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Towards Digital Transformation Techniques Application at the Egyptian Airports

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Keywords

Egyptian Airports
Digital Transformation **(DT)**
Passenger Experience
Business Model **(BM)**
Digital Transformation Strategy **(DTS)**

Abstract

The aviation, travel, and tourism as a whole industry has become at the forefront of other industries, having no choice but to face the challenge of identifying new and emerging technologies that have the potential to improve the passenger experience and optimize flight operations efficiency. The current paper aims mainly to explore the applied digital transformation technologies at the Egyptian airports, analyzing the current situation of the Egyptian airports' operation business model towards digital transformation, demonstrating the core activated digital technologies at the Egyptian airports, defining the core aspects of the digital transformation strategy, and moreover, identifying the opportunities and challenges within the Egyptian airports' digital transformation journey. For that sake, this research adopted a method of descriptive-analytical methodology by using a focus group open interview tool. The sample was the top management of the ICT sector at the Egyptian airports holding company. The research reached several results, the most important of which is that technology is the company's best choice to which it pays attention as a directing way for achieving the travel facility and security. Moreover, the airports activating digital technology safety and passenger service systems. The research thus recommended that should support Egyptian airports digital unites to fulfill

digital transformation journey in addition to bolstering major departments which interact directly with passengers to raise digital passenger experience awareness especially marketing and sales management.

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1. Introduction

The aviation industry is constantly dealing with a disruptive and fast-paced era that could be referred to as the era of hyper-competition due to the increased and constantly changing customer demand **(Airports International Council Annual Report, 2017)**. As a result, airports and airlines had to compete fiercely to survive and gain competitive advantages while also providing as many passengers with better experiences and more seamless journeys as possible. Additionally, new technologies have opened up new markets, which in turn have brought daily new consumers and competitors who are raising the bar on what is expected of them **(KPMG International, 2017).** With no other option but rather to take on the challenge of discovering new and emerging technologies with the opportunity to enhance customer experiences and maximize operational efficiency, the aviation, travel, and tourism sectors as a whole have moved to the front of other industries **(Sahin, Haitmurodov& Turan, 2019).** To meet the growing demand for air travel as well as deliver economic and social values and air connectivity, airlines particularly need getting a high-quality, sufficient, and safe infrastructure at competitive costs due to the fact that the number of passengers using air transportation is expected to nearly double by 2036 **(IATA, 2018, p.36)**.

Research Aim

The current research aims mainly to explore the applied digital transformation technologies at Egyptian airports. Moreover, the paper seeks to:

1) Demonstrate the core activated digital technologies at the Egyptian airports.
2) Defining the core aspects of airports business strategy (BS) and the digital transformation strategy position within the whole BS.
3) Identifying the opportunities and challenges within the airports digital transformation journey.
4) Demonstrating how do the government and the legal institutes support the airport operations within the digital transformation journey.

Research Problem

The study problem is about the current situation the Egyptian airports toward the digital transformation in air travel operational processes pre, in, and post stages of flight. In addition, the research is concerned about exploring the ability and the efforts of airports to activate digital service, end-to-end passenger experience, fast self-travel, and smart operations to provide more seamless experience for passengers and achieve safety and security.

Research Importance

Nowadays, world witness the international digital transformation the issue that in turn has driven the international air transportation associations (e.g; IATA-ICAO) to pay more attention to digital transformation in international aviation industry.

Moreover, Egypt visions for digital transformation 2030 in all sectors starting with economy which aims mainly to increase business efficiency and other one related to environmental sustainability. Hence, the stimulation of the Egyptian airports for digital transformation is a vital issue which embraces achieving a seamless flow through the airport by means of integrating systems and services, including those provided by partners such as airlines, security, customs, concessions, ground handlers, etc.

The importance of the current study is divided into two parts which are; "the Theoretical Importance" which is to enrich the field studies and researches related to airlines in general, and digital transformation in aviation industry as one of the vital issues and "the Practical Importance" which is concerned about reaching a set of results and recommendations that can help superior managers of the Egyptian airports holding company and the airports managements to be transformed digitally improving its services and operations.

Research Questions

The current research seeks to answer some questions as following:

1) What is the current situation of Egyptian airports operation business model towards digital transformation?
2) What are the core activated digital technologies at the Egyptian airports
3) What are the core aspects of airports business strategy (BS) and the digital transformation strategy position within the whole BS
4) What are the opportunities and challenges within the airports digital transformation journey?
5) How do the government and the legal institutes support the airport operations within digital transformation journey?

2. Literature Review

2.1 Digital transformation definition

According to **Morakanyane, Grace, and O'Reilly (2017),** digital transformation (DT) is an evolutionary process that makes utilization of digital technologies integration with the capabilities to change business models, customize operational processes, and improve consumer experiences to get value. However, so many authors endeavored to define DT. According to the **European Commission (2019),** the digital transformation is considered as the fusion of cutting-edge technologies and the integration of new operational procedures. On the other hand, there are ideas associated with DT and synonyms for it, such as digitization and digitalization. The process of transforming analogue data into digital data sets is known as digitization **(Brennen& Kreiss, 2016)**, The digitalization is the integration of processes, people, data, and objects to create intelligence and valuable insights that help businesses achieve their goals **(Surber, 2016).** While the process of reshaping economies, institutions, and society at a fundamental level is known as "digital transformation" **(Unruh& Kiron,2017).**

> "*Thus, it could be concluded that, digital transformation in a wide definition is that essential integration of digital technologies with physical systems besides a wide multiple dimensional conversion for business models, customer experience, operational processes, workforce skills and entire value systems. Consequently, radically achieve ubiquitous connections, sustainable competitive advantage,*

performance efficiency, more profitable revenues and higher customer experience values".

2.2 Airports and Digital Transformation

For airports and airlines, the digital transformation has been described as the "Holy Grail." With the help of that multifaceted project, airports may improve their services while boosting consumer satisfaction and cutting costs. Every airline and airport in the world should indeed engage with in crucial aviation digital transformation. The Figure (1) illustrates for how organizations in the ecosystem relate to customers into an end-to-end customer service and each other is evolving getting more seamless journey experience for passengers. Meanwhile, stakeholders are driving overall corporate strategies, for the vision of being among the most preferred airlines and airports, supporting sustainable profits, improving customer satisfaction and loyalty **(Singh, 2019).**

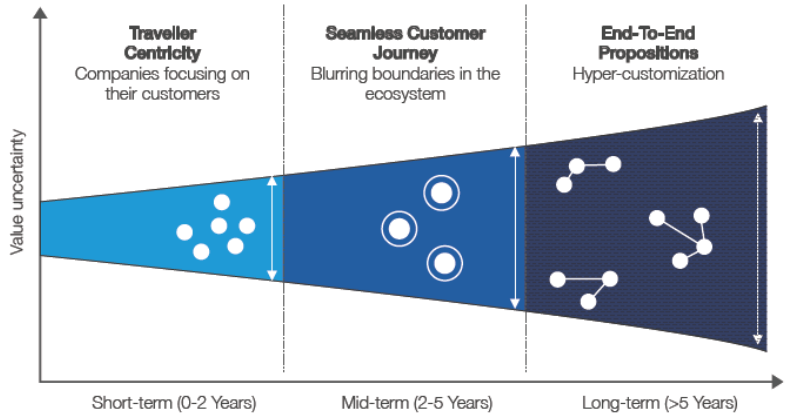

Fig. 1: Evolution of Living Travel Experience
Source: World Economic Forum, 2017, p.12

Leading businesses therefore concentrate on two complementary processes to succeed in digital transformation: restructuring consumer value propositions and transforming their operations with digital technologies for increased customer interaction and collaboration **(Berman, 2012).** However, there are additional areas that are acknowledged, such as raising sales and enabling sustainable profitability in addition to increasing operational efficiencies and reducing costs and times **(Forbes Online Magazine, 2019)**. Additionally, the digital transformation improved data sharing with all partners and stakeholders **(Brem& Bican, 2020).** The following **figure (2)** explains that IATA offered the program in consistent partnership with key stakeholders to continue this decisive industry digital transformation journey that offers convenience, control, and choice to passengers within the aviation, travel, and tourism industries which have recently been at the forefront position, among other industries forward the digital transformation. Along with DT significant contribution at providing airports with the efficient utilization of resources, safety and security, it also enhances the overall travel experience for passengers. Therefore, by airlines cooperating with airports through the digital transformation process, airlines be better equipped to promote the passenger experience value, improve customer service, reduce operating costs, and boost their bottom line **(IATA, 2016).**

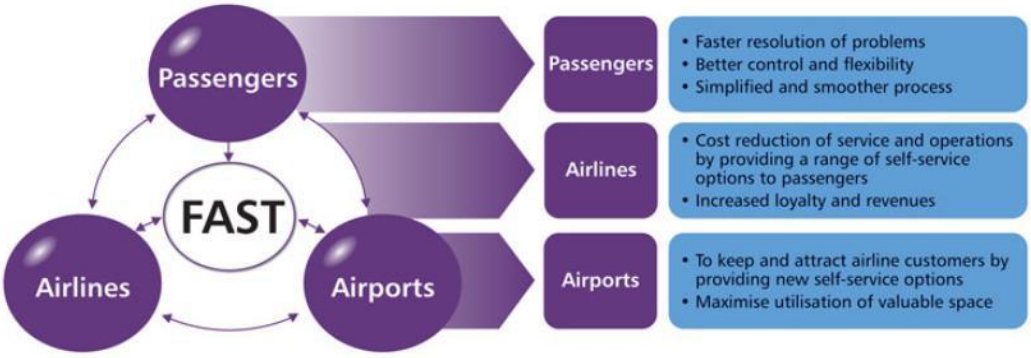

Fig. 2: Benefits of The Fast Travel Initiative
Source: IATA, 2016.

2.3 Digital transformation Strategy (DTS)

A successful digital transformation (DT) strategy is now essential for long-term sustainability. Instead of being a source of little efficiency benefits, digital technologies are now the basis for transformation **(DLApiper, 2017).** In this regard, **Kane, Palmer, Phillips, Kiron, and Buckley (2015)** affirmed that digital transformation is an organizational change in which the customer value proposition, operations, business models, competencies, and procedures are transformed by digital technologies. In the framework for digital transformation, actors are connected through the application of new technologies **(PwC, 2013)** across all value-added chain segments, including customers and enterprises **(BMWi, 2015; Bowersox, Closs, and Drayer, 2005)**.

As illustrated at the following figure (3) the research could conclude that the digital transformation strategy (DTS) with its multifaceted nature, should be set with multi-dimension framework in this concern, the figure illustrates DT aspects; processes, business models, customers, leaders, employees, data and technologies. DT is not the final objective to achieve yet itself is considered the driver for goals achievement. It could be explained that digital transformation must be integrated within whole organization business strategy (BS) or as called the corporate strategy (CS) within process beginning with a strategy coping with BMI getting operations optimization as well as giving value for customer satisfaction and loyalty. According to the shown figure, the business model is considered as a connecting point between planning and implementation levels forward digital transformation. Nonetheless, the dynamic capabilities and employee performance efficiency are necessary for the effective successful strategy for value proposition for customers and consequently the transformation journey.

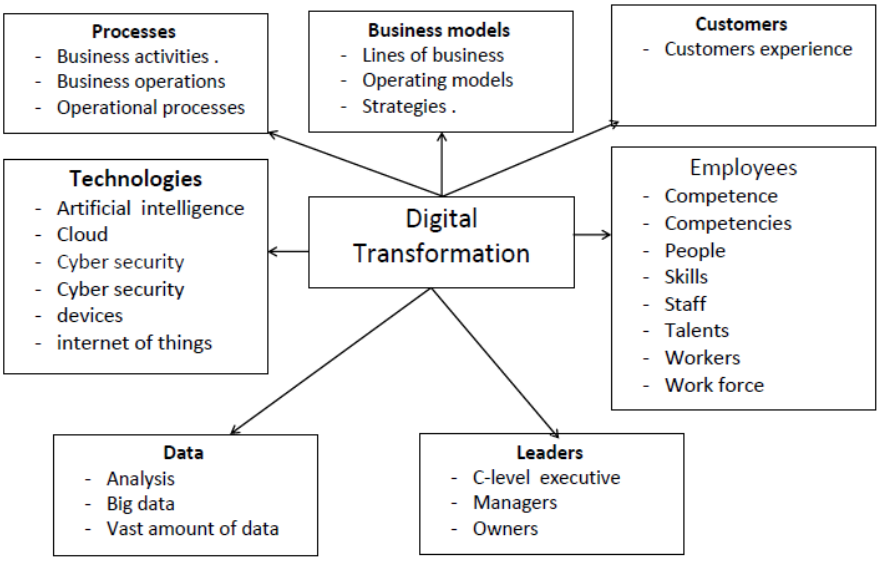

Fig. 3: Digital Transformation Aspects
Source: Verina& Titko, 2019.

2.4 End-to-end Fast Travel and passenger experience

Customers nowadays are accustomed to receiving high levels of service, which has an impact on their expectations in the aviation, travel, and tourist industries**.** In order to provide highly customized and end-to-end travel experiences, it is crucial to put consumers at the center of travel services and integrate physical and digital assets to enable seamless customer journeys **(World Economic Forum, 2017).** In the digital world, travellers rather control their journeys by themselves and avoid long queues. They want such control at other airport process touch points in addition to check-in. As a result, both airlines and passengers are putting more pressure on airports to ensure a smooth journey through their facilities **(IATA, 2016).**

In this context, the research highlights IATA fast travel coping with customers' insistent desire for more increased control over airport services and seamless journey in addition to the need for taking advantage of the latest digital, self-service options. In this concern, in response to customer expectations for a smooth travel experience and for control over their journey through efficient self-service choices, IATA launched the fast travel program in 2007. According to IATA, the program's vision was to provide a comprehensive and relevant self-service suite to 80% of travellers worldwide by the year 2020 **(IATA, 2016)**. The **figure no.4** illustrates the program's six initiatives of the "Fast Travel" project that IATA created to assist airports all over the world in providing their customers with speedy, hassle-free journeys **(IATA Annual Report, 2016).**

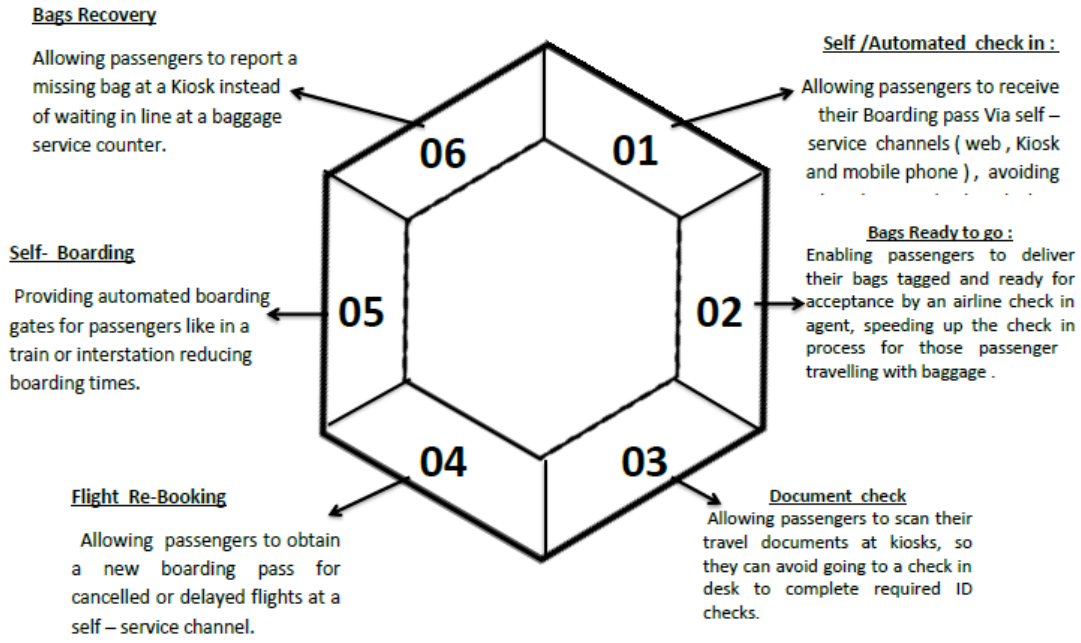

Fig. 4: International Air Transport Association "IATA" Fast Travel program: The Six Initiatives in IATA's Fast Travel Initiative
Source: IATA, 2016.

Thus, according to **IATA Annual Report (2018)**, IATA seeks continually to meet these needs by end-to-end fast travel innovations and digital solutions in all six areas the program provides self-service options at six airport touch points: self- or automated check-in, self-tagging of baggage, self-checking of documentation, self-rebooking of flights, self-boarding, and self-recovery of baggage.

2.5 Business Model Innovations

Business model innovation (BMI) is the process by which a company's business model is changed to obtain a new one, which leads to observable changes in its operational procedures, the optimization of its customer service in a way that meets their needs, and other business dealings with other partners **(Bouman, Ruver& Shahrokh, 2017).** In this regard, there are three typical ways in which DT influence companies and their business models: **I**) Optimization of the existing business model, **II**) Transformation of the existing business model, and **III**) Development of a new business model. On the other hand, the value proposition, internal infrastructure management, and customer interactions are thought to be the major aspects impacted by digital transformation (DT) **(Rachinger, Ropposch& Vorraber, 2018).** Additionally, a business model includes the dimensions and components listed below **(Schallmo, 2013, P. 22):**

- The customer dimension contains the customer segments, customer channels, and customer relationships.
- The benefit dimension includes products, services, and values.
- The value-added dimension includes the resources, skills, and processes.

2.6 Airports Digital Transformation Technologies

Recent technological advancements in the service sector have led to a shift away from face-to-face interaction either towards self-service technology (SST) **(Lu, Chou&**

Ling, 2009). Additionally, with SST initiatives in the airport business such kiosks, online baggage tagging, self-boarding, internet of things (IOT), and others, passengers can self-serve without having to contact with staff. Nevertheless, the rise of mobile technology has increased the accessibility of self-service choices at each stage of a passenger's trip, from booking till boarding. Additionally, most airports anticipate having self-boarding gates and automated border controls by 2023, which will further improve cost effectiveness and support new travel demands like social distancing **(SITA, 2020).**

In this regard, the (SST) put the consumer in full control of the trip experience by placing them in the driver's seat **(Drennen, 2011).** Therefore, compared to those who opt for face-to-face encounters travellers who use self-service techniques are more able to rapidly and efficiently accomplish travel procedures during their journeys and can more expedite their experience **(Alcatel Lucent Enterprise ALE, 2018).** In this context, IATA introduced the Fast Travel program supporting and facilitating self-service in the following six areas:

•**Check-in:** Enables passengers to check-in and obtain boarding passes using self-service channels (online/mobile/kiosk/automated), thus avoiding long queues at check-in counters.

•**Bags ready-to-go:** Offers passengers the ability to print and attach their own baggage tags (at kiosks, at home or using electronic baggage tags), while also providing dedicated bag-drop options (bag-drop counters or automated self-bag drop units).

•**Document Check:** Enables passengers to self-scan travel documents (i.e. passport, visa, ID card, driver's license etc.) to ensure compliance with destination and transit requirements.

• **Flight Re-booking:** In case of disruption (cancelation or delay), enables airlines to pro-actively re-book passengers, offering new booking options and new boarding tokens using self-service channels (online/mobile/kiosk).

• **Self-boarding:** Offers passengers the option to self-scan boarding tokens at automated self-boarding gates.

• **Bag Recovery:** Offers passengers the option to report mishandled bags using a self-service channel instead of waiting in line at a baggage service counter (online/mobile/kiosk).

Furthermore, **SITA (2020)** reported that, through the touch less self-service initiatives airports have prioritized investment in self-service options to help limit contact at all passenger touch points. The next **figure no.5** explains that making the check-in process completely touch less is the main priority for airports. Airports want passengers to be able to check-in (89%), print bag tags from their mobile devices (79%), and drop bags (67%) without touching a screen. Moreover, biometric technology has the focus for airport investment to enable a faster automated passenger process. Moreover, around 64% of airports have planned to implement biometric-enabled border gates by 2023 in addition to automatic biometric boarding gates by 2023 with 64%.

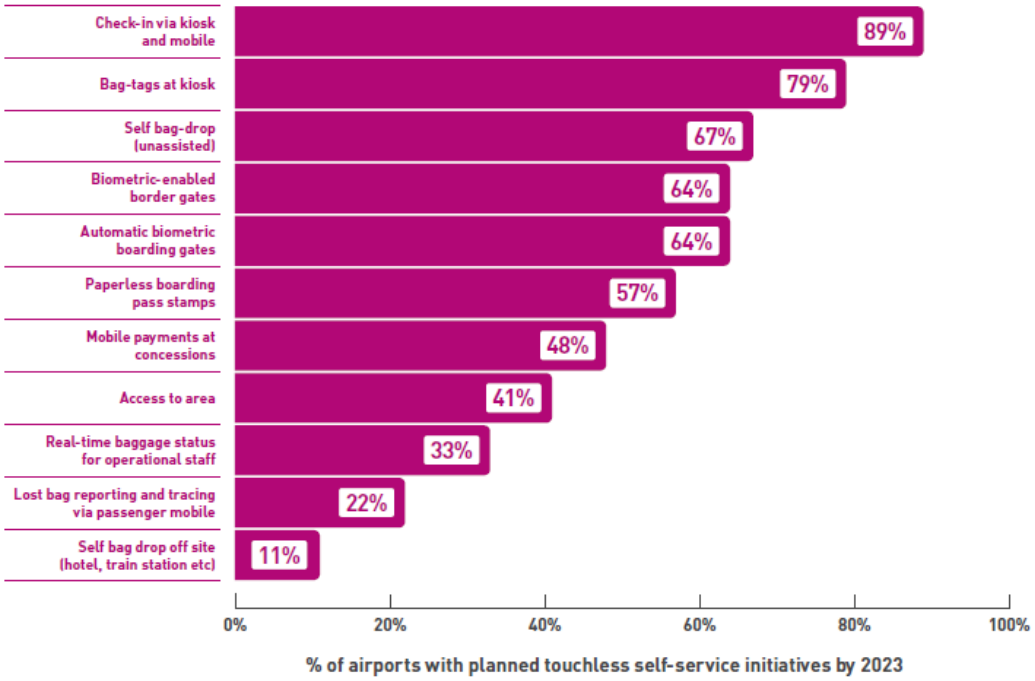

Fig. 5: Airports Focus on Automated Services at Border Control and Boarding
Source: SITA, 2020

A joint program was created by IATA and Airports Council International (ACI) for the future of on-ground travel. ONE Record, Interactive Cargo, The Cargo Facility of the Future, Baggage Tracking, One ID, One Order, Travel Communications, Smart Security, Enhanced Airport Collaborative Decision-Making (A-CDM), CEDAR (Ramp of the Future), and The Airline Industry Data Model (AIDM) are the eleven key IATA projects that were harmonized under this program of infrastructure, processes, and business to realize the NEXTT vision **(IATA Annual Report, 2020, p.46).**

2.7 Egyptian Airports

The current research is concerned about the Egyptian airports operations digital transformation. Egyptian Airports Company is a subsidiary of the Egyptian holding company for airports and air navigation which is specialized at construction, preparation, management, development and operation of Egyptian airports and landing areas **(EHCAA, 2022)** except Cairo international airport which is the air gateway to Egypt and to the continent of Africa and is considered as the second largest airport in the continent in terms of congestion and passenger density **(Mahmoud, Abdelrahman& Saeid, 2022)** therefore, it operate independently by Cairo airport company. Here are the Egyptian airports are listed below as follows:

The international airports are Sharm El-sheikh international airport, Luxor international airport, Aswan international airport, Hurghadah international airport, Borg El-arab international airport, Marsa matrooh international airport, Taba

international airport, Bort said international airport, Assiut international airport, Sohag international airport, Alexandria "Nozha" international airport. Whereas, the domestic airports in Egypt are Abou simbel airport, Shark aloweinat, Al areish, Al kharga, Saint Catherine, Al dakhla, and Al tor airports. Moreover, Marsa alam international airport and Alamein international airport are Egyptian BOT airports **(EHCAAN, 2022)**. The Egyptian Airports Company (EAC) has selected SITA to deploy its technologies at five of the airports it manages in the country as part of its airport IT modernization program. EAC chairman and CEO said "More and more passengers are going through the Egyptian airports each year, so it is essential to have the very best technology in place to ensure we continue providing great service. Specifically, the company is enhancing the passenger experience with new self-service opportunities and the latest baggage solutions, and using SITA's world-class airport management system to manage flights, gates, baggage and most importantly, passengers more efficiently. Moreover, the operations team will also be able to carry out check-in and boarding for charter flights with the use of the departure control system" **(Airport Technology, 2015).**

3. Methodology

The research was conducted to answer set questions and achieve research aim and its objectives, reach results and propose recommendations. For that sake the current research adapted the qualitative approach using an open interview; for being conducted with top managers of ICT sector at the Egyptian airports holding company; as the research qualitative method for answering the study related questions to digital transformation at the Egyptian airports including the Cairo international airports; the major airports and the other secondary ones; in addition to analyzing the current situation of digital transformation journey at airports. Furthermore, the interview has answered the related questions to opportunities supporting digital transformation at airports and the challenges that may embed airports' digital transformation. Nonetheless, the interview highlighted the efforts that governments and legal institutes exert for success digital transformation for more seamless and secured passenger travel experience.

In this context, the interview was divided into four parts in approach is somehow relevant to research questions and objectives. Each single part was conducted to answer related research question. These parts are; Part one: the current situation of the Egyptian airports toward digital transformation in passenger service and operational processes, Part two: the digital business strategy of airports, Part three: digital transformation capabilities, and Part four: Digital transformation techniques and civid-19.

4. Results

The research has employed the descriptive analytical method through which the interview tool has been adapted to answer research questions. Through the applied open interview with Egyptian airports holding company ICT sector top managements the research found out that the Major airports; including the Cairo international airport; have more passenger traffic and higher operation that's why the holding company ICT sector often pays more attention providing higher and more costing systems to meet ICAO, CIAC and SITA standardized operation, consequently the increased traffic could cover systems high costs. However, all the minor airports have the major security and safety systems. Moreover, the company ICT sector is considered as the major ICT management at the holding company managing the

Egyptian airports. Generally, the holding company set structure for airports classification as A& B categories. Each airport has internal departments or managements (dependent managements to the whole holding company).

Furthermore, the technology is the company best choice as a directing way for achieving the main goals that the airports are activating the major digital technology detection systems, information security systems, computed tomography systems, safety systems, identity recognition systems, biometric gates, baggage recognition systems, passengers traffic facilitation systems, operations management smoothness systems , operation and personalized self-designed systems, aircrafts fees systems, imports and exports management systems, staff attendance (work time) and salaries management systems, and aircrafts services data collector systems. Moreover, the holding company pays more and more attention for digital transformation strategy aspects along with Egyptian vision significance for aviation sector and travel industry with its multiple improvements and optimizations providing; safe and secure travel, smooth passenger experience, frictionless travel at airports and onboard, more efficient internal and departmental management, flight operations customization, more personalized passenger service, more efficient airports operations, more profits with less costs and improved brand image in addition to achieving airports' and airlines' key aspects of digital transformation strategies, competitive advantages and customer satisfaction and loyalty.

Nonetheless ,the holding company presents all initiatives exerting efforts and well uses the available capabilities as much as it could do cooperating with the government and legal institutes to cover all digital transformation strategy aspects as a core part of the whole company preset business strategy serving its main goals to facilitate and secure travel process and passenger traffic with more seamless and frictionless experience services and passenger traffic facilitation systems taking in the consideration the required balance between the security factor and passenger traffic nature. Furthermore, company aims to:-

- Provide sufficient information technology and communication service
- Achieve passenger security and safety airports
- airports passengers traffic facilitation
- Fulfill Airports operations management smoothness/ facilitation systems
- Replace airports costing systems with more efficient operational and personalized self-designed systems

In this context, along with maintaining the security sides at airports with more frictionless and less time as much as it could take and getting security means, the holding company ICT sector has been constantly developing the security and operational systems at all Egyptian airports and company is cooperating with competent bodies and organizations for safer travel and more seamless passenger experience and managing covid- 9 crisis. Moreover, concerning about staff culture at airports for digital transformation the managers explained that, regarding to the staff culture in Egyptian aviation (airports, airlines and on boards), the holding company of Egyptian airports continuously is training employees focusing on technical skills and performance to raise their competencies day by day and to get well using the digital techniques and modern systems in addition to security systems at airports. Nonetheless, the holding company trains also the airlines mainly Egyptair airlines.

Egyptian airports and Egyptair digital transformation journey seeks for safety and security in addition to passenger flights smoothness; as the major airports' digital

strategy aspects in addition to the urgent need of airports for operations and processes digital transformation to get its values overcoming security obstacles and crises are considered the key opportunities for airports and EgyptAir airlines towards the digital transformation. However, passenger traffic nature and some passengers' conventional culture of travel and far absence of "how to use systems or devices" awareness over many passengers at some Egyptian airports which drive them more to use counters not to use the self-service options which in turn leads to long queues and much more taken time for flight operations at airports are considered the main challenges which impede or obstruct digital transformation at these airports.

5. Discussion and Recommendations

The interview has been conducted with the information and communication technology "ICT" sector at the Egyptian airports holding company; as the service sector and strategic partner with all holding company sectors such as the airports sectors, financial sectors, security sectors and human resources sectors. Furthermore, the interview has been based on interviewing the **ICT sector master president** (coded as **A**) and the general managers of sector's four managements; **The electricity and communications management** (coded as **B), The airports systems operation and maintenance management** (coded as **C)**, **The airports information systems development management (**coded as **D)** and **The information technology systems projects management** (coded as **E**). For that sake, the interview has been conducted on 7th of December 2021 at 10:45 am till 1:30 pm.

Consequently, in this research, the interview qualitative data was analyzed through the qualitative analysis as the method which employs a wide range of analytical techniques to generate findings and put them into context. Performing a qualitative analysis on the interviews entails identifying the key themes that come out of the respondents' responses. Although there are several software computer packages for analyzing qualitative data, the researcher believed that manual analysis procedures were more suitable for getting constant review of the transcribed data to extract key items to inform themes giving the chance to gain a deeper knowledge and interpretation of the data. Additionally, adopting manual analysis allowed the researcher to become more involved and intimate with the data. Each management has been interviewed to answer related study questions as following:

- **Part one: the current situation of the Egyptian airports toward digital transformation in passenger service and operational processes.**

This part consisted of three main questions. The questions answers are concerned about the current situation of Egyptian airports operation business model towards digital transformation, first of all "**the head manager (A)**" pointed out that, the Egyptian airports holding company is considered as a profitable company serving 26 Egyptian airports including the major operating Egyptian airports such as; Hurghada, Luxor, Aswan, Sharm Elsheikh, Abu-simbel, Borg Elarab international airports….etc, in addition to the other minor airports. However, the Cairo international airport is operating and managed by the Cairo international airport company.

Furthermore, the major airports; including the Cairo international airport; have more passenger traffic and higher operation that's why the holding company ICT sector often pays more attention providing higher and more costing systems to meet standardized operation of the International Civil Aviation Organization (ICAO) and SITA the international aeronautical telecommunications company, consequently the increased traffic could cover systems high costs. However, the "**airports information**

system development manager (D)" figured out that all the minor airports have the major security and safety systems. Yet, the major airports have more related airport operation systems such as:

- The public announcing as a part of the flight information display system (FIDS).
- 3D detection systems; have been executed in Sharm Elshiekh and Hurghada airports and planned to be implemented in the other airports.
- The passenger record system (PRS) that related airports security and operational system in addition to the boarding gate reader (BGR) which are together related with scanning boarding pass during check-in process once the passenger boarded on the plane, his or her baggage is also boarded consequently.
- The local departure control system (LDCS) as a back-up system for check-in systems connection downs enabling passengers to flight boarding automatically.

Moreover, related to the information technology (IT) or digital transformation (DT) units at the Egyptian airports, the interview with the "**airport system operation and maintenance manager (C)**" relieved that, ICT sector is considered as the major ICT management at the holding company managing the Egyptian airports. Generally, the holding company set structure for airports classification as A& B categories. Each airport has internal departments or managements (dependent managements to the whole holding company). The Egyptian airports holding company classified airports as

- Airport (A) which is the international airport with special nature
- Airport (B) which is that under the category (A)

The airports with category (A) have information technology (IT) manager as a managerial, maintenance and operational department manager at airport but is also being a technical department belong to the holding company. On the other side, the (B) airports have IT or information and communication technology (ICT) chef office belong technically to the holding company. Nonetheless, concerning about **the core activated digital technologies at the Egyptian airports,** the **"ICT sector president (A)"** reported that according the category of airport, the sector identifies the provided digital system. However, all airports have the same efficiency and operation like the large categorized airports. Yet the difference in the operation scale.

Moreover, according to the sector goals the sector seeks digital technologies application and developments for achieving passenger smooth travel and airports security. In this concern "**the manager (B) and (E)"** figured out the major activated digital technology systems at the Egyptian airports are:

- X-Ray devices; explosive detection systems (EDS) and computed tomography (CT) and luggage& baggage detection. X-Ray applications at the Egyptian airports have being updated via technology for more integration. The X-Ray has been implemented for the first time in2007 in Sharm Elshiekh international airport, then in 2011 in Borg El-arab international airport and in 2014 in Hurghada international airport. That it's implemented with three steps evolution which are; the single view X-Ray devices and has been executed at all Egyptian airports, then the company implemented the dual view at the major most traffic airports like Hurghada and Luxor airports and recently CT scan rays have been implemented in both Luxor and Aswan international airports that worthy to mention these devices costing more than three million dollar for only one device and need to be updated continuously but the holding company applied it to

maintain the airports security and facility the passenger travel with CT scan rays which smooth operations with more efficiency.

- Passengers detection systems; via walking through metal detectors, hand held metal detector and body scanners.
- Explosive trace detection (ETD) systems.
- Information security systems; closed circle televisions (CCTV), biometric gates and baggage recognition systems (BRS).
- Safety systems; fire alarm (FA) and fire-fighting in addition to safety announcing.
- Airports passengers traffic facilitation systems such as PCS passenger check-in systems; CUTE and CUPS, flight information display systems (FIDS) and local departure control systems (LDCS). Kiosks are being activated in the Cairo international airport though it doesn't get passengers interest for more reasons especially their culture. Nonetheless, kiosks had been testing-activated in 2007 in Hurghada international airport but its activated had been stopped because of the passenger culture.
- Airports operations management smoothness/ facilitation systems; airport operations database and resource management systems.
- Airports operation and personalized self-designed systems; aircrafts fees systems, imports and exports management systems, staff attendance (work time) and salaries management systems, aircrafts services data collector systems.
- Efficient systems application such as; the currently under test self-designed systems instead of costing programmatic systems such as following:

a) Flight information display system FIDS is integrated with airport systems for data sharing; is being either on airport counters or in lounges for displaying flights data and schedules information automatically while its displaying only passenger checked flights. However, FIDS all programmed with the same template for flight data announcing while the most global high quality FIDS are at the major airports.

b) Airport operations database AOD.

c) Resource management systems.

d) PAX system which is for passenger numbers management and has been already implemented at small airports which have less operation yet these systems are home-made while the large airports have high global systems.

- Security Systems automatic popups reactions to track individuals and security staff at airports and onboard.
- RFID systems have not been implemented on wide scale for its high costs and execution huge processes. However, for tracking baggage airports activate readers for scanning baggage and extracting the bag label tags.

Part two: The digital business strategy of the Egyptian airports

Within this part four questions were dedicated to be concerned about digital transformation strategy and visions of the Egyptian airports digital transformation journey. The answers are relieved as follow:

When the "**the head manager (A)**" asked about **"how could digital transformation "DT" optimize or improve the aviation industry?",** the answer was as following points: "airports and aviation stakeholders through the digital transformation could achieve":

- Safe and secure travel.
- Smooth passenger experience.
- Frictionless travel at airports and onboard.
- The airports' and airlines' key aspects of digital transformation strategies.

- More efficient internal and departmental management.
- Flight operations customization.
- More personalized passenger service.
- More efficient airports operations.
- More profits with less costs.
- Customer satisfaction and loyalty.
- Improved brand image.
- Competitive advantages.

Whereas, concerning about **the core aspects of airports business strategy (BS) and the digital transformation strategy position within the whole BS, the ICT sector manager** assured that on day one before going forward DT, the holding company business strategy main goal is to facility and secure passenger travel with more seamless and frictionless experience services and passenger traffic facilitation systems taking in the consideration the required balance between the security factor and passenger traffic nature. For that sake, the sector reported that the technology is the company best choice as a directing way for achieving the main goals. Along with maintaining the security side at airports with more frictionless and less time as much as it could take. Furthermore, to get security means the holding company ICT sector has been constantly developing the security and operational systems at all Egyptian airports. That's why the company aims to:

- Provide sufficient information technology and communication service
- Achieve passenger security and safety airports
- airports passengers traffic facilitation
- Fulfill Airports operations management smoothness/ facilitation systems
- Replace airports costing systems with more efficient operational and personalized self-designed systems

Moreover, each device system for being activated it requires high costs for its high international quality. The activated devices have life span to take and need to be updated accordingly on time that basic IT systems take around five years while the global systems take from eight to twelve years. In this concern, the largest 26 Egyptian airports (8 airports) and the Cairo international airport are totally equipped digitally and updated through making contracts with global digital systems providers for modern devices, more efficient operations, higher activation and more smooth travel with more secure processes to achieve the crucial strategy aspects; smooth travel and airport security.

Part three: Digital transformation capabilities

Related to the major aspect of digital transformation framework which is the capabilities pushing the digital transformation forward the interview stated that, concerning about **how do the government and the legal institutes as major stakeholders within the value chain support the airport operations within digital transformation journey** the "**manager A**" stated that, with regarding to, specialist and competent bodies and organizations for safer travel and more seamless passenger experience and managing covid-19 crisis. Furthermore, the Egyptian airports holding company has being cooperated with the global digital technology systems providers to fulfill airports and aircrafts with necessary systems for flight operations and other service processes. Nonetheless, the company is continually cooperating with the

governmental authorities such as the ministry of aviation, civil aviation authority, customs body and passports and immigration administration.

In this concern, the general intelligence agency has been commissioned by the Egyptian prime ministry to activate passports and immigration systems inclusively over all Egyptian ports and airports with touch less biometric technology devices as insurance and identification recognition systems in addition to other stakeholders such as the Egyptian interior affairs ministry, airlines and so on. Furthermore, as a part of head ministry of aviation, the authority of civil aviation is considered as the legislative body which gives the holding companies for Egyptian airports the business legislations. Consequently, answering the question of "**To what extent the passengers are digitally interacting with airport e-services (e.g; self-services and fast travel programs)?", "the manager (A)**" said that "Because of the passengers traffic nature and some passengers' conventional culture of travel and "how to use systems or devices" awareness absence of many passengers at some Egyptian airports are considered the main challenges which impede or obstruct digital transformation at these airports.

In this context, the Cairo international airport operations focus more on schedule flights when the other Egyptian airports operate mostly charter. Flights with more 70% and have high traffic operations as a result. Yet, the schedule operations are often during high seasons. In this context, the traffic nature and passenger travel culture make the passenger more use counters not to use the self-service options which in turn leads to long queues and much more taken time for flight operations at airports." Moreover, related to **airports' digital infrastructure for digital transformation, "the manager (A)"** claimed that, related to the current infrastructure for digital transformation, the holding company explained that key foundation of airports inside-out connections is based on Copper and fiber lines for outside connection while airports use huge secured and safe internal networks for the internal connections mainly in the major international Egyptian airports; like in Luxor, Hurghada and Sharm El-shiekh international airports.

Nonetheless, concerning about staff culture at airports for digital transformation the managers explained that, regarding to the staff culture in Egyptian aviation (airports, airlines and on boards), the holding company of Egyptian airports continuously is training employees focusing on technical skills and performance to raise their competencies day by day and to get well using the digital techniques and modern systems in addition to security systems at airports. Nonetheless, the holding company trains also the airlines.

Part four: Digital transformation techniques and civid-19

The interview fourth part was conducted to get answers for research questions related to the opportunities or values of digital transformation during the covid-19 and in contrast the challenges that could embed the digital transformation journey at the airports. The related part questions are as follow:

Related the answer about **what are the opportunities that support the airport digital transformation& what are the challenges and obstacles that embed digital transformation journey at the airport,** the **manager "A**" answered that, the key opportunities for airports and Egyptian airlines (Egyptair) towards the digital transformation is its value for safety and security in addition to passenger flights smoothness; as the major airports' digital strategy aspects.

Nonetheless, the urgent need of airports for operations and processes digital transformation to get its values overcoming security obstacles and crises. On the other side, **"the head manager (A)"** mentioned that: "Because of the passenger traffic nature and some passengers' conventional culture of travel and far absence of "how to use systems or devices" awareness over many passengers at some Egyptian airports are considered the main challenges which impede or obstruct digital transformation at these airports. Furthermore, the Cairo international airport operations focus more on schedule flights when the other Egyptian airports operate mostly charter flights with more 70% and have high traffic operations as a result. Yet, the schedule operations are often during high seasons. Consequently, the traffic nature and passenger travel culture make the passenger more use counters not to use the self-service options which in turn leads to long queues and much more taken time for flight operations at airports."

Moreover, when the "**the head manager (A**)" was asked about **how could digital transformation DT activation and touch less techniques managed covid-19 crises coping with fast travel IATA program and end-to-end customer experience,** he explained that, during covid-19 pandemic Along with finger biometric systems, the thermal cameras have been activated by the airports for passenger traffic safety at airports and onboard. The holding company has planned for future touch less technologies activation such as the biometric gates to track over individuals at airports and on aircrafts. It's worthy to mention that, these biometric systems require huge execution, high technical programming and costs in addition to the long contracting durations. However, it currently activated on narrow scale at airports tracking staff members at work times with the facial recognition systems and individual tracking with the proximate cards and finger prints. Lately, managing the covid-19 pandemic crisis, almost the passenger operations have been turned into touch less processes and operations in some way maintain passenger safety and deliver more seamless experience to passengers.

Recommendations

According to the research methodology and results discussion, the research presents some recommendations that could drive the Egyptian airports holding company within the airports and airlines forward digital transformation journey. The most important recommendations are that the Egyptian airports holding company**:**

1- Should bolster Egyptair airlines and Egyptian airports major departments which interact directly with passengers to raise digital passenger experience awareness specially marketing and sales managements and fulfill digital transformation journey.

2- Seriously uphold human resources departments at the Egyptian airports specially the major ones where the traffic is being heavy to boost digital transformation employees training programs to have more skills and be qualified to commit with the digital transformation.

3- Put a systematic strategy to enhance digital transformation culture at airports managements and Egyptair airlines among internal departments and staff members.

4- Should identify crucial pre, in and post flight related procedures to be implemented in digital ways through airports digital techniques, official websites and mobile applications transforming passenger service digitally at all touch points along the trip and deliver real-time, relevant and more personalized experiences for passengers.

5- Should invest more in digital transformation technologies at airports, airlines and on board to serve fast travel program axes for getting more seamless and better passenger experience with less efforts, costs, time and no more queues.
6- Should dedicate passenger digital support units at airports to make sure that passengers use techniques easily and in a right way without any digital loss or using obstacles.
7- Egyptair and airports need to update official websites and mobile applications accessibility, browsing and navigation facilities attracting passengers to use it rather than the conventional ways in way more easy and smooth.
8- Cooperate with the Egyptair holding company adapting integral and inclusive digital transformation strategy with overall axes; business model, technologies, employees, culture, infrastructure, external co-operations and so on in away meeting demands, achieving competitive advantages, passenger satisfaction and loyalty.
9- Intensify external digital transformation innovations with specialist digital institutes for fulfilling digital transformation journey steps in the context of Egyptian digital transformation vision 2030 with inclusive and secure technological support.
10- Need to raise the digital travel awareness on airports and Egyptair websites and mobile applications to make passenger pre, in and post flight get digital flight experience more easily and seamlessly.
11- Should focus on secure and value-added information, sufficient offers and personalized service that maintain the satisfaction, build trusted relationships and ensure loyalty.

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نحو تطبيــق تقنيــات التحول الرقمي في المطــارات المصريــة

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الكلمات الدالة

المطارات المصرية
التحول الرقمي
تجربة المسافر
نموذج التشغيل
إستراتيجية التحول الرقمي

المستخلص

أصبحت صناعة الطيران والنقل الجوي في طليعة الصناعات الخدمية التي ليس لديها خيار أخر سوي مواجهة التحدي المتمثل في تفعيل التقنيات الرقمية الجديدة التي لديها القدرة علي تحسين تجربة المسافرين، وتعزيز كفاءة تشغيل الرحلات الجوية وعمليات الطيران، مع تحقيق الميزات التنافسية للمطارات وشركات الطيران علي حد سواء بشكل يمكنها من البقاء في ساحة المنافسة العالمية. ويهدف البحث الحالي إلي الكشف عن إلي أي مدي تطبق المطارات المصرية تقنيات التحول الرقمي، وتحليل الوضع الراهن لنماذج اجراء عمليات السفر وتشغيل رحلات الطيران، وإلقاء الضوء علي التقنيات الرقمية المفعلة بشكل أساسي بالمطارات المصرية إلي جانب تحديد المحاور الرئيسية لإستراتيجية التحول الرقمي والفرص والتحديات التي تواجه تلك المطارات في رحلة التحول الرقمي. ولتحقيق أهداف البحث والاجابة علي التساؤلات تبني البحث الراهن المنهج الوصفي التحليلي بإستخدام أداة المقابلة المفتوحة كأداة كيفية لجمع البيانات. تمثلت عينة البحث في الإدارات العليا لقطاع تكنولوجيا المعلومات والإتصالات بالشركة القابضة للمطارات المصرية. وقد توصل البحث إلي عدة نتائج من أهمها أن التحول الرقمي يعد أفضل المسارات التي توليها الشركة القابضة للمطارات المصرية إهتماما كبيرا كآلية فعالة لتوفير كافة تسهيلات السفر والأمان للمسافرين، علاوة علي ذلك تفعل المطارات المصرية آليات التكنولوجيا الرقمية من خلال أنظمة تشغيل الرحلات، وأنظمة الأمن والسلامة، وأنظمة خدمة الركاب في المطارات وعلي متن الطائرات بالاضافة الي توافر الامكانيات المادية والبشرية وكفاءة البنية التحتية للتحول الرقمي الي حد كبير بالمطارات المصرية. ومن ثم فقد أوصي البحث بضرورة دعم الوحدات الرقمية في المطارات المصرية للمضي قدما نحو التحول الرقمي بالإضافة إلي تعزيز الإدارات الرئيسية التي تتفاعل بشكل مباشر مع المسافرين خاصة إدارات التسويق والمبيعات لرفع الوعي لديهم بتجارب السفر الرقمية ومدي قيمتها في تقديم رحلات سفر بشكل أسرع و أكثر مرونة وسلاسة من الطرق التقليدية لإجراء كافة عمليات السفر قبل وأثناء وبعد الرحلة.

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