



The Role of Innovation in Achieving a Competitive Advantage of Airlines

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ARTICLE INFO

Abstract

Keywords:

Competitive advantage;
Market innovation,
organizational innovation,
service Innovation, Online
order meals.

(IJTHS), O6U

Vol. 3, No. 2,
October,2022,

pp. 1- 32

This paper aims to investigate the role of innovation in achieving competitive advantage among private airlines in Egypt. Data was collected from four private airlines. To gather data; two versions of the surveys were distributed. The first was for airlines' executives and consultants, and the second was for passengers. While 34 valid surveys were collected from the airlines' executives, a total of 310 valid surveys were collected from passengers. The results showed there is a statistically significant relationship between the elements of innovation and competitive advantage in airlines. The study provides the Egyptian government with recommendations on paying more attention to developing the innovation system and embedding its culture in society. Secondly, recommendations directed at top management in airlines include: matching on-board services to today's passengers' interests and adopting features such as online food ordering and pre-ordering meals. Additionally, to adopt technological innovation such as AI-based improvements and the AI-enabled food waste management system.

1. Introduction

Recently, aviation has become one of the main transport means to many people. According to the forecast made by the International Air Transport Association (IATA), the total number of airlines' passengers will reach up to 7 billion by the year 2034 (Air Transportation ,2022).

The airline sector operates in a market that is very competitive. With the current development and an increase of 17.62% over the previous year, there has been a huge rise in airline prospects (Selvi *et al.*, 2019). The market for low-cost airlines worldwide, which was valued at \$155.0 billion in 2016, is anticipated to increase at a compound annual growth rate (CAGR) of 15 % from 2021 to 2030, which means it, will reach \$440.5 billion. The growth of the low-cost airline industry is facilitated by the expansion of the travel and tourist industry (Allied Market Research, 2022).

Beroe Inc., (2022) claimed that COVID-19 had a catastrophic effect on the airline sector. In 2020, the sector lost \$138 billion in total due to a 66 percent decline in demand. The desire for flying is gradually increasing; in 2022, domestic travel is anticipated to return to pre-crisis levels. Although steadily increasing, airline prices are still 5–10% below pre-crisis levels.

The current high levels of competition and rapid change in the aviation sector as a result of factors such as deregulation, rapid technological breakthroughs, and industry consolidation. This highly competitive environment needs innovations to bring benefits to airlines, and make them quickly and effectively adapt to the market, which is essential for success and competitive advantage (Babic *et al.*, 2017). Innovation is also considered an essential for increasing productivity and operational capabilities as well as for adding value through advancements in air traffic control, advanced materials, more sustainable fuels, energy storage, conversion to digital systems, and the mitigation of environmental concerns, all of which present fresh opportunities for the industry to grow (Tinoco & Johnson, 2010; Liu *et al.*, 2017).

Despite of its importance, the areas of innovation are scarce in the literature globally and in Egypt in particularly (Crossan & Apaydin, 2010; Valencia *et al.*, 2010; Keupp *et al.*, 2012). In the same context, previous studies indicated that ignoring the importance of innovation in the services provided to passengers, especially in the period of the Corona pandemic, which affects airlines' competitiveness. As a result, travelers have started to complain about problems like exposure to traffic jams, crowdedness, cancellations, delays, as well as any other schedule adjustments with or without warning from the airline. To fill this gap, it would be interesting to make contribution to knowledge by examining innovation and competitive advantage, particularly in the private airlines in Egypt. Thus, the current paper aims to shed the light on the innovation concept and classifies innovation into four groups' service /product innovation, process innovation, marketing innovation and finally organizational innovation at private airlines in Egypt based (Data, 2005). Additionally, to identify recent innovations in the airlines (inflight meals; entertainment systems; booking and travel procedures); how airlines are responding to these innovations; and, finally, to explain how private airlines in Egypt can adopt innovation to provide a sustainable competitive advantage. On the other hand, the study aims to identify to what extent airlines respond to new innovations in flight services, and the importance of these innovations to passengers.

Literature Review

1. Innovation (Concept, and Types)

Since there are various definitions of the term "innovation" in literature; innovation in its broadest definition, derives from the Latin verb innovate, which means "to make something new" (Amidon, 2007). Innovations defined as improvements to organizations, processes, and products that are independent of new scientific findings (Hana, 2013). Hence, the sustainability of a competitive advantage depends on isolation mechanisms, which may be defined as factors that prevent competitors from neutralizing a higher performance in a given company and which can be obtained by innovation, organization evolution, and the company's domestic environment or industry position (Besanko, 2013).

Data (2005) classified innovation into four groups' service /product innovation, process innovation, marketing innovation and finally organizational innovation as follows:

A) Services innovation: new trends (in-flight services)

For any sustainable firm, new and creative ideas must be presented and existing services must be developed Chai *et al.*, (2005). Innovation is a key component of business competitiveness because it enables firms to effectively alter their goods, procedures, and administrative frameworks to meet the needs of a market that is undergoing rapid change (Yeh, 2014). A new product or service that has been significantly improved in terms of its features or intended applications is referred to as a "product innovation". This comprises materially better technical requirements, parts and materials, software integration, user friendliness, or other functional qualities. Service innovation aims to improve a company's offering's usability, effectiveness, and perceived value. By prioritizing the customer, a company can minimize obstacles during the customer's journey and improve the buyer's experience and conversion process (Richards ,2021). Service and products innovations include:

- On-board Wi-Fi and entertainment systems: Providing premium in-flight amenities like the newest movies and WIFI could have an impact on ticket purchases and increase consumer happiness (Alamdari, 1999). Bennet and Wood (2002) recommended that in order to satisfy airline passengers, the flight caterer needs to create new cuisines and adhere to emerging meal and culinary trends. However, creative concepts can actually be embraced and incorporated into the aircraft catering. On-board Wi-Fi is one of those instances; it was simply a pipe dream a decade ago. Some airlines, including Emirates, JetBlue, Norwegian, Turkish Airlines, AirChina, Philippine Airlines, Hong Kong Airlines, and Nok Air, provide free Wi-Fi onboard. A certain type of passenger, such as business travelers who could be ready to pay extra for this service (other airlines are offering it for free), may be drawn in by the ease of having internet access throughout the entire journey (Yashodha *et al.*, 2012). According to Harris (2014), the aviation industry's deregulation has resulted in ongoing improvements to airline services, particularly in-flight services. More options, including video, audio, games, and music, are offered to

passengers via a new generation of in-flight entertainment systems (IFE), enhancing their enjoyment of the flight and reducing weariness (Sarno *et al.*, 2013).

- Online order meals & Food pre-ordering: According to Davis *et al.*, (2018), the in-flight catering service varies significantly depending on the class of travel and length of the journey. For passengers flying economy class, food and beverage portions are highly standardized, with meals portioned into plastic trays from which they eat their meals in order to improve standards of hygiene and decrease the weight carried and storage space requirements. In first class, food is served from a gueridon cart and portioned out in front of passengers. Fine glassware is mixed with Bon China crockery on the table. The service is often contracted out to a specialist catering firm, which will supply a similar service to many airlines. As a result of the increase in air travel, food service is one particularly competitive aspect of the overall service provided by airlines.

To attract more passengers, Emirates, Cathay Pacific, and Singapore Airlines are actively promoting their in-flight meals/food in the electronic media, websites, and other kinds of advertising. According to reports, other airlines like British Airways, Air France, and Qantas have hired high-profile chefs to oversee the preparation of meals and cuisine, create menus, and ensure that dishes are of a high enough standard to satisfy growing passenger expectations (Zahari, 2011). Various airlines are taking note of recent discoveries regarding the power of sensory-driven experiences, a great example of which is the British Airways initiative that saw the pairing of the airline's in-flight meals with unique musical soundtracks that highlighting certain flavors and textures (Byers , 2015).

Mariano (2019) reported that there is an increasing trend among different airlines to spend money and enhancing their catering and in-flight meals. According to Altexsoft (2021), if a low-cost airline sells food on board, it must be able to forecast how much food it will need to purchase for a particular flight. Additionally, at the end of the day, airlines frequently discard a large number of sandwiches.

- Food pre-ordering: Dana *et al.*, (2002) previously advocated for airlines to provide special meals or food to accommodate dietary restrictions or religious requirements, as well as to use meal reservations in advance to draw in more passengers. United Airlines is billing the food and drink with pre-order option to improve service, allowing flight attendants to move through the cabins faster and delivering more personalized service to passengers. Pre-orders are handled through United's contactless payment system, which the airline also claims is safer for passengers and flight attendants (although evidence suggests that COVID is rarely transmitted through surface contact (Clabaugh, 2021). Many airlines provide food pre-ordering for certain flights in an effort to make travelling simpler and more enjoyable. Viewing the menu for their upcoming flights allows passengers to choose the options that best suit their preferences and/or dietary needs. These personalization efforts boost passenger's satisfaction and increase flight efficiency (Fazio, 2022).

- Providing Healthy Options: Being able to recognize the ingredients is becoming more crucial for sustainability and health reasons (Baskas, 2020). Onboard meals created with fresh ingredients are becoming more and more popular with passengers. Many airlines now try to use healthy foods and offer options for different dietary preferences or constraints. On all flights,

Business Class passengers have access to a variety of delectable plant-based vegan dishes that are offered à-la-carte. In addition, they provide distinct special meals that can be ordered before takeoff to accommodate various dietary needs, including kosher meals, diabetic meals, low-sodium meals, etc. (Fazio, 2022). Based on the previous literature, the following hypothesis was formulated:

H1a: Service innovation has a positive role in competitive advantage creation.

B) Process Innovation

Processes are a crucial component of every company's survival and success, despite being a frequently ignored topic. The adoption of significantly improved delivery system is referred to as a process innovation. For example, installing a new or enhanced technology, such as automation equipment or real-time sensors that may alter processes, also computer-aided product creation, is an example of a significant change in methods, apparatus, and/or software (Atalay, *et al.*, 2013). Process innovation is described as an enhancement of the methods and techniques used in the manufacture and distribution of various goods and services (Huang & Rice, 2012). This kind of innovation examines an organization's internal operations to find methods to enhance how products and services are developed and delivered.

New technologies will be launched in the transportation and travel industries, to automate unnecessary jobs or to improve other operations throughout the full customer journey (Ascolese & Llantada, 2019). In fact, as stated by Orlikowski & Barley 2001; Ullah, *et al.*, 2018), innovations may have an industry-wide impact, forcing airlines to perform extensive technological transformations as Big Data technologies, the Internet of Things, automation in the cloud, smart grids and renewable energy, mobility, unmanned sites and remote operations, and services like software-as-a-service (SaaS) as follows:

-One ID (identity): One identity seeks to introduce a collaborative identity management solution that spans across all process steps and stakeholders in the end-to-end journey from booking to destination, putting the passenger in the center (Patel, 2018).

-Biometric recognition technology: Biometric recognition technology will be for instant identity verification throughout the various process steps (Patel, 2018). Part of the airline's digitalization strategy, facial biometric technology is expected to improve operational efficiency by speeding up the existing check-in process and automating crew time and attendance management and access controls. Cabin crew will also experience a seamless and contactless check-in experience (Amankwah ,Amoah, 2021).

-Mobile Applications and development new platforms: In order to facilitate transparent transactions and easier ticketing, new platforms have been developed offering Application Product Interfaces (APIs) that connect to the airline distribution data at a deeper level (Arslanian, 2019).

Airlines use technology to attract customers, including self-service stations, in-flight entertainment systems, media platforms, and a variety of airline mobile apps (Liu & Rauterberg, 2007; Menon *et al.*, 2019). The application begins to function once the user enters their itinerary information. It then helps the passengers with all services available, including helping them with

immigration security checks, picking up their luggage from any location, getting to the airport on time, receiving constant alerts and reminders about their flights, and using a Google indoor map to help them navigate the terminal (Rajapaksh & Jay asuriya, 2020).

-Robotic Applications: Service robots and artificial intelligence can be used in a variety of contexts. Another way to look at it is that artificial intelligence automates corporate processes by having algorithms carry out preset human jobs without further human involvement (Paluch & Wirtz 2020). New information and communicate (on technologies are commonly used to produce communication applications, such as those that leverage artificial intelligence techniques, machine learning, the Internet of Things, big data, and blockchain (Wang& Wang 2021). Based on the previous literature, the following hypothesis was formulated:

H1b: Process innovation has a positive role in competitive advantage creation.

C) Marketing Innovation

Over the past ten years, there has been much talk about employing creative marketing techniques to gain a competitive advantage. Obermiller *et al.*, (2008); Toh & Raven (2003) argued that online services are computer reservation systems, frequent flyer programs, segmentation techniques, low-fares advertising, code sharing, scheduling, and seat availability. Marketing innovation refers to the application of a fresh marketing strategy incorporating considerable adjustments to product positioning, promotion, pricing, or design or packaging. Marketing innovations can increase a company's sales by better meeting client needs, expanding into new areas (Gault, 2015).

Increasing number of airlines are organizing micro events, unexpected onboard events, ranging from mid-air fashion shows to inflight bingo and product give away, in order to transform an ordinary flight into something passengers will talk about on social media and generate some earned publicity for the airline. Thanks to the nearly endless possibilities that today's technology offers, airlines have the ability to build innovative products and services that could set them apart from competitors (Simpli Flying inc.,2014). Today's businesses have access to a wide range of web resources, but when it comes to the airline industry specifically, it has been discovered that only significant airlines use them all simultaneously as reported by Tůma, & Endrizalová (2015). Medrano *et al.*, (2020) summarized that marketing innovations are vital to technological ones and they are supported by the fact that they have effectively assisted businesses in overcoming intense competition. Based on the previous literature, the following hypothesis was formulated:

H1c: Marketing innovation has a positive role in competitive advantage creation.

D) Organizational Innovation

Implementing a new organizational strategy into company operations, company structure, or external relations is referred to as an organizational innovation. Organizational innovations include introducing management systems (Gault, 2015). Organizational innovation is measured by a company's capacity to consistently accept and implement administrative and technical improvements with a higher level of incorporated uniqueness than their primary rivals (Santos-

Vijande *et al.*, 2012). The organizational or managerial methods employed by numerous institutions are referred to as organizational innovation (Vargo *et al.*, 2015) airlines, airports, and civil aviation chains can adopt innovation as a basis of value creation to obtain profits via technological performance improvements, complementary assets, a reduction in environmental impacts, and the offer of additional value to the passenger (Grampella *et al.*, 2017; Kim *et al.*, 2019).

An airline can be envisioned as a system with related input and output flows in the process of organizing an innovation system (logistic concept). Because it essentially appears unified methods to improve the airline's activity through the rationalization of management of financial, material, information, and service flow during the process implementing innovation projects. The logistic approach to the airline's innovation activity management is thought to be conceptual (Smerichevskiy *et al.*, 2020).

Emirates have equipped its attendants with tablets containing its system. With which, attendants can see which previous trips a passenger has taken with the carrier before, and accordingly, know their food, wine and seating preferences as well as any issues a customer may have during their travels. In addition, an AI-enabled food waste management system will enable Emirates Flight Catering (EKFC) to improve reporting and data collection to further reduce food waste. By using a camera, a set of smart scales and machine learning technology, the system 'learns' to recognize the variety of food being thrown in the bin and calculates the cost of this discarded food to the kitchens (Fazio, 2022). Additionally, some airlines have touchless payment methods for on-board purchases of food and drinks. The flight crew can access pre-loaded passenger profiles on portable tablets to instantly pay for food and beverages using a saved payment option. With the integration of other airlines and payment systems, customers may easily check out using a QR code on their phone (Fazio, 2022). Based on the previous literature, the following hypothesis was formulated:

H1d: organizational innovation has a positive role in competitive advantage creation.

3. Competitive Advantage concept and dimensions

Hosseini *et al.*, (2018) claimed that the ability of a company to design and implement strategies that place it in a better position in relation to other businesses engaged in the same activity is referred to as having a competitive advantage. A company can achieve this advantage by making the best use of its organizational, financial, material, and technical resources, as well as its human, technical, and intellectual resources. When compared to rivals, a company's competitive advantage lies in the higher rate of attractiveness it provides to customers. Additionally, it has been stated that innovation-based competition serves as the foundation for long-term growth in the post-industrial knowledge economy (Bessant and Tidd, 2007; Labitzke *et al.*, 2014; Romer, & Kurtzman, 2004).

According to Gomes *et al.*, (2009), market leadership, production, innovation, and efficiency or services are all directly tied to competitive advantage. Price advantage, products quality advantage, product differentiation, and conformity of product to customer needs were used as competitive advantage indicators. In addition to improving the company's capabilities,

production, and marketing capabilities, documenting its relationships with customers, and advancing management decisions, the importance of competitive advantage lies in the fact that it grants businesses the ability to defend their market positions and keep their competitive position among their competitors. One of the most crucial aspects of competitive advantage is the quality of services offered, profitability, market share, creativity, and innovation (Munizu, 2013).

Dirisu *et al.*, (2013) referred that there are some indicators used to measure competitive advantage such as product uniqueness, product quality, and competitive price. The first indicator refers to the product uniqueness of a company that combines arts and customer desire. Product quality refers to the quality of design from company quality, while competitive price, the last indicator, is the ability of the company to adjust its product price to the general price in the market. The aviation market is currently characterized by intense rivalry and quick changes brought about by causes such as deregulation, quick technological advancements, industry consolidation, and innovations. Airlines that can swiftly and efficiently adapt to and adjust to the market benefit from the highly competitive environment, which is essential to succeeding there (Babić, 2017). Yuleva (2019) added that each company has the right to choose between different competitive advantages in a given period of time. The criteria for selecting the most important ones are significance, Uniqueness, Specificity, competitors, Superiority, Justifiability, and Efficiency.

Demand shock and financing restrictions brought on by crises can damage firms' positions and make many innovative unsustainable (Paunov, 2012). Economic crises cause businesses to reduce their investment in innovation and also diminish their motivation to do so (Archibugi, Filippetti, & Frenz, 2013). To prevent the company from being exposed to adverse conditions in the long run, scenario planning must take into account the possibility of either a quick or drawn-out recovery from fresh viral surges. Chief executive officers have a window of opportunity to reimagine and reinvigorate the company because of COVID-19's seismic effect on travel. Redefining the business model for generating revenues and cost containment strategies are two aspects of reinitiating the airline industry (Vinod, 2021). Based on the previous literature, the following hypothesis was formulated:

HIII: Passengers do not obtain sufficient innovative services from airlines.

4. Research Methodology

The study was applied to the private airlines because, in light of the effects of the coronavirus crisis, the private airlines did not get any financial support from the government like commercial airlines. The private airlines that have a long history in the Egyptian market and contribute significantly to air traffic and the transportation of passengers, totaling (10), are as follows; Nile Air, Air Cairo, Fly Egypt, Al Masria Universal Airlines, Nesma Airlines, PAS – Petroleum Air Services, Air Arabia Egypt, Alexandria Airlines, AMC Airlines, and Air Sphinx. A simple random sampling technique is used in the study. Each airline is given an ID number. The sample size was nine airlines and was calculated using the Steven K. Thompson formula. Only four airlines agreed to participate in the study. The four private airlines are: Air Cairo, Air Arabia Egypt, Air Sphinx, and AMC Airlines. Additionally, they are the best airlines that offer flights to several destinations and are distinguished by providing innovative services for a large segment of

travellers at the lowest prices. They were actively operating at Cairo International Airport when this study was conducted.

This study adopted a quantitative methodology, using a questionnaire as a tool for data collection. Ly (2013) noted that questionnaires are thought to be the most effective method for gathering data that accurately reflects the views of the entire target population. Data was collected through two surveys, which were distributed by mail and manually. The sample of respondents was selected via purposive sampling, as they cannot be predicted. Data were collected from samples totaling (400) passengers who travelled at least one time through the private airlines under study and survey distributed to travellers of the chosen airlines at the terminals before the takeoff, a questionnaire was provided to passengers as they waited to board.

According to Stevens (2002), literature sample sizes typically range from 200 to 400. Total of (310) valid forms were received; representing a response rate of (77.5%) and (200) were distributed to executives, consultants who have experience and background in innovation and airlines. Only (34) were valid for analysis, with a response rate of (17.1%).

The airline executives' survey is to investigate the role of innovation (service/product, process, organizational, and marketing) in achieving a competitive advantage (cost, quality, flexibility, and time) in airlines. The survey includes three parts. The first part is about personal data for respondents. The second part consists of four questions about innovation importance and area of applications and investigates if a company introduces new innovations or improvements that significantly support activities during the period of pandemic virus, with which organizational service and process innovations are identified respectively.

The last part is mainly concerned with identifying the main innovations used in providing a competitive advantage to airlines. This part depended on using innovation and competitive advantage scales. The innovation scale adapted from Lin *et al.*, (2010) comprises (23) items; service innovation (8 items); process innovation (4 items); organizational innovation (5 items) and marketing innovation (6 items). The competitive advantage scale is adapted from the study done by Hayes *et al.*, (1998) who suggested that firms compete in the marketplace by virtue of one or more of the following competitive priorities: time, quality, and cost, along with flexibility. The competitive scale consists of twelve items: cost (3 items); flexibility (3 items); quality (3 items) and finally time (3 items). All measurement statements were measured based on a five-point Likert scale ranging from 1 = strongly disagree to 5 = strongly agree.

The purpose of the passenger's questionnaire was to determine the advancement in the offered services for passengers and which the latest innovations that airlines apply. Finally, it remains to be seen how important the recent innovations are to passengers. The three parts made up the questionnaire; the first part identifies the respondents' personal information; the second part asked if respondents preferred to travel by plane or not, how frequently they travel, and whether they preferred to use a certain airline or not. In order to determine the latest innovative services applied in airlines, the third part consisted of two questions. First, it is asked how frequently these new services are offered while a passenger is flying. That consists of a five-point scale with the options of never, rarely, sometimes, often, and always. The second question presented the ten latest service innovations to investigate their importance from the perspective of the passenger.

The new innovative service scale depended on a documented search of papers, articles, websites, and reports in the suggested period after the Corona Virus.

4.1 Data analysis

Before beginning the actual data collection process, the study conducted reliability and validity tests. It used four criteria to increase reliability: (1) configure all variables, (2) improve measurement stages, (3) apply a variety of indicators, and (4) carry out pilot tests. The forms are shown to three arbitrators of aviation academia who were not part of the core sample and the necessary adjustments are made. To correlate between two normally distributed quantitative variables, reliability statistics were assessed using Cronbach's Alpha test. According to the guidelines by Hashim *et al.*, (2019), numbers below 0.6 are estimated to be weak, while values between 0.70 and 0.8 are assessed as Reasonable, and values above 0.9 are considered excellent. Items with scores of less than 0.70 have had their scores removed or improved. Additionally, experts in aviation sector were invited to examine and certify the information.

The data was fed into the computer and analyzed with the IBM SPSS software package version 20.0 (Armonk, NY: IBM Corp.) (Kotz *et al.*, 2006; Kirkpatrick, 2015). Numbers and percentages, means and standard deviations were used to describe the data. Pearson coefficient was used to correlate between innovation and competitive advantage, and Linear Regression to detect the most effective factor for creating the competitive advantage.

Table (1): Reliability Statistics

Item	Cronbach's Alpha	No. of Items
Managers		
Innovation dimension	0.703	23
Competitive advantage dimensions	0.871	12
Passengers		
Question8: is related identity how often these following services are done during your flight,	0.832	11

5. Research results & Discussion

1) Airlines managers' survey analysis

A) Part one: Respondents' demographic characteristics analysis

Frequency tests revealed (see table 2) a gender ratio of male (100%) against female (0%) respondents. As regards age, the majority of respondents aged 40–59 years (70.6 %) were between 40 and 59 years. Others were between 22 and 39 years old, which represented 29.4%. As it relates to educational level, about two-thirds of respondents (64.7%) had a bachelor's degree and the rest (35.3%) had a master's or PhD degree. The majority of respondents (79.4%) had > 15 years of work experience. About 58.8% of respondents were administrative managers, and just over one third of respondents (41.2%) were operational managers. This finding means that the majority of respondents had long experience working in airlines in managerial positions

and they were in a mature age stage that may enable them to implement any improvements in airlines that would create a competitive advantage.

Table (2): Respondents' demographic characteristics (n = 34)

Q	Demographic factors	No.	%
1	Gender		
	Male	34	100.0
	Female	0	0.0
2	Age		
	21 Years or less	0	0.0
	22-39	10	29.4
	40-59	24	70.6
3	Educational level		
	High School	0	0.0
	Bachelor Degree	22	64.7
	Master/ PhD	12	35.3
4	Tenure		
	1to less than 4 years	0	0.0
	4 to less than 10 years	0	0.0
	10-15 years	7	20.6
	> 15 Years	27	79.4
5	Positions		
	Administrative managers	20	58.8
	Technical	0	0.0
	Operative	14	41.2
	Other, mention	0	0.0

B) Part two: Innovation in the years following the pandemic virus

Table (3): The extent to which innovations are developed in airlines and their importance (n = 34)

Q	Part2	No.	%
2	Do you think innovation in the airline sector is important?		
	Yes	23	67.6
	No	11	32.4
3	During the years after the pandemic virus, did your company introduce new innovations or significantly improve support activities (on the air or on the ground) in your company?		
	Yes	34	100.0
	No	0	0.0

Q	Part2	No.	%
4	Which of the following has developed related to "organizational innovation"?		
	Smart robots to reduce work pressure on employees.	3	8.9
	The company lets an individual participate in the organization's continuous improvement activity.	8	23.6
	The company makes improvements to the working environment.	9	26.4
	The company seeks to provide diversity among employees and their ways of thinking for more employee participation in the institutional innovation process.	5	14.8
	The company gives training to employees to help them be creative.	6	17.5
	The company launched a smart system that allows the airline to track passengers' food consumption and provide accurate data on consumption preferences.	3	8.8
5	Which of the following has developed related to "service process innovation" which facilitates travel procedures?		
	Availability of a collaborative identity management solution that facilities all process steps and stakeholders in the whole journey.	2	5.9
	Biometric recognition technology is available	2	5.8
	Developing an integrated platform for air services to attract a wider segment of customers from airlines	6	17.7
	Providing a mobile app to help passengers with all services.	21	61.8
	Providing robotic applications, such as artificial intelligence methods, the Internet of things, and big data.	3	8.8

The findings from the table (3) showed that two thirds of respondents (67.6 %), knew the importance of innovation in their companies, and the whole sample (100%) pointed to new innovations or significantly improved support activities (on the air or on the ground). Regarding to organizational innovation, less than one third of the sample (26.4%)of respondents referred to making improvements in the working environment; (23.6%) of respondents pointed out that an individual can participate in the organization's continuous improvement activity, followed by the company giving training to employees to help them be creative with a percentage of (17.5%) , then using smart robots to reduce work pressure on employees (8.9%), and finally, launching a smart system which allows the airline to track passengers' food consumption and provide accurate data on consumption preferences (8.8%) .

The majority of respondents (61.8%) recognized the importance of providing a mobile application to assist the passenger with all services, followed by developing an integrated platform for air services to attract a wider segment of customers from airlines (17.7%) of respondents. The availability of collaborative identity management solutions that facilitate all process steps and stakeholders in the whole journey and biometric recognition technology got the lowest percentage among respondents with (5.9 %), and (5.8%) respectively.

Although all respondents admitted to making improvements and applying innovations to their companies, the majority of innovations were limited to mobile applications, with a few companies adopting an integrated platform procedure to improve travel procedures, as well as making improvements to the work environment and conducting training for employees that helped innovating new ideas and allowed them to be successful. This is an indicator of less interest from stakeholders in providing smart robots, AI-based improvements, biometric technology, and the availability of identity management solutions. Moreover, the technological innovations in controlling onboard meal costs such as applying a smart catering system have received little attention, as well as a lack of applying technological innovations in companies that would reduce work pressure on employees and help in more creativity and innovation. This finding ties into the study done by Andal-Ancion *et al.*, 2003 and Ordieres-Mer´e *et al.*, (2020) that argued that airlines should work with various IT and technology businesses to create their own distinct digital offerings in order to increase competition.

C) Part three: The role of innovation in creating competitive advantage

Table (4): Mean scores and percentages of agreements among respondents on innovation (variable 1) (n = 34)

Q	Innovation dimension (variable 1)	Strongly disagree		Disagree		Neither agree nor		Agree		Strongly agree		Mean	SD.	Rating	Rank
		No.	%	No.	%	No.	%	No.	%	No.	%				
1	A) Service innovation (dimension 1) The company launches new services.	0	0.0	0	0.0	5	14.7	29	85.3	0	0.0	3.85	0.36	Agree	2
2	The company services are unique.	0	0.0	8	23.5	0	0.0	26	76.5	0	0.0	3.53	0.86	Agree	5
3	The company increases the number of services provided	0	0.0	0	0.0	8	23.5	26	76.5	0	0.0	3.76	0.43	Agree	3
4	With new service developments, the company is expanding into new markets.	0	0.0	0	0.0	3	88.2	4	11.8	0	0.0	3.12	0.33	Neither agree nor disagree	6
5	The company is focused on innovating ways of providing information to passengers.	0	0.0	3	8.8	9	26.5	1	2.9	21	61.8	4.18	1.11	Agree	1
6	The company launches customized services for passengers.	0	0.0	2	5.9	9	26.5	23	67.6	0	0.0	3.62	0.60	Agree	4
7	Individual Carrier Systems (ICS) for conveying, storing, and sorting baggage are used in the company.	24	70.6	0	0.0	0	0.0	8	23.5	2	5.9	1.94	1.50	Disagree	8
8	New applications based on artificial intelligence are implemented in the company.	4	11.8	5	14.7	2	73.5	0	0.0	0	0.0	2.62	0.70	Neither agree nor disagree	7
Total Service innovation		3.33 ± 0.27													

Q	Innovation dimension (variable 1)	Strongly disagree		Disagree		Neither agree nor		Agree		Strongly agree		Mean	SD.	Rating	Rank
		No.	%	No.	%	No.	%	No.	%	No.	%				
B) Process innovation (dimension 2)															
1	The company adopts an advanced technology policy to control the reservation process.	0	0.0	0	0.0	2	82.4	4	11.8	2	5.9	3.24	0.55	Neither agree nor disagree	1
2	Compared with other companies, the company changes service processes at a great speed.	0	0.0	0	0.0	2	82.4	6	17.6	0	0.0	3.18	0.39	Neither agree nor disagree	2
3	Compared to other companies, the company modifies the way that services are provided quite quickly.	0	0.0	0	0.0	3	88.2	4	11.8	0	0.0	3.12	0.33	Neither agree nor disagree	3
4	The company has introduced advanced automated programs that will facilitate procedures for travelers	4	11.8	0	0.0	2	67.6	7	20.6	0	0.0	2.97	0.83	Neither agree nor disagree	4
Total Process innovation		3.13 ± 0.34													
C_ Organizational innovation (dimension 3)															
1	The company adopts innovative reward systems for employees.	0	0.0	7	20.6	2	67.6	4	11.8	0	0.0	2.91	0.57	Neither agree nor disagree	3
2	The company adopts innovative work designs.	0	0.0	12	35.3	1	38.2	9	26.5	0	0.0	2.91	0.79	Neither agree nor disagree	3
3	The company engages in organizational reconstruction to improve operational efficiency.	0	0.0	1	2.9	2	79.4	6	17.6	0	0.0	3.15	0.44	Neither agree nor disagree	1
4	The company adopts a policy of encouraging innovative management	0	0.0	16	47.1	1	52.9	0	0.0	0	0.0	2.53	0.51	Disagree	5
5	The company engages in administrative business process re-engineering.	0	0.0	1	2.9	2	85.3	4	11.8	0	0.0	3.09	0.38	Neither agree nor disagree	2
Total Organizational innovation		2.92 ± 0.34													

Q	Innovation dimension (variable 1)	Strongly disagree		Disagree		Neither agree nor		Agree		Strongly agree		Mean	SD.	Rating	Rank
		No.	%	No.	%	No.	%	No.	%	No.	%				
D.) Marketing innovation (dimension 4)															
1	The company depends on innovative distribution methods to reach markets.	5	14.7	0	0.0	25	73.5	4	11.8	0	0.0	2.82	0.83	Neither agree nor disagree	6
2	The company depends on innovative promoting methods to reach markets.	0	0.0	2	5.9	30	88.2	2	5.9	0	0.0	3.0	0.35	Neither agree nor disagree	5
3	The company is constantly expanding its potential markets.	0	0.0	0	0.0	21	61.8	13	38.2	0	0.0	3.38	0.49	Neither agree nor disagree	2
4	The company creates wireless sensor networks to capture information about passengers to personalize services.	0	0.0	0	0.0	31	91.2	3	8.8	0	0.0	3.09	0.29	Neither agree nor disagree	4
5	The company uses innovation-based new technology to attract more customers.	0	0.0	0	0.0	25	73.5	9	26.5	0	0.0	3.26	0.45	Neither agree nor disagree	3
6	Noticeable changes to the design of onboard meals or services to improve brand image.	0	0.0	0	0.0	15	44.1	19	55.9	0	0.0	3.56	0.50	Agree	1
Total Marketing innovation		3.19 ± 0.22													
Overall Innovation		3.17 ± 0.18													

*Strongly disagree*1: 1.8, *Disagree* 1.8: 2.6, *Neither agree nor disagree* 2.61: 3.4, *Agree* 3.41: 4.2, *Strongly agree* 4.21: 5

Regarding to service innovation, the descriptive statistic in table (4) showed that the majority of respondents (61.8%) were strongly agreed on using innovation ways for providing information to passengers and just (5.9 %) on individual carrier systems (ICS) for conveying, storing, and sorting baggage are applied in the company; there were none of respondents (0.0%) strongly agreed on organizational and marketing innovation statements .Based on mean score, “Neither agree nor disagree” were got among respondents in items (M= 3.12, item A4; M= 2.62, item A8; M= 3.24 item, B1; M= 3.18, item B2; M= 3.12 item B3; M= 2.97 item B4; M= 2.9,1, item C1; M=2.91, item C2; M=3.15, item C3; M= 3.09, item C5; M= 2.82, item D1; M= 3.0, item D2; M= 3.38 item D3; M= 3.09 item D4, M= 0.45 item D5). This indicates that respondents did not give an assertion that the majority of innovations were applied in airlines, due to the fact that they may feel embarrassed for their work by stating that explicitly.

As it relates to " Service innovation in fact, the levels of agreement among responds were ranked in list below :

- The company is focused on innovating ways of providing information to passengers (Mean = 4.18 &SD=1.11).
- The company launches new services (Mean =3.85& 0.36 SD.)
- The company increases the number of services provided (Mean =3.76& 0.43 SD).
- The company launches customized services for passengers. (Mean 3.62 = &SD=0.60).
- The company services are unique (Mean = 3.53& SD. 0.86).

Regarding process innovation and organizational innovation, the respondents didn't indicate any agreement. On the other hand, respondents agreed on only (item6) "Significant changes to the design of onboard meals or services to improve brand image" received agreement among respondents (Mean =3.56 & SD =0.50) among the marketing innovation items.

These results clearly indicated that although the private airlines in Egypt pay attention to the application of innovations in the services provided to passengers, the results indicate that less attention is given to create new services aimed at expanding new markets and based on artificial intelligence. Furthermore, individual carrier systems (ICS) for conveying, storing, and sorting baggage weren't applied in the company weren't applied. The majority of participants were neutral and not committed to implementing the majority of innovations, except for a few that were approved, such as adopting innovative ways of providing information to passengers, launching customized services, and making noticeable to the design of onboard meals and services. Airlines have paid little attention to the existence of a technological policy to control the reservation procedure. Consequently, there is a lack of direct advanced technology policy to the actual application in adjusting passenger service quickly and the presence of technological programs that facilitate the travel procedure.

At the organizational level, airlines did not give enough attention to innovation in the work environment, where there is an absence of a policy of encouraging innovative management, introducing reward systems for employees. On the marketing level, respondents showed little interest in using innovation in promoting, distribution methods to markets, expanding their potential markets, and capturing information about passengers. The little interest in adopting advanced technology innovations in organizational and marketing innovations indicates the absence of strategic decision-making, which forms how airlines use their organizational systems to achieve competitive advantages. This weakens their competitive abilities and opportunities to compete strongly in the travel market. To acquire a competitive advantage, support from higher management should be fostered; moreover, a strong motivation system should be in place. This finding assured by the study conducted by Wilford, (2000) that referred to continuous technological advancement will result in a lasting competitive edge. Today's technology offers provides airlines the opportunity to come up with innovative products and services that have the

potential to set them apart from the competition, better team up with the technology and creative classes to co-create new applications.

Table (5) The mean scores and percentages of agreements among respondents on Competitive advantage dimensions (The second variable) (n = 34)

Q	B) Competitive advantage dimensions (The second variable)	Strongly disagree		Disagree		Neither agree nor disagree		Agree		Strongly agree		Mean	SD.	Rating	Rank	
		No.	%	No.	%	No.	%	No.	%	No.	%					
1	A) Cost There is some kind of cost control over the facility's resources in order to reduce costs.	0	0.0	21	61.8	5	14.7	8	23.5	0	0.0	2.62	0.85	Neither agree nor disagree	2	
	2	The company's cost control system is good, compared with competitors.	0	0.0	0	0.0	27	79.4	7	20.6	0	0.0	3.21	0.41	Neither agree nor disagree	1
	3	The company offers competitive ticket prices.	0	0.0	21	61.8	9	26.5	4	11.8	0	0.0	2.50	0.71	Disagree	3
Total Cost		2.77 ± 0.34														
1	B) Flexibility The company has flexibility in changing reservations, compared with competitors.	0	0.0	3	8.8	31	91.2	0	0.0	0	0.0	2.91	0.29	Neither agree nor disagree	2	
	2	The company has eliminated change and cancellation fees in cases of delay or non-attendance.	0	0.0	0	0.0	20	58.8	14	41.2	0	0.0	3.41	0.50	Agree	1
	3	There is some kind of flexibility while changing one of the customer's orders with the least negative impact on the customer as compared to other competing companies.	0	0.0	4	11.8	30	88.2	0	0.0	0	0.0	2.88	0.33	Neither agree nor disagree	3
Total Flexibility		3.07 ± 0.21														
1	C) Quality The company is able to achieve superior quality.	0	0.0	16	47.1	18	52.9	0	0.0	0	0.0	2.53	0.51	Disagree	3	
	2	The company is committed to providing customers with services that exceed their expectations.	0	0.0	12	35.3	22	64.7	0	0.0	0	0.0	2.65	0.49	Neither agree nor disagree	2
	3	Compared with competitors, the company's quality is good.	0	0.0	4	11.8	12	35.3	18	52.9	0	0.0	3.41	0.70	Agree	1
Total Quality		2.86 ± 0.36														
1	D) Time Compared with competitors, the company has an advantage in punctuality in the market.	0	0.0	9	26.5	8	23.5	17	50.0	0	0.0	3.24	0.85	Neither agree nor disagree	2	
	2	Compared with competitors, the company has an efficient and reliable complaint system.	0	0.0	9	26.5	21	61.8	4	11.8	0	0.0	2.85	0.61	Neither agree nor disagree	3
	3	The company is more unique as it takes less time between thinking about the innovation and implementing it.	0	0.0	9	26.5	7	20.6	18	52.9	0	0.0	3.26	0.86	Neither agree nor disagree	1
Total Time		3.12 ± 0.38														
Overall Competitive advantage		2.96 ± 0.31														

Looking at the analysis in the table (5) roughly half of the respondents (52.9%) agreed that the company is more unique as it takes less time between thinking about the innovation and

implementing it, and that the company's quality is good compared with the other competitors. (41.2%) agreed that the company has eliminated change and cancellation fees in cases of delay or non-attendance. (50.0%) of respondents agreed that a company has an advantage in punctuality in the market, (23.5%) of respondents agreed that there is some kind of cost control over the facility's resources in order to reduce costs. The respondents were agreed that the cost control systems of their companies are good compared with competitors presented (20.6%) of respondents, and (11.8%) of them agreed that the companies have an efficient and reliable complaint system and offer competitive ticket prices. According to mean scores, it is possible to state that the majority of respondents did not give explicit consent to the majority of the elements of competitive advantage, as well as the respondents' refusal to have competitive prices ($M = 2.50$) and to compete for superior performance ($M = 2.53$).

This result indicates that airlines aren't as close to their passengers as possible. Airlines should not be oriented only to satisfying the expected needs of passengers; they should also be oriented beyond their expectations. Additionally, high management may not adopt incomplete and undefined strategies and may not use multiple strategies to gain a competitive advantage in the travel market. They may depend on incomplete competitive advantage strategies related to uniqueness, flexibility, and time. Additionally, airlines showed little interest in competing by reducing the cost of resources and the time of delivering services, so airlines' competing strategies require more special attention. This finding is supported by Wilford (2000) that no airline can hope to obtain a large share of the available business travel market if it is saddled with the handicap of a poor punctuality reputation. Time and flexibility are the main sources for achieving competitive advantage; higher management should take time and punctuality as an advantage. Airlines require speed in meeting the requirements and needs of passengers, constantly anticipating changes and updating passengers. This finding matches the study conducted by Sachitra (2016) which showed that time management leads to reducing costs, achieving high and distinguished quality, and enabling the company to maximize its profits, Shaw(2016) assured that connecting passengers' importance of punctuality increases.

Table (6) Correlation between innovation and competitive advantage (n = 34)

Competitive advantage		Innovation				
		Service innovation	Process innovation	Organizational innovation	Marketing innovation	Overall Innovation
1) Cost	R	0.622*	0.567*	0.629*	0.553*	0.931*
	P	<0.001*	<0.001*	<0.001*	0.001	<0.001*
2) Flexibility	R	0.543*	0.471*	0.584*	0.639*	0.869*
	P	0.001*	0.005*	<0.001*	<0.001*	<0.001*
3) Quality	R	0.548*	0.582*	0.601*	0.579*	0.895*
	P	0.001*	<0.001*	<0.001*	<0.001*	<0.001*
4) Time	R	0.593*	0.545*	0.640*	0.580*	0.922*
	P	<0.001*	0.001	<0.001*	<0.001*	<0.001*
Overall Competitive advantage	R	0.608*	0.575*	0.648*	0.611*	0.952*
	P	<0.001*	<0.001*	<0.001*	<0.001*	<0.001*

r: Pearson coefficient

*: Statistically significant at $p \leq 0.05$

The table (6) showed that there is a very strong positive correlation between innovation and competitive advantage. The majority innovation items had a very strong positive correlation with competitive advantage components and was significant at $p < 0.001^*$. The majority had a very strong positive correlation with competitive advantage components and was significant at ($r = 0.952^* < 0.001$). The highest correlations were cost ($r = 0.931 < 0.001^*$) and for time ($r = 0.922^* < 0.001^*$), while the lowest coefficient was for flexibility ($r = 0.869^* < 0.001$). There is a moderate positive correlation between process innovation and cost ($r = 0.567^* < 0.001^*$) and also between marketing innovation and cost ($r = 0.553 < 0.001$). Additionally, there is a moderate positive relationship between flexibility and both of service innovation ($r = 0.543^* < 0.001$), also and process innovation ($r = 0.471 < 0.005^*$). Service innovation ($r = 0.548^* < 0.001^*$) ($r = 0.593^* < 0.001$), process innovation ($r = 0.582^* < 0.001$) ($r = 0.545^* < 0.001$) and marketing innovation ($r = 0.579^* < 0.001^*$) ($r = 0.580^* < 0.001^*$) all have positive correlations with quality and time respectively.

The results indicate that innovation is a major source of competitive advantage for airlines and this was confirmed by the study done by Goksoy, Vayvay, & Ergeneli, 2013 and Lim, 2010) who argued that innovation plays a significant role in many facets of corporate rivalry. Organizations can enhance their market share by introducing new or superior products to the market before their rivals. Innovation has helped a number of businesses succeed and develop, giving them a competitive advantage. The results affirmed that innovation is viewed as a crucial strategic tool for businesses looking to stay competitive and relevant given that it has been empirically related to competitiveness in service enterprises (Darroch & McNaughton, 2002).

Table (7): Multivariate analysis linear regression for competitive advantage

Innovation	B	Beta	t	p	95% CI	
					LL	UL
Service innovation	0.643	0.560	10.255*	<0.001*	0.515	0.771
Process innovation	0.248	0.272	4.338*	<0.001*	0.131	0.365
Organizational innovation	0.358	0.393	6.151*	<0.001*	0.239	0.477
Marketing innovation	0.367	0.266	4.192*	<0.001*	0.188	0.546
$R^2 = 0.914, F = 77.462^*, p < 0.001^*$						

F, p: f and p values for the model

B: Unstandardized Coefficients

CI: Confidence interval

LL: Lower limit

*: Statistically significant at $p \leq 0.05$

R^2 : Coefficient of determination

Beta: Standardized Coefficients

UL: Upper Limit

Regarding regression analysis for innovation factors with competitive advantage, table (7) showed the role of innovation in creating a competitive advantage in airlines, From the table, it showed that innovation significantly explained competitive advantage ($R^2 = 0.914, F = 77.462^*, p < 0.001^*$). The table also indicated that service innovation is the strongest

type in the relation between innovation and competitive advantage (Beta= 0.560). The second effective type was organizational innovation (Beta=0.393), followed by process innovation (Beta=0.272), and finally marketing innovation (Beta=0.266). This result indicates the level of innovation increasing, which ultimately achieves a competitive advantage as an outcome. In other words, service and organizational innovation are the most innovative types are creating competitive advantage an organization runs the risk of falling behind and having the initiative taken over by other entities if it is unable to continuously introduce innovations.

According to Fayvishenko *et al.*, (2020) entrepreneurs try to leverage technological innovation to create new goods or services or possibly new production processes as long as doing so gives them a strategic competitive advantage. Due to this, existing organizations excel in competition that targets their very existence rather than their profit margins or outputs. From the previous results, it could be seen that hypotheses a, b, c, and d are supported.

2) Passenger's survey analysis

A) Respondents' profiles

Table (8) passengers Profiles (n = 310)

Q	Item	No.	%
1	Gender		
	Male	103	33.2
	Female	207	66.8
2	Age		
	21 Years or less	0	0%
	22-39	111	35.8
	40-59	199	64.2
	More than59	0	0%
3	Education		
	High School	4	1.3
	Bachelor Degree	225	72.6
	Master/ PhD	81	26.1
4	Nationality		
	Saudi /	267	86.1
	Egyptian	43	13.9
	Others	0	0%

As for passengers' sample, about two-thirds of passengers (66.8%) were female and most of them belonging to the age group of 40-59 years. Most of the passengers (72.6%) had a bachelor degree and were from Saudi Arabia, see table (8).

B: Frequency of travelling by plane and having a favorite airline

Table (9) percentage, numbers, times of travelling passengers

Q	Question	No.	%
5	Do you prefer travelling by plane?		
	Yes	310	100.0
	No	0	0%
6	How many times have you travelled by plane?		
	1-5 times	0	0%
	6-10 times.	27	8.7
	More than 10 times.	283	91.3
7	Do you have a favorite airline to book your flights through?		
	Yes	44	14.2
	No	266	85.8

The results in table (9) show that all the passengers preferred travelling by plane with a percentage of (100%) and most of the passengers travelled more than 10 times with a percentage of (91.3%). Additionally, the majority of passengers (85.5%) didn't have a favorite airline. This is an indicator that an airline may not have a strong competitive advantage making passengers prefer to book their flights through it. Shaw (2016) discussed that the in-flight experience is important when choosing an airline, even for short flights of around three-quarters of an hour. This result is also supported by the study done by Park *et al.*, (2004) that the in-flight experience is one of the direct airline services that might influence passengers' opinions of the airlines.

C: The latest innovative services applied in airlines

Table (10) Measurement items means, standard deviations, and percentages

Q	Question8: to identify how often these innovative services are done during passenger's flight,	Never		Rarely		Sometim es		Often		Always		Mean	SD.	Rating	Rank
		No.	%	No.	%	No.	%	No.	%	No.	%				
1	The company offers religiously themed meals on board.	198	63.9	29	9.4	83	26.8	0	0.0	0	0.0	1.63	0.88	Never	9
2	The company offers heritage-related food items on board.	5	1.6	0	0.0	272	87.7	29	9.4	4	1.3	3.09	0.45	Sometimes	3
3	The company launches mobile applications on the plane linked to the airline program can choose the movies and channels that the passenger watches.	50	16.1	6	1.9	147	47.4	53	17.1	54	17.4	3.18	1.23	Sometimes	1
4	Announcing all nutritional information related to the meal to travelers, such as ingredients and calories	244	78.7	42	13.5	0	0.0	24	7.7	0	0.0	1.37	0.84	Never	11
5	The company provides all the digital tools that enable passengers to book their flights without any obstacles.	107	34.5	63	20.3	65	21.0	0	0.0	75	24.2	2.59	1.55	Rarely	4
6	Medical services on board are offered.	182	58.7	35	11.3	0	0.0	1	0.3	92	29.7	2.31	1.78	Rarely	6
7	Pay in advance for extra services that are available.	35	11.3	90	29.0	172	55.5	13	4.2	0	0.0	2.53	0.75	Rarely	5
8	The company organizes micro events onboard to kill time and provide more enjoyment for the passengers during the trip.	208	67.1	59	19.0	43	13.9	0	0.0	0	0.0	1.47	0.73	Never	10

Q	Question8: to identify how often these innovative services are done during passenger's flight,	Never		Rarely		Sometimes		Often		Always		Mean	SD.	Rating	Rank
		No.	%	No.	%	No.	%	No.	%	No.	%				
9	The company permits online food orders to allow passengers to enjoy meals inflight.	166	53.5	122	39.4	22	7.1	0	0.0	0	0.0	2.07	1.25	Rarely	8
10	The company provides onboard Wi-Fi and choices such as video, audio, and games to enhance the enjoyment of the journey.	123	39.7	0	0.0	187	60.3	0	0.0	0	0.0	2.21	0.98	Rarely	7
11	The company presents promotional offers, discounts, or coupons to travelers.	84	27.1	0	0.0	12	3.9	214	69.0	0	0.0	3.15	1.33	Sometimes	2
Total		2.33 ± 0.58													

Never 1: 1.8, Rarely 1.8: 2.6, Sometimes 2.61: 3.4, Often 3.41: 4.2, Always 4.21: 5

According to mean scores in table (10), services that were sometimes provided during a passenger's trip were : launching mobile applications on the plane linked to the airline program to choose the movies and channels (M = 3.18); presenting promotional offers, discounts, or coupons to travelers(M = 3.15); offering heritage-related food items on board(M=3.09).And services that were done rarely during passengers' trips were providing all digital tools that enable passengers to book their flights without any obstacles (M = 2.59); paying in advance for extra services(M = 2.53); offering medical services on board (M = 2.31); providing onboard Wi-Fi and choices such as video, audio, and games to enhance the enjoyment of the journey (M = 2.21); and permitting online food orders to allow passengers to enjoy meals inflight (M = 2.07).

In addition, the following services were never provided: offering religiously themed meals on board (M = 1.63); organizing micro events onboard to kill time and provide more enjoyment for the passengers during the trip (M = 1.47) and announcing all nutritional information related to the meal to travelers, such as ingredients and calories (M = 1.63). Passengers, in fact, didn't mention any improvements related to linking food to passengers' religions, organizing micro events on board or announcing nutritional information about meals. Airlines didn't provide sufficient new innovative services for passengers, accordingly, Hypothesis two is supported. Airlines potentially weaken its competitiveness; therefore, they should identify their competitive abilities and adopt more than one competitive strategy. Although Lee &Ko (2016) mentioned that in-flight meal service is the focus of airline rivalry, it is worth mentioning that airlines focused on a few noticeable improvements rather than offering various innovative services. Additionally, paying in advance for extra services got little attention from airline stakeholders, which is considered a source of revenue. Nilsson (2012) added that catering is not offered free of charge. This revenue is significant; some estimates place the percentage of in-flight purchases between 10% and 20% of total sales.

Table (11) Importance rating of the innovative service

Importance of latest inflight service	Freq.	%	Rank
1. The company offers religiously themed meals on board.	12	3.87%	Eighth
2. Pay in advance for extra services that are available.	6	1.93%	ninth
3. Announcing all nutritional information related to on board meals to travelers, such as ingredients and calories.	58	18.70%	Third
4. Providing all the digital tools that enable passengers to book their flights without any difficulty.	62	20%	Second
5. Making pre-ordered travelers' meals while making their booking through applications.	28	9.03%	Fifth
6. Providing on-board medical services	15	4.8%	Sixth
7. Organizing micro events onboard to pass the time and provide more entertainment for passengers during the journey.	3	0.9%	tenth
8. Allowing online food orders to let passengers to enjoy meals inflight.	31	10%	fourth
9. Providing onboard Wi-Fi and entertainment options such as video, audio, and games to make the journey more enjoyable.	12	3.9%	seventh
10. Presenting promotional offers, discounts, or coupons to travelers.	83	26.77%	first

As shown in a table (11), it could be seen that the four highest ranks were as follows: presenting promotional offers, discounts, or coupons to travelers got the first rank with percentage (26.77%), while providing all the digital tools that enable passengers to book their flights without any difficulty occupies the second rank with the percentage (20%). The third rank is announcing all nutritional information related to the meal to travelers, such as ingredients and calories, with the percentage (18.70%). Allowing online food orders to let passengers to enjoy meals inflight got the fourth place with (10%). making pre-ordered travelers' meals while making their booking through applications got the Fifth place (9.03%).

This clarifies priorities for the most recent services that passengers want, such as providing offers and discounts, followed by the importance of digitizing services that allow passengers to book flights without difficulty. Then the announcement of healthy food for the passengers comes, and the fourth service is online food orders on board. Airlines' top management should consider the new and advanced services that are most important to passengers and provide them in order to achieve a good travel experience. One of the direct airline services that can affect passengers' appraisal towards the airlines is their in-flight services (Park *et al.*, 2004; An, & Noh 2009), which in-flight meal service has been the main aspect. From the previous discussion all Hypotheses are supported and summary of tests can be presented in table (12).

Table (12) Summary of tests

Hypothesis	Description of Test	Result
H1a: Service innovation has a positive role in competitive advantage creation	<ul style="list-style-type: none"> • Pearson's correlation coefficient was used to test correlation between Process innovation and competitive advantage. • Multivariate linear regression test was used to predict competitive advantage. 	Accepted
H1b: Process innovation has a positive role in competitive advantage creation.	<ul style="list-style-type: none"> • Pearson's correlation coefficient was used to test correlation between process innovation and competitive advantage. • Multivariate linear regression test was used to predict competitive advantage 	Accepted
H1c: Marketing innovation has a positive role in competitive advantage creation.	<ul style="list-style-type: none"> • Pearson's correlation coefficient was used to test correlation between organizational innovation and competitive advantage. • Multivariate linear regression test was used to predict competitive advantage 	Accepted
H1d: Organizational innovation has a positive role in competitive advantage creation.	<ul style="list-style-type: none"> • Pearson's correlation coefficient was used to test correlation between Marketing innovation and competitive advantage. • Multivariate linear regression test was used to predict competitive advantage. 	Accepted
HII: Passengers do not obtain sufficient innovative services from airlines.	<ul style="list-style-type: none"> • Means, standard deviations, and percentages. 	Accepted

6. Conclusion and Recommendations

The current study aimed to investigate the role of innovation among private airlines in Egypt, which creates competitive advantages and identifies implemented innovations in airlines. The results also show that innovation significantly creates a competitive advantage. The outcomes emphatically demonstrate little interest in adopting advanced technology innovations at organizational and marketing levels inside airlines, emphasizing a lack of interest in applying technological innovations that would reduce work pressure on employees and help with more creativity and innovation. Additionally, the absence of a policy for encouraging innovation in the work environment, airlines didn't provide sufficient new innovative and advanced services for passengers that were most important to them.

With using mobile devices and biometric authentication, airlines will be able to make travel services more seamless and personalized. Additionally, airlines will decrease the amount of time needed to complete travel-related procedures and ease airport overcrowding by providing passengers with digital services. Finally, the experience of the traveller will be improved, and the passenger's loyalty to the airline will increase. Application of innovations at the organizational

level will help to boost staff productivity, keep control over the company's resources, minimize costs, and reduce employees' tensions. Adopting the newest marketing techniques can also assist in boosting bookings and expanding the passenger base. All of this, in turn, can achieve a competitive advantage for airlines.

This study presents a number of critical recommendations that should be implemented in airline companies. **Firstly**, recommendations to the Egyptian government include: paying more attention to the issue of creativity and innovation; developing the innovation system and embedding its culture in society by providing educational opportunities for tourism and hospitality based on innovation foundations; providing opportunities for tourism and hotel students to collaborate with private sector institutions and airlines to present new ideas in providing meals, services, and innovations that contribute to positive travel experience; building innovations in the tourism and aviation sectors by providing specialized programs and organizations to support students' innovations and to benefit from funding opportunities for innovative tourism projects that contribute to the opening of new doors. The necessity of cooperation between the Egyptian government, airlines, and food and beverage service providers to foster innovations that would help deliver distinctive travel experiences; Launch the "Creative Traveller" initiative, embracing their innovations to develop the application, and rewarding creative travellers with incentives and rewards for their value-added services. Provide a platform for discussing and presenting the most significant innovations in the tourism sector and airlines to develop services that aid in streamlining travel procedures and gaining access to global tourism markets; and finally, adopt a strategic vision to encourage entrepreneurship and draw creative ideas to the tourism sector and attract innovative projects in the tourism, hospitality and airline sector.

Secondly, recommendations directed to top management in airlines to support technological innovation and promote more technological applications that contribute to enhancing the trip experience for travellers and aid in the growth and success of airlines, such as smart robots, AI-based improvements, and AI-enabled food waste management systems, biometric technology and the availability of identity management solutions, a smart catering system, technological innovations in the workplace, and the necessity for identifying adopting various competitive strategies to acquire greater market share in the travel market. Finally, airlines should match onboard service innovation to today's travellers' expectations and adopt features that appear to be a great importance among passengers, such as online food ordering, informing passengers with health information appropriately and pre-ordering meals. In fact, it is essential to take into account the "ideal" level of innovation. The companies will lose market share if they don't innovate enough.

Limitation and Further studies

Limitations can be seen when adopting quantitative methods; the study included only four airlines, and it was difficult to include large numbers of airlines in the study to provide further details about the applied innovation and competitive advantage. Therefore, future studies should include larger samples. The second limitation is that the study didn't consider the relationship between travel classes and the latest innovative services. Therefore, future research should involve

different travel classes. Another limitation includes that there wasn't a database including the latest applied innovations in airlines. Therefore, there should be a study of how to activate airlines' executives to support innovations and effectively build databases. Further studies should involve the relationship between innovative products and airline brand awareness; using technology to improve vision in the airspace and during bad weather; the behavior of creative passengers; and the effect of applying smart catering management on airline revenue.

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المخلص

الغرض من هذه الدراسة هو إلقاء الضوء على مفهوم الابتكار ودراسة دوره في تحقيق الميزة التنافسية بين شركات الطيران الخاصة في مصر. تم جمع البيانات من أربع شركات طيران خاصة. تم توزيع عدد (2) استمارة استقصاء، الأولى: تم توزيعها على المديرين التنفيذيين والاستشاريين في شركات الطيران، والثانية على المسافرين. تم جمع عدد (34) استبيانًا صالحًا من المديرين التنفيذيين لشركات الطيران، بالإضافة إلى عدد (310) استبيانًا صالحًا من المسافرين. أظهرت النتائج وجود علاقة ذات دلالة إحصائية بين عناصر الابتكار والميزة التنافسية في شركات الطيران. ساهمت الدراسة في تقديم العديد من التوصيات الهامة، والتي تتضمن أولاً: توصيات موجهة إلى الحكومة المصرية مثل: إيلاء مزيد من الإهتمام لتطوير نظام الابتكار وترسيخ ثقافته في المجتمع. ثانياً: توصيات موجهة إلى الإدارة العليا في شركات الطيران مثل ملائمة الخدمات المتاحة على متن الطائرة لمتطلبات المسافرين اليوم وإطلاق ميزات جديدة مثل طلب الطعام عبر الإنترنت، والطلب المسبق للوجبات، بالإضافة إلى ضرورة تبني الابتكار التكنولوجي في شركات الطيران والتحسينات القائمة على الذكاء الاصطناعي، ونظام إدارة مخلفات الطعام المدعوم بالذكاء الاصطناعي.

الكلمات المفتاحية؛ الميزة تنافسية؛ الابتكار التسويقي، الابتكار التنظيمي، الابتكار الخدمة، الطلب المسبق للوجبات.