



THE IMPACT OF ORGANIZATIONAL FORESIGHT COMPETENCY ON AIRPORT SECURITY PERFORMANCE



DOCTOR OF PHILOSOPHY

2024



Institute of Technology Management and Entrepreneurship

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COMPETENCY ON AIRPORT SECURITY PERFORMANCE**



Mira Abdulla Essa Al Hebsi

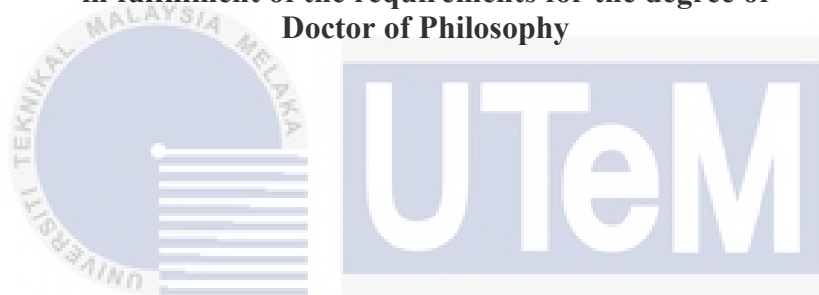
Doctor of Philosophy

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**THE IMPACT OF ORGANIZATIONAL FORESIGHT COMPETENCY ON
AIRPORT SECURITY PERFORMANCE**

MIRA ABDULLA ESSA AL HEBSI

**A thesis submitted
in fulfillment of the requirements for the degree of
Doctor of Philosophy**



Institute of Technology Management and Entrepreneurship

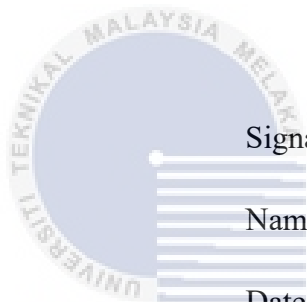
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DECLARATION

I declare that this thesis entitled “The Impact of Organizational Foresight Competency on Airport Security Performance” is the result of my own research except as cited in the references. The thesis has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.



Signature :

Name : Mira Abdulla Essa Al Hebsi

Date : 10 February 2024

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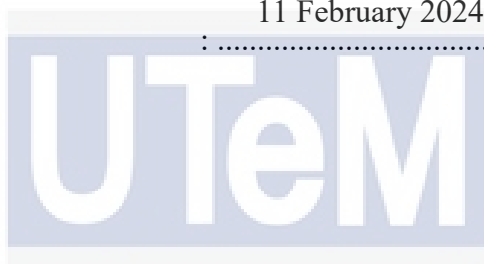
APPROVAL

I hereby declare that I have read this thesis and in my opinion, this thesis is sufficient in terms of scope and quality for the award of the degree of Doctor of Philosophy.

Signature 

Supervisor Name : Dr.Noraswaliza binti Abdullah

Date : 11 February 2024



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DEDICATION

To my beloved mother and father.



ABSTRACT

As global air traffic continues to expand, the management of airports has evolved into a complex system, with the integration of security measures posing ongoing challenges. Addressing security concerns through predictive strategies has become imperative, and the convergence of future foresight, big data, and Artificial Intelligence (AI) technology is at the forefront of this endeavor. This research aims to critically examine the impact of utilizing future foresight powered by big data and AI technology, along with fostering a learning orientation, on the development of an innovation culture within airport management, ultimately influencing airport security performance. To achieve these objectives, a quantitative research methodology was employed, utilizing a survey research strategy. The survey questionnaire was distributed among 540 security personnel at Dubai Airport (DXB) Terminal One, with a sample size of 225 determined through simple random sampling, based on Slovin's formula. Data analysis was conducted using structural equation modeling (SEM) in IBM SPSS Statistics and SPSS AMOS. The findings of the study reveal that organizational foresight ($B=.477, p < 0.05$) and learning orientation ($B = .175, p < 0.05$) have a significant positive impact on innovation culture. Furthermore, innovation culture was also found to have a significant positive relationship with airport security performance ($B = .328, p < 0.05$). Specifically, the analysis revealed that 0.908% of security performance can be explained by the variables considered in the study. Additionally, deleting certain items from the list had minimal impact, with only 0.122% of squared multiple correlations and 9.58% of scale variance affected. However, the study did not find statistically significant moderating effects of big data and AI technology on the relationship between organizational foresight competence and innovation culture, nor did it find a direct impact of these technologies on innovation culture. These findings suggest that while technology plays a role, there are remaining gaps that need to be addressed to fully realize innovation in airport security management. In conclusion, this research highlights the potential for airport security performance management from a strategic perspective, emphasizing the importance of innovation culture. It emphasizes the significance of big data and AI technology in enhancing security measures but also reveals that their full potential has not been realized. As an implication of this study, it is recommended that airport security authorities work to establish mechanisms that facilitate the effective integration of big data and AI systems, optimizing their contribution to airport security. This research emphasizes the need for ongoing technological advancements and the cultivation of an innovation-driven culture in the aviation security sector.

IMPAK KOMPETENSI RAMALAN ORGANISASI TERHADAP PRESTASI KESELAMATAN LAPANGAN TERBANG

ABSTRAK

Seiring dengan perkembangan berterusan trafik udara global, pengurusan lapangan terbang telah berubah menjadi sebuah sistem yang kompleks, dengan penyepaduan langkah-langkah keselamatan yang menimbulkan cabaran yang berterusan. Menangani kebimbangan keselamatan melalui strategi ramalan telah menjadi penting, dan penumpuan pandangan jauh masa hadapan, data raya dan teknologi Kepintaran Buatan (AI) berada di barisan hadapan dalam usaha ini. Penyelidikan ini bertujuan untuk mengkaji secara kritis kesan penggunaan pandangan jauh masa depan yang dikuasakan oleh data raya dan teknologi AI, bersama-sama dengan memupuk orientasi pembelajaran, terhadap pembangunan budaya inovasi dalam pengurusan lapangan terbang, yang akhirnya mempengaruhi prestasi keselamatan lapangan terbang. Untuk mencapai objektif ini, metodologi penyelidikan kuantitatif telah digunakan, menggunakan strategi kajian tinjauan. Soal selidik tinjauan telah diedarkan di kalangan 540 anggota keselamatan di Terminal Satu Lapangan Terbang Dubai (DXB), dengan saiz sampel 225 ditentukan melalui persampelan rawak mudah, berdasarkan formula Slovin. Analisis data dijalankan menggunakan pemodelan persamaan struktur (SEM) dalam IBM SPSS Statistics dan SPSS AMOS. Dapatan kajian menunjukkan bahawa pandangan jauh organisasi ($B = .477, p < 0.05$) dan orientasi pembelajaran ($B = .175, p < 0.05$) mempunyai kesan positif yang signifikan terhadap budaya inovasi. Tambahan pula, budaya inovasi juga didapati mempunyai hubungan positif yang signifikan dengan prestasi keselamatan lapangan terbang ($B = .328, p < 0.05$). Secara khusus, analisis mendedahkan bahawa 0.908% prestasi keselamatan boleh dijelaskan oleh pemboleh ubah yang dipertimbangkan dalam kajian. Selain itu, pepadaman item tertentu daripada senarai mempunyai kesan yang minimum, dengan hanya 0.122% kuadrat berbilang korelasi dan 9.58% varians skala terjejas. Walau bagaimanapun, kajian itu tidak menemui kesan penyederhanaan data raya dan teknologi AI yang signifikan secara statistik terhadap hubungan antara kecekapan berpandangan jauh organisasi dan budaya inovasi, dan juga tidak menemui kesan langsung teknologi ini terhadap budaya inovasi. Penemuan ini menunjukkan bahawa walaupun teknologi memainkan peranan, terdapat baki jurang yang perlu ditangani untuk merealisasikan inovasi sepenuhnya dalam pengurusan keselamatan lapangan terbang. Kesimpulannya, penyelidikan ini menyerlahkan potensi pengurusan prestasi keselamatan lapangan terbang dari perspektif strategik, menekankan kepentingan budaya inovasi. Ia menekankan kepentingan data raya dan teknologi AI dalam meningkatkan langkah keselamatan tetapi juga mendedahkan bahawa potensi penuh mereka belum direalisasikan. Sebagai implikasi kajian ini, adalah disyorkan bahawa pihak berkuasa keselamatan lapangan terbang berusaha untuk mewujudkan mekanisme yang memudahkan penyepaduan data raya dan sistem AI yang berkesan, mengoptimalkan sumbangan mereka kepada keselamatan lapangan terbang. Penyelidikan ini menekankan keperluan untuk kemajuan teknologi yang berterusan dan penanaman budaya yang dipacu inovasi dalam sektor keselamatan penerbangan.

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LIST OF SYMBOLS

β - Beta



LIST OF ABBREVIATIONS

ACI	-	Airports Council International
AI	-	Artificial Intelligence
APF	-	Association of Professional Futurists
AMOS	-	Analysis of Moment Structure
AR	-	Augmented Reality
CFA	-	Confirmatory Factor Analysis
CVI	-	Content Validity Index
DXB	-	Dubai International Airport
EFA	-	Exploratory Factor Analysis
ICT	-	Information Communication Technology
IFC	-	Institutional Foresight Competency
IoT	-	Internet of Things
KBV	-	Knowledge-based view
RBV	-	Resource-based View
SEM	-	Structural Equation Modelling
UAE	-	United Arab Emirates
VR	-	Virtual Reality
VRIO	-	Value, Rare, Inimitable and Organization

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LIST OF PUBLICATIONS

The followings are the list of publications related to the work on this thesis:

Al Hebsi, M.A.E., and Samer, A.A., 2022. The Effects of Future Foresight Competency, AI Technology Competency, Learning Orientation on Innovation Culture and Airport Security Performance. *Mathematical Statistician and Engineering Applications* 71(3), pp. 2004-2014.

Al Hebsi, M.A.E., 2023. Enhancing Airport Security Performance Through the Fusion of Big Data, Artificial Intelligence, and Strategic Foresight: A Conceptual Framework for Dubai Airport. *Science International Journal*,5, pp.609-612.



CHAPTER 1

INTRODUCTION

1.1 Background

An airport is no doubt a complex system, which is becoming even more multifaceted on the continuous expansion of global air traffic (Wu and Mengersen, 2013). As one of the most complex systems in modern society, Popovic et al. (2010) assert that the integration between a variety of large-scale components giving no room for errors, but with the highest level of efficiency at stake, is a rather complex and daunting task. Security and logistics systems, emergency protocols, and the safety of individual passengers have been highlighted as some of the vital aspects of airport management that are becoming rather difficult to manage (Zografos and Madas, 2006; Dou, 2020).

Airports services remain the main operational centre for airlines and money-making machinery for the airline industry which is currently valued at over US\$ 885 billion (Statista, 2019a). This industry supports close to 4% of the global domestic product (GDP) valued at US\$ 3.7 trillion in 2016 (Air Transport Action Group Authoring Tools Accessibility Guidelines – ATAG, 2016). The need for effective and efficient security performance to thwart the endless attempts by criminals to sabotage, criminalise and terrorise travellers, including diplomats, is fundamental (Gillen et al., 2015). This has called for global regulators and stakeholder agencies, with the highest level of regulatory collaboration compared to other sectors (International Air Transport Association - IATA, 2011).

Despite the contribution of IATA, International Civil Aviation Organization (ICAO) and other local, regional and international agencies, significant security lapses continue to

remain in the face of growing passengers and challenging peak hour demand (de Neufville and Odoni, 2003). According to Wu and Mengersen (2013), due to the complex systems nature of the airport, it is not possible to employ traditional systems engineering processes, which are predominantly sequential, and requirements based since the requirements are not entirely known in advance and may change during system operation.

This gives rise to the need to give in to foresight and artificial intelligence-based systems (Wu and Mengersen, 2013). According to Webber (2007), foresight is a critical component of cultural criminology in diverse spaces. Within the domain of airport security, strategic future foresight management has not only proved instrumental to ease operational complexity but has gained a reputation in practical aviation security (Charles et al., 2007; Anderson, 2010; Price and Forrest, 2016). To play their role in regional growth, the prediction and prevention of future threat, including terrorism remain critical (Price and Forrest, 2016).

Despite the overemphasized need for strategic foresight management, readiness for the future raises the question of competency in dealing futuristically with specific contexts (Hines et al., 2017). The need to build core competence regarding one's ability to manage the future has become a critical aspect of global security institutions (Prahalad and Hamel 1990; Hamel and Prahalad, 1994; Biden et al., 2023). This stems from the resource-based view perspective on how an institution can utilize internal sources to create sustainable advantage (Barney, 1997). Future foresight competency, therefore, lies in the institution's ability to create the future through its intangible assets – that is human capital. The ability of human capital to make good use of ICT supported foresight management through the application of big data to arrive at complex modelling, is critical to performance in given contexts (Keller and von der Gracht, 2014).

Ultimately, “how competent institutions are in anticipating and shaping the future” and the contributory role of institutions to help teams anticipate the future, remains a critical aspect of professional futurist (Hines et al., 2017). This leads to further observation of the need for an institutional-wide supportive environment that has future foresight at the core of the institution’s operations – an innovation culture (Hietanen et al., 2011). Within this culture, the constant generation of knowledge is paramount to constant innovation and a revolutionary application of future foresight.

Ultimately, through big data analytics conducted with the help of artificial intelligence technology, airports will be able to catalyze future foresight competency and future knowledge creation through an atmosphere of innovation culture, towards improved security performance (Price and Forrest, 2016). Nonetheless, in the midst of these factors, the ultimate role of technology adoption and readiness remains integral to airport security management (Kaufmann, 2016; Naji et al., 2018). As mentioned by Kaufmann (2016), security technology systems are installed and evaluated based on the expectations of how they are intended to perform. Nonetheless, lapses in security systems are not new, as such systems are never 100% accurate but have their own security lapses. As narrated by Kaufmann (2016), “security devices consequently bring with them their own security problems. Taking biometric identity documents as an example, this begins with document counterfeiting safeguards, leading to the problem of readers being outsmarted (“fake fingerprints”), and it could impact the security of databases that store biometric data”.

Technology in itself, therefore, has proven rather challenging in addressing the whole issue of airport security performance, leading to the need to resort to predictive and preventive mechanisms that build on future foresight and AI (Price and Forrest, 2016). A critical and futuristic airport security system beyond installed technology systems has been considered critical to analytically or probabilistically simulate anticipated security lapses