products due to the complexity of having different classes on a single flight, economy class and business/first class, with varying degree of uncertainty. The economy class has a slightly different supply chain than business/first class due to many factors, including the type of ingredients used, different facility locations, and the freshness of the food, food packaging and food variety. Operationally, the economic-class demand is aimed to be more stable than the business class and first class.

When identifying the customer needs for EKFC, it is often clear that all customers require top-quality, fresh and delicious food. While conducting onsite examinations, the research revealed that economy class leaned towards a more efficient supply chain, whereas business/first class was inclined towards a somewhat responsive supply chain. Table 2 below discusses various category differences between the efficient and responsive supply chains in relation to the logistical and cross-sectional supply chain drivers.

The strategic fit exercise above demonstrates that economy class has a somewhat definite demand and therefore offered an efficient supply chain, whereas business/first class has a high degree of implied uncertainty and therefore applied a responsive supply chain. Overall, the research reveals that EKFC's catering supply chain follows a hybrid supply chain strategy by thoughtfully laying

Table 2. Supply Chain Drivers measured across EKFC business processes.

Supply chain drivers	Responsive (Business/first class)	Efficient (Economy class)
Facilities	Located close to the airport terminals and standby facilities at the airport. Large area of 58,600 m ²	Located in Dubai Investment Park, that required some travel time from airport. Regular deliveries per day of fully loaded trucks
Inventory	High inventory 24-hour replenishment. Wide range of meals available based on destination. Three available segregated warehouses.	Inventory levels are lower. Very high turnover. Far fewer meal options than business/first class.
Transportation	Very frequent and fast shipments. Around 300 trucks available. Speed is the focus.	Few but large shipments daily. Around 100 trucks available. Orders are generally aggregated and hence economy of scale in supply and inventory is focused
Information	Uncertain demand for meals based on a number of flight tickets sold (high price tickets). Changes in-flight timings and destinations can complicate the supply chain drastically	Certain demand for meals due to economy class is always being sold out. Similar meals for all flights, making it easier to coordinate the delivery of the meal trays
Sourcing	Deliveries must be finished within 6 hours. Meal preparation is performed on the same day as the flight departure.	Weekly or monthly deliveries of products. Meal preparation is undertaken in advance together with purchasing. Meal trays are frozen and defrosted when needed.
Pricing	Variable price strategy. Meals are costly, due to the use of very fresh ingredients, top chefs and specialised menus for each destination. Tickets are expensive	Fixed price strategy. Economies of scale in operations. Tickets are 20% less expensive; therefore, the budget is less, and food freshness is decreased.

Source: Adapted from the strategic fit theoretical framework (Chopra and Meindl 2016)

out every SCOR element of planning, sources, making, delivery and returns, ultimately aligning its strategy end-to-end.

4.5.4. Achieving the strategic fit

Figure 8 below illustrates how EKFC implements its strategy by synchronising across other operations discussed in the above sections, through its corporate strategy, transportation strategy, Information Technology strategy, marketing strategy, sustainability strategy and supplier collaboration strategy in the development and implementation process. Any small variation in these business strategies is swiftly communicated to EKFC's executive team to be able to re-align with the supply chain strategy.

5. Key issues in designing and implementation

One of the greatest challenges for EKFC in terms of warehousing is the limitation of space. The capacity is not sufficient relative to the amount of goods received on a daily basis. Although EKFC receives its supply 24/7, and suppliers are sent goods based on a six-hour notice period, this challenge remains critical. Another challenge faced by the industry includes the short-life cycle of the product because it should be used within one day from being made, thus avoiding food waste. Therefore, optimal planning requires improvement, while forecasting quantities of meals is based on the flight destination, with a variety of meals, such as 6000 different menus each year, which seems to be very difficult task for the planning department. Therefore, to receive all of the ingredients from the suppliers on time, the company must ensure that its re-order point satisfies optimal lead-time conditions. Innovations in monorail transportation, which is currently 2.5 km long and crosses 3 floors within the facility, reduces accidents because it has 180 carrier capacity, along with 17,500 full trips everyday operating at 99.6% efficiency.

5.1. Benchmarking the performance

In the race to become a BIC performer and to ensure EKFC's measures with a global standard, benchmarking is performed. Benchmarking is a continuous process used to achieve business excellence. While it is a common practice to benchmark the service, in this analysis we benchmark EKFC production, delivery and service excellence with that of Singapore-based SATS catering performance measures (Table 3).

For a prolong period of time, SATS has been established as a BIC catering provider for the Asian flight catering market, Chang, Yeong, and Loh (1997). Therefore, Table 3 compares the production



Figure 8. Operational strategy implementation and strategic alignment

Table 3. Benchmarking the performance to lead BIC company.

Benchmarking	EKFC	SATS
<i>Production</i>		
Daily meals (meals/day)	180,000	336,000
Capacity (square meters)	88,000	60,000
Waste reconciliation	600 meters of vacuum	–
Quality accreditation	HACCP, ITCA, OHSAS 18001 & ISO 9001	2016 QSAI Silver Award, ISO 18001 & ISO 9001
<i>Service</i>		
Main airlines	Emirates & Fly Dubai	Singapore & Silk Air
Hub	Dubai	Singapore
Clients	128 International Airlines	68 International airlines
Passengers handled	55.0 million	25.18 million
Flights handled – Annually	146,400 flights to 142 destinations	85,280 flights
Gross meals served	53.25 million	34.21 million

Source: Archival data collected from Emirates Flight Catering (2017a) and SATS (2017).

and service measures of EKFC and SATS for the Yr 2016/2017 financial period. Based on the archival records of these two organisations, the research presents how EKFC sets comparable measures in line with the global SATS. Although SATS leads on a daily meals production, the production capacity of the facility indicates that it is lagging behind in international clientele (68 clients) and annual passengers handled, which is numbered at 25.18 million (SATS 2017). Other leading indicators of EKFC are annual gross meals of 53.25 million served and its annual flight handling destinations of 146,400 flights to 142 destinations as opposed to SATS of 34.21 million meals serving with 85,280 flights. These measures show that EKFC's performance measures are comparable to and even exceeding SATS performance outcome, thus setting new limits for in-flight catering benchmarking.

5.2. Major benefits and risks

Offering 24/7 service to a variety of customers requires much staff and a very high degree of automation. To accomplish this goal, EKFC has invested in SAP-based Enterprise Resource Planning (ERP) systems to ensure that all of the operations work together. The widespread use of modules has facilitated coordination with key airline catering functions in the facility, such as finance, inventory, purchasing, HR, equipment maintenance and manufacturing, thus leading to end-to-end transparency.

The company upgraded to the latest version of the ERP software, enabling them to reduce invoice time by 60% by introducing electronic invoicing for customers, faster development of new menus, and lower costs, thus reducing inventory, improving stock management, expediting delivery of pay slips and eliminating the need for manual processing in several tasks (Sutton, 2012). However, there are a few risks that the facility addresses on a daily basis. Because most of its ingredients are imported from different countries, a small delay from suppliers can lead to a delay in the production sequence of the food. Foreign suppliers play a key role in EKFC's business operations because local suppliers are unable to provide enormous quantities required. Therefore, using block chain the ledger payment to foreign suppliers are ensured a secure payment and sets end-to-end protection. Furthermore, owing to the wide variety of food products available and different menus for each class, it can be difficult to homogenise all the dishes for travellers. Transportation is crucial, bearing in mind that food must be delivered to each flight at the right time. If delivery suddenly comes to a halt, it might cause a delay in the arrival of food at the airport.

6. Conclusions

The results of our study indicated the ways in which EKFC played an efficient supply chain strategy by controlling all supply chain processes in order to achieve cost efficiency for economic class

passengers and a more responsive supply chain strategy by swiftly controlling those supply chain processes in order to serve first and business class passengers. The SCOR model implementation of level 1 to level 4 indicated how business strategies are aligned with the operational strategies in terms of the flow of raw material, order management with reduced supply chain operation cost, various levels of food ingredients and non-food inventory management along with the delivery of in-flight used items. All such measures ensure EKFCs capability in terms of delivering BIC service to achieve profit as well as to sustain its strong position in the industry. From 'the conveyor-belt washers', which are responsible for cleaning more than 2 million pieces of cutlery per day, to a 2.5 km factory monorail, the EKFC supply chain has everything in its BIC supply chain. Currently, EKFC is considered as one of the leading food catering providers in the world, offering a wide range of products of quality and preparation of food for passengers travelling in different classes, such as economy, business and first class.

A robust supply chain plays a large role in EKFC, which has sufficient food and products that help it to stay ahead of its competitors, translating into maintaining customer satisfaction with Emirates Airline as their clientele. Moreover, their competitive strategy is another success of EKFC, giving them an advantage to be the most productive and successful food catering/provider of this decade. Through this hybrid supply chain strategy, EKFC, in partnership with Emirates, offers its consumers food on time and extends its supply chain excellence to other stakeholders. The astonishing network created by EKFC never fails to impress with the food products X-rayed and sent to the kitchens, while the cutlery and plates are stacked in pallets and carried by an advanced monorail. In addition to serving its travellers, EKFC catering also offers its services to airports, as well as event, VIP and private jet catering.

6.1. Managerial implications

The research offers a number of managerial implications for flight catering service providers to follow-up since the airline business is increasingly competitive, and the majority of airlines are considering increasing their competitive edge by taking into account the 'in-flight service package' quality being offered to their customers. There is an opportunity for similar industries to take on such in-house production rather than outsourcing to manage their supply chain in order to have end-to-end monitoring. There is a need to actively promote airline menus, drinks and food through advertising on internet-based platforms and by recruiting high-profile chefs to design the dishes and menus. Furthermore, personalisation and mass customisation should be offered to the customers according to their preference. Customising the service and meals need to change from the traditional concept of low volume and high cost to the futuristic view of high-volume and low-cost production tied into an individualised offer to each passenger. Ordering meals via the internet up to 48 hours before the flight should be made possible in the future since that could reduce food waste and improve efficiency in planning. Adoption of block chain-based technology could thus make way for contract suppliers to seamlessly be integrated into EKFC and thus could work for hand in hand operations. However, this has to be mandated by EKFC for all its qualified suppliers. Smart contracts, real-time customer preference, motivated crews and innovative service delivery are a few other possibilities for which EKFC could pave the road. Continuous replenishment of inventory, the usage of automated systems, and the adoption of blockchain-based technology are warranted in the future in order to sustain the competitive advantage. Thus, EKFC sets the benchmark for other catering industries to reach.

6.2. Limitations and future research

Our study has some limitations to be acknowledged. Although this research focused on deep observation of a single case study, it could be further extended into multiple case-study-based researches across selected firms in order to benchmark their excellence. Likewise, a longitudinal case study with

repeated observation of historical data over a long period of time could unearth a possible causal relationship between the supply chain processes when the study is performed retrospectively. The research can also be further extended into a more quantitative information-based study and analysis in order to examine the catering industry-wide performance in future.

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Disclosure statement

AQ5 No potential conflict of interest was reported by the authors.

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