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The Effects of Future Foresight Competency, AI Technology Competency, Learning Orientation on Innovation Culture and Airport Security Performance

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ABSTRACT

Purpose – The purpose of this study is to examine the effects of future foresight competency, AI Technology capability and learning orientation and innovation culture on airport security performance.

Design/method/approach – A survey research was employed and data were collected through questionnaire from 212 security personnel from Dubai International Airport. Four hypotheses testing the direct effect of the three independent variables, namely future foresight competency, AI Technology capability and learning orientation on innovation culture and the effect of innovation culture on airport security performance. Normality test were conducted to test the validity of the data. Covariance Structural Equation Modelling (CO-SEM) was used to validate the measurement model and structural model.

Findings – The study found that future foresight competency and learning orientation have significant positive relationship with innovation culture, while AI technology capability does not have significant positive relationship with innovation culture. Additionally, innovation culture was found to have positive significant relationship with airport security performance.

Practical Implications - This study would benefit the management of airport security to understand the effect of future foresight competency, AI Technology capability and learning orientation on innovation culture and the effect of innovation culture on airport security performance.

Originality/value – This study contributes to the knowledge on airport security performance by understanding the effect of namely future foresight competency, AI Technology capability and learning orientation on innovation culture and the effect of innovation culture on airport security performance.

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Introduction

Airports services remain the main operational center for airlines and money-making machinery for the airline industry. In this case, it is crucial for airports to establish effective and efficient security performance to thwart the endless attempts by criminals to sabotage, criminalise and terrorize travellers, including diplomats, is fundamental (Gillen et al., 2015). Further, Gillen (2015) asserted that the monetary and economic costs of the current aviation security system are likely to reach unsustainable levels over the next 15–20 years as the number of air travellers and air cargo continue to grow. This gives rise to the need to give in to foresight and artificial intelligence-based systems (Wu & 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 (Anderson, 2010; Charles et al., 2007; Price & Forrest, 2016). To play their role in regional growth, the prediction and prevention of future threat, including terrorism remain critical (Price & Forrest, 2016).

Nevertheless, readiness for the future raises the question of competency in dealing futuristically with specific contexts (Hines et al., 2017). Coined as strategic foresight, it is a set of practices that enable firms to attain superior performance and increase in future markets position (Rohrbeck&Kum, 2018). The need to build core competence regarding one’s ability to manage the future has become a critical aspect of global security institutions (Hamel & Prahalad, 1994; Prahalad & Hamel 1990). 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 & von der Gracht 2014; shirkarami et al, 2020).

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, p. 1). This leads to further observation on 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. Nonetheless, in the midst of these factors, the ultimate role of technology adoption and readiness remains integral to airport security management (Naji et al., 2018; Kaufmann, 2016).

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 & 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 based on growing challenges of air travel (Zidarova & Zografos 2011; Correia & Wirasinghe 2004).

The purpose of this paper is to report on a research that examined the impact of future foresight competency, AI technology capacity and learning orientation on innovation culture, which subsequently influenced the airport security performance. In the subsequent section, the conceptual model of the present study is discussed based on the three theories that govern the study. The review is followed by a description of methodology and the section thereafter provides an analysis of the data. A discussion of the findings and implications of the study is presented in the final section.

Theories underpinning the study

Three theories have been adopted to gain understanding of the relationship among the variables. These theories are resource-based view theory, dynamic capabilities theory and knowledge-based theory. Specifically, the resource-based view theory provides a lens to understand the ways in which how an organization employs resources to realize positive changes within their environment. To achieve competitive performance through dynamic capabilities, the resources to be employed must have key characteristics including rarity, durability, value and imitability (Russo & Cesarani, 2017). Within the resource-based view, the need for complementary resources has been deemed critical to bridge the gap by redirecting the strategic path of the organization towards competitive performance (Hines et al., 2017). In relation to this study, resource-based view is used as an overarching theory to understand the ways in which institutional resources realized through foresight competency and AI technology capability and learning orientation environment encourage innovation culture for enhancement of security performance. In this case, the three independent variables are considered as the organization resources to achieve innovation culture and security performance.

The dynamic capabilities theory to strategic management presents a more specific set of definitions and construct to help understand and model of strategic management. According to Teece et al., (1997), the dynamic capabilities approach to strategic management is an important model that takes into consideration the source and creation of wealth within an environment of rapid technological change. At the core of the dynamic capabilities theory, the focus has been on the creation of value and wealth from existing resources, with the main intent to establish competitive edge (Teece et al., 1997). The area of strategic future foresight management represents one of the most up-to-date technology trends adopted by management and global corporations today. Like other forms of technology trends, future foresight is expected to mature and evolve into other technology formats considering the rapid rate at which technology is advancing (Adegbile et al., 2017; Mirghafoori etval, 2020). This theory is used as a lens to understand the creation of value and wealth resulting from the foresight competency, AI technology capacity and learning orientation environment as the creation of value and wealth represented by the innovation culture. It is expected that the innovation culture results in positive impact on the airport security performance.

The third theory, namely the knowledge-based view theory builds on knowledge as critical to competitive advantage. This theory is particularly relevant to the present study considering the study focuses on data, knowledge sharing and knowledge creation but within the special context of future foresight management. According Hawass (2010), the knowledge-based view stems from the resource-based view. Here, the emphasis is placed on the handling of data, sharing information, and knowledge as a generic resource. The knowledge-based view focuses in dealing with data, information, and knowledge focused on studying knowledge-based approaches for dealing with data, information and knowledge related constructs. With the present study focuses on future foresight management, the creation and sharing of knowledge, this theory equally addresses the area of study. This observation is consistent with other observations by Marsh & Stock (2006) and Hawass, (2010). As such, based on the underpinning theory, the research hypotheses are presented below and the conceptual framework is presented in Figure 1.

H1: Institutional foresight competency has a significant positive effect on innovation culture.
H2: AI technology capability has a significant positive effect on innovation culture.
H3: Institutional learning orientation has a significant positive effect on innovation culture.
H4: Innovation culture has a positive effect on airport security performance

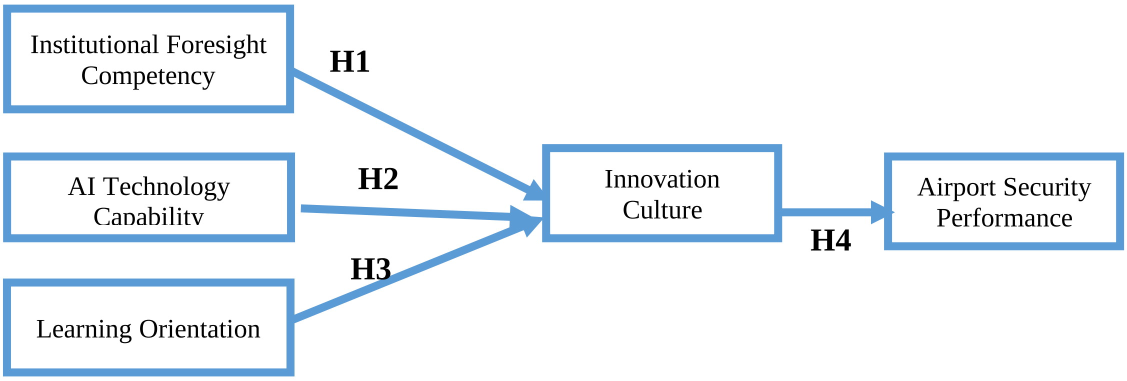

Figure 1 Conceptual Framework

Methodology

This study adopted causal correlative research driven by the quantitative approach, consistent with its purpose and objectives.

Population and Sampling

This study was conducted at the Dubai International Airport, involving security personnel working at the airport. Given the population size of 540 security personnel, a sample of 225 were determined (Easterby-Smith, 1991). To avoid, low response rate, an additional 40% of the sample were collected, totaling 315 security personnel. The name list of the security personnel was provided by the company, and a simple random was used to select the respondents to ensure that all units of the population have equal chance to participate. The questionnaires were distributed through Survey Monkey online data collection. From the 315 distributed questionnaires, 212 were complete and useable for the data analysis, producing a 67.3% response rate, hence adequate for statistical analysis, as recommended by Hair et al. (2020). Table 1 provides the demographic information of the respondents.

Table 1: Demographic profile of respondents

Demographic Variables		Frequency	Valid (%)
Gender	Male	121	57%
	Female	91	42.9%
	Total	*212*	*100%*
Age group	18-24	1	0.5%
	25-34	40	18.9%
	35-44	79	37.3%
	45 -54	76	36.8%

	55 and above	16	7.5
	Total	*212*	*100%*
Level of education	Junior high school	4	1.9%
	Senior high school	43	20.3%
	University /1st degree	140	66.%
	Postgraduate or PhD	25	11.8%
	Total	*212*	*100%*

Based on Table 1, the results show that male constitute about 57.1% of the study respondents, making up a total of 121 individual study participants. The remaining 91 participants or 42.9% of the respondents were female. The results also show that the age group of 35 to 44 years is the largest within the data. About 37.3% of the study respondents fall within this group. This was closely followed by security personnel aged between 45 and 54 years; this group made about 34.8% of the total respondents. Together, these two groups made up about 73% of the total respondents. The least age group within the data is 18 to 24 years; only 1 respondent was recorded in this category. The data shows that most of the personnel completed university degree; 140 security personnel participants fell into this category (66%). The remaining 44% were spread across high school leavers (20.3%), post graduate degrees (11.8%), and junior high school personnel (1.9%). None of the respondents were of a basic school level qualification.

Questionnaire development

The questionnaire was categorized into six sections, including a preface of a cover letter offering a brief overview of the study. The first section (Section A) focuses on acquiring the demographic information of the respondents. Meanwhile, the other five sections (Section B-F) focus on acquiring respondents' responses on the five constructs (Institutional Foresight Competency, Learning Culture, AI Technology Competency, Innovation Culture and Security Performance). The measurement of the constructs with the respective number of items and the resources of the items is shown in Table 2. Respondents were expected to give their response based on a five-point Likert scale from 1- strongly disagree to 5 strongly agree. In addition, two experts from the aviation industry were requested to validate the questionnaire.

Table 2. Questionnaire design: The Number of items and the source of reference

Dimension	**Number of items**	**Source**
Institutional Foresight Competency	18	Hines et al., (2017)
Framing	*4*	
Scanning	*3*	
Futuring	*3*	
Visioning	*3*	
Designing	*2*	
Adapting	*3*	
Technology Capability	13	Manataki & Zografos (2010)
Learning Orientation	6	Burt & van der Heijden, (2003); Burt et al., (1996)

Dimension	Number of items	Source
Innovation Culture	11	Hietanen et al., (2011)
Airport Security Performance	5	Bezerra& Gomes (2016

Reliability Test

A pilot study has been conducted to ensure the reliability of the questionnaire. Reliability of the pilot results was observed with the help of Cronbach Alpha test for internal consistency. According to Souza et al. (2017), data are recognized as reliable when the constructs have a value of Alpha coefficient more than 0.7. It was found that all the constructs on the survey questionnaire had Alpha score above 0.7; hence, all the constructs are considered statistically reliable. Table 3 shows the results of the reliability test.

Table 3. Results of the reliability test

Dimension	n (items)	Cronbach Alpha
Institutional Foresight Competency	18 items	.789
Technology Capability	13 items	.760
Learning Orientation	6 items	.761
Innovation Culture	6 items (5 items removed)	.983
Airport Security Performance	5 items	.874

Normality Assessment

Normality assessment has also been conducted to ensure that the data are valid and reliable to be analyzed. The results of the normality test for all the constructs are presented in Table 3. As shown in Table 3. As shown in Table 3, all the five constructs have high mean value, which is more than 4, with the highest mean is IC.

Table 4 Normality Test Result

Constructs	Mean	Standard Deviation	Skewness	Kurtosis
Institutional Foresight Competency (IFC)	4.2272	.48485	-2.301	7.852
AI Technology Capabilities (TC)	4.2801	.77382	-2.204	4.754
Learning Orientation (KC)	4.1164	.87492	-1.217	0.856
Innovation Culture (IC)	4.3381	.63323	-1.585	3.420
Security Performance (SP)	4.2792	.70673	-1.841	3.688

Data analysis

The IBM SPSS AMOS was used to conduct a confirmatory factor analysis in order to model the framework in a more guided fashion. The guided model will help improve the model in terms of its parsimony by carefully evaluating key model fit indices. Following the confirmatory factor analysis, the IBM SPSS AMOS was applied using the Covariance-based Structural Equation Modelling analytical technique. The Co-SEM places emphasis on the validation of theory (Kinnear & Gray, 2007; Curwin & Slater, 2007). The CO-SEM permits parametric analysis of data using bootstrapping validation.

Measurement model and modifications

The CFA analysis was conducted using IBM SPSS AMOS. The measurement model was derived based on several modifications. At the first order level, all the items of institutional foresight competency had successful loadings; at the second order level, the regression weights were low but statistically significant. As part of the study modifications, I item of SP was removed from the data. Additional adjustments were made mainly the sub-dimensions of IFC. The low regression weights translated into low factor loadings; four out of six items of IFC were therefore removed. Based on the elimination, all the loadings were above 0.5 and generally above 0.7. The model fit indices for the final CFA model are presented in Table 5. The model fit indices were generally acceptable, with only GFI a few points below optimal threshold; nonetheless, this was considered satisfactory. The final model structure marked the optimum achievable parsimony based on several iterations.

Table 6. Model fit indices for final CFA model

Measurement	Recommended	Score	Remarks
Chi Square (X^2) value	-	677.291	-
Sig. Threshold for (X^2)	> .05	.0000	-
CMIN (X^2 /df)	$1.0 < X^2 / \text{df} < 3.0$	1.764	Acceptable
Goodness of Fit (GFI)	> .90	.834	Satisfactory
Average GFI	> .80	.799	Acceptable
Root Mean Squared (RMR)	< .08	.036	Acceptable
Root Mean-Square Error of App. (RMSEA)	< .08	.060	Acceptable
Tucker-Lewis Index (TLI)	> .95	.945	Acceptable
Comparative Fit Index (CFI)	> .95	.955	Acceptable
Normed Fit Index (NFI)	> .90	.903	Acceptable
Consistent Akaike Information Criterion (CAIC)	-	1430.122	Acceptable

Structural model

Data were analyzed to test direct relationships among the constructs through four hypotheses. Results of the hypotheses are presented in Table 5.

Table 7: Direct relationship between the exogeneous and endogenous variables

H	**Relationship**	**B**	**Standard Error**	**CR**	p-Value	**Decision**
H1	IFC → (IC)	0.477	0.153	2.041	0.041	**Supported**
H2	TC→ (IC)	-0.221	-0.221	-1.095	0.274	**Rejected**
H3	LO → (IC)	0.175	0.047	2.266	0.023	**Supported**
H4	IC → (SP)	0.328	0.153	3.364	***	**Supported**

** IC-Innovative Culture; IFC- Institutional Foresight Competency; TC-Technology Capability, SP-Security Performance*

For the first hypothesis, the effect of IFC on IC was hypothesized. As part of the SEM results, overall positive regression weight was B = .477 ($p < 0.05$). Based on these results, H1 is accepted. For the second research hypothesis, the effect of TC on IC was hypothesized. An overall negative regression weight was observed B = -0.221, but not statistically significant. Based on these results, H2 was rejected. The third research hypothesis sought to investigate the impact of LO on IC. A positive regression weight was recorded, where B = 0.175 (sig. = $p< 0.05$). Based on these results, H3 was accepted. The fourth research question sought to observe the effect of IC on SP. The results revealed that this relationship is positive and highly significant (B= .153, $p < 0.05$). Therefore, H4 was accepted.

Discussion

The study, conducted in Dubai Airport, the UAE, examined the impact of IFC, TC and LO on IC and the impact of IC on SP. Empirical results obtained via Co-SEM revealed that IFC and LO have significant positive relationship with IC, but TC does not have significant positive relationship with IC. Further, IC was found to have a significant positive relationship with SP. In this case, three hypotheses were supported (H1, H3 and H4), while one hypothesis (H2) was not supported.

Interestingly, it was found that IFC (B=0.477) has the strongest relationship with IC. LO was found to have less relationship with IC in comparison to the IFC and IC. It can be implied that IFC is essential for the realization of innovation culture. While learning orientation has somewhat positive impact on innovation culture, the relationship is not relatively strong in comparison to IFC. However, TC does not have significant positive relationship with IC. This implies that the capability of using the AI technology does not guarantee the creation of innovation culture.

Based on the resource-based view theory and dynamic capability, the IFC and LO as resources significantly contribute to the realization of innovation culture of an organization. On the other hand, AI TC was found not have impact to the realization of innovation culture. In this respect, the AI technology competency does not have any impact on innovation culture. within the organization. In this case, regardless of the competency of AI technology, the future foresight has influence on innovation culture. Consistent with the knowledge-based view, learning orientation of an organization was found to have significant impact on innovation culture. This study also found that the realization of innovation culture of an organization contributes to the airport security performance.

Conclusion

This study investigated the impact of institutional foresight competency, AI technology capability and learning orientation on innovation culture that subsequently contribute to the airport security performance. Analyzing the data using CO-SEM approach, it was found that both the institution foresight competency and learning orientation have significant impact on innovation culture. However, AI technology capacity was found to have insignificant relationship to innovation culture. The study also supported that innovation culture have impact on the airport security performance.

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