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THE ROLE OF HOFSTEDE DIMENSIONS ON THE READINESS OF IOT IMPLEMENTATION CASE STUDY: SAUDI UNIVERSITIES

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ABSTRACT

The importance of the Internet of Things (IoT) in various institutions and organizations is crucial in the quality of services, provision, and facilitation in providing those with related services. Therefore, before deciding to implement these regulations in the institutions, it is essential to study the institution's situation from various aspects to avoid loss and failure. This research study is based on the role of Hofstede Dimensions on the readiness of IoT adoption in Saudi universities. This study reviews the literature about the concept of Hofstede dimensions on the readiness of the IoT on a global scale. In-depth study and practical implications are assessed by hypothetical testing based upon predetermined variable and their possible impact of adopting IoT. A questionnaire was conducted and distributed in 6 universities in located the kingdom of Saudi Arabia. The questionnaire received 390 responses. SPSS 24.0 was used to examine the possible impact and degree of impact on the adoption of IoT in these Universities. The results demonstrated that there was a positive relationship between Hofstedefactors and the readiness of Saudi universities in applying the IoT.

Keywords: *Hofstede Factors, IoT, Saudi Universities, Culture Dimensions, IoT Applications*

1. INTRODUCTION

IoT can be defined as a communication between physical and virtual objects of everyday life, devices, user's data, and interoperable systems anytime and anywhere which are assembled by embedded sensors and controlled by the internet. IoT has added value services and a hot topic area for researchers because it has many tracks to apply for different kinds of applications for businesses and domains

Today, the IoT is changing every environment around the world and started to improve human life in many sectors such as health, traffic, logistics, retail, agriculture, education, smart cities, smart metering, remote monitoring, process automation, etc [1]. The architecture Information System (IS) for example IoT is difficult to develop, because of the variety of devices, link layer technologies, and services that may be involved in such a system [2].

Firouzi et al. (2020) discussed that universities are the best environment for the creation of smart place due to a continuing increase in the use of information systems and technology. Nowadays; students, teachers, employees, and visitors are using smartphones for rapid identification. [1, 2] showed in their previous work that this new trend of technology requires sensors for monitoring the flow of people, reduce the energy, increase safety, create a social environment, and also provide smart parking, smart lighting and smart tracking for students. Implementing such a system is difficult task, and if not implemented properly, it may consume many of the resources. Therefore, the readiness of adopting IoT should be measured and tested in advanced.

IoT offers many opportunities for businesses such as cost savings, improvements of products and services, risk mitigation. It can also support in offering a safer environment [3]. A study was conducted in KSA on SME to investigate what factors impact adopting the IoT applications [4]. Universities cannot stand outside of the trend of this

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new technology because many objects are connected in a daily basis to the IoT, which may cause the learning process of the universities to transform from a model of knowledge transfer to a model-based interaction [5]. Such kinds of objects are simply like doors, windows, printers, projects, and books, etc. On the other hand, there are complex objects like buildings, classrooms, laboratories, and parking, etc [6]. All of these objects can be converted into smart objects by connecting them to sensors. All of this set of smart objects can transform the university into a smart-university. A study in Elsaadany and Soliman [7] presented the advantages and influences of utilizing the IoT in both physical and virtual learning environment in Egypt. In other studies initiated by [8, 9] stated that IoT is predictable to be a key major IT-enabled business and educational in future and they have shown benefits of the use of IoT in education sectors based on technological changes.

Recently, the adaptation of IoT in education domain has been widely explored and discussed in many studies [5, 6, 7, 10, 11, 12, 13, 14]. They purpose of using IoT in education is to create an environment that supports the acquisition of knowledge in a new, natural and efficient manner consistent with the learners' needs and expectations. For example, if someday a teacher cancels a course due to various reasons, students alarm clocks might be reset automatically, (because they don't have the scheduled course) letting them sleep two hours extra [8, 11, 15, 16, 17].

This article reviews the literature about the concept of Hofstede's dimensions on the readiness of IoT on global scale. In-depth this study and practical implications are assessed by hypothetical testing based upon predetermined variable and their possible impact of adopting IoT. The possible variables are retrieved from similar previous studies on IoT and its impact on education and transforming education in the digital era. The sample is selected from the region of Saudi Arabia and SPSS 24.0 is used for data analysis. The critical examination study model and explanatory research design is used to furbish the research with the statistical conclusion from data. This work aims to investigate Hofstede's culture factors impacts and effects on the adoption of IoT in Saudi Universities.

Considering the lack of researches to study IoT readiness in Saudi universities regarding cultural factors, this study focuses on the cultural factors demonstrated by Hofstede and literature before adopting IoT in Saudi universities. Therefore, the objective of this article is to study the readiness of IoT implementation in Saudi universities taking into consideration the cultural factors proposed by Hofstede mentioned in the literature. The authors set research questions to shape the study and guide us to concentrate on the research as follows:

- What are cultural factors from Hofstede's cultural dimensions theory that lead to the readiness of IoT implementation in Saudi universities?
- To which level Hofstede's cultural factors are present to implement IoT in Saudi universities?
- Which of the Hofstede's cultural factors have a significant positive impact on Saudi universities towards a successful implementation of IoT?

The rest of the paper is organized as follows: section 2 gives conceptual background and motivation which covers the Hofstede's culture dimensions, and the relationship between IoT and culture. Section 3 provides research model and hypothesis. Section 4 provides research methodology which consists of eight subsections: data analysis and results, statistical assumptions for factor analysis, Cronbach's alpha test of reliability, communalities table, testing of the research hypothesis, factor analysis, descriptive analysis and discussion. Section 5 gives the discussion and implications. Section 6 gives the limitations and future work and Section 7 states the conclusion of the study.

2. CONCEPTUAL BACKGROUND

This section is divided into two subsections: the cultural dimensions of Hofstede, and the relationship between these dimensions with IoT. The researchers addressed many of the previous studies that have focused on these topics and found that there is a gap in terms of linking the cultural factors with the Internet of things. Also, most of the studies addressed only the technical aspects far from the cultural sides and users' acceptance of the modern technology.

2.1 Culture

In this section, a detailed discussion of the issues of culture and the IoT is presented. There are several different definitions of culture in the literature, but there is no agreement on a particular definition of the culture. The wide varieties of scholar working in these areas is Hofstede [18, 19]. He has presented definitions from simple to complex. In general, the term "Culture" is composed of assumptions and beliefs common to a large group of people with a shared history. The authors of Gong

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and Stump [20]; Erumban et al. [21]; Dwyer et al. [22]; Tellis et al. [23]; Van and Waarts [24] described cultures as the outcome of experiences, beliefs, knowledge, values, attitudes, meanings, hierarchies, religion, timing, roles, spatial relations, concepts of the universe, and material objects and possessions acquired by a large group of people in the course of generations through individual and group striving.

The most and best particular cataloguing is Hofstede's that describes culture as a dimensional model or group cultures. He presented a model of culture based on a survey of more than 50 countries involving more than 120,000 respondents—that suggested five dimensions: Femininity, Power Distance, Individualism, Long Term Orientation and Low Uncertainty Avoidance [18, 19]

We believe that the work of Hofstede five dimensions could classify culture as the following:

- Power distance: the degree to which members of a society accept that power and all that is associated with it is distributed unevenly.
- Individualism: the degree to which a society emphasizes the role of the individual.
- Femininity: the degree to which a society emphasizes traditional feminine values (such as competitiveness, achievement, and ambition), as opposed to others (such as nurturing, helping others, and valuing the quality of life).
- Low Uncertainty avoidance: the degree to which people feel threatened by uncertain, unstructured situations and ambiguity.
- Long-term orientation: fostering of virtues oriented towards future rewards.

2.2 Culture and IoT

McKenna [6]; Madakam et al. [10]; Sørnes et al. [25]; Bagchi et al.[26]; Elsaadany and Soliman [7]; Georgescu and Hucanu [27] confirmed that Hofstede's is the most widely accepted model amongst Information and Communication Technology (ICT) researchers. In addition, it can be used for the purpose of forecasting and explaining human behaviours towards the acceptance of different technologies at both individual and industrial levels [20, 21, 26, 28].

In most of the previous studies, the researchers found that most of them are focusing on the technical side of IoT, such as architectural elements, attribute-based, security, and wireless sensor network. A few articles are concerning the influence of human and societal factors on successive or failing IoT as summarized in Table 1.

However, there is less attention on exploring the behavioural, organizational and business concerns that are critical to better understand the adoption of new technologies such as IoTs. Al-Shargabi and Sabri [8]; Jalagat et al. [12] and Ben-Daya et al. [15] stated that it is important to study the relationship between culture and the new trend of technology because organizations are increasingly facing the difficulty of managing and using the multiplicity of new technology, especially IoT.

Table 1. Selected empirical studies have investigated Hofstede culture factors and IoT

NO	Study	Findings
1	Al-Shargabi and Sabri [8]	This paper looks into the reasons that influences the user acceptance of IoT technologies, and proposed a new way how IoT can be adopted in SMB in Saudi Arabia. The study revealed that the local culture would play a vital role to determine the user attitude towards the use of new technology.
2	Jalagat et al.[12]	This paper donates to the body of knowledge on how culture can confirm the impact of cultural factors on the success of IoT and students' performance. Although, the findings of the research found that cultural dimensions of hofstede's model crucially have a great impact on the educational system
3	Choden et al. [28]	This study revealed the diffusion level using Schwartz's three national cultural dimensions. The regression results revealed that autonomy vs. embeddedness had significant impact on diffusion levels, whereas, the correlation results revealed that autonomy vs. embeddedness and egalitarianism vs. hierarchy influenced I.C.T diffusion levels.

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4	Al-Gahtani et al. [29]	The study revealed that the Hofstede factors positively effect on the success and failure of IoT. In addition, the study revealed that there is an influence on performance and productivity when considering cultural factors on the impact of IoT
5	Cho and Kim [30]	The author used Hofstede's traditional ways as symbols to find out the differences, the way countries deliver their IoT.
6	Baty et al. [31]	In this paper a comparative study was conducted to examine the national culture and its link with SUIICT organizations in Japan and Australia using a qualitative survey of ICT decision makers.
7	Wu[38]	This paper made an attempt to updated and expanded Hofstede's (1984; 2001) cultural studies while the main focus was Taiwan and the United States. The outcomes have bought significant insights into the area of multi-cultural communication in the context of ICT organizations.
8	Martinsons et al. (2009)	The review exposed that individualism is positively related to corporate reporting policy, while it is associated with low levels of tax evasion. High levels of Femininity are generally associated with low disclosure environments and aggressive accounting manipulations. Finally, long-term orientation has been examined with respect to social environmental disclosure, and findings are supportive of a positive association between both variables.

There are no previous studies that have touched the cultural factors and their impact on the IoT in Arab universities in general and in Saudi universities in particular, therefore, this research is unique in that it opens the way for researchers to address such topics in the Middle East and in the Arab Gulf, therefore, in this paper we are interested in investigating Hofstede's cultural factors that influence on the readiness of IoT implementation in Saudi universities.

3. RESEARCH MODEL AND HYPOTHESES

To achieve the objective of the research, we used the descriptive and analytical approach to describe the role of Hofstede's cultural factors in measuring the success of IoT applications in Saudi universities and the readiness of these universities in Saudi Arabia to apply these applications. This section presented, data analysis statistically to answer research questions and test hypotheses.

The research was based on two types of data:

- Secondary data: the data was collected from an academic electronic database, from the literature of high ranking journals, scientific periodicals, and statistical publications related to two topics; the Internet of things (IoT) and cultural factors of Hofstede in terms of measuring the readiness of institutions in general and universities in particular in implementing IoT.
- Primary data: the research objectives are evaluated by collected data and interpreted using a quantitative method by employing a survey questionnaire. The questionnaire was developed based on relevant studies which had approved in the literature. The research objectives are evaluated by questionnaire. The questionnaire method is used to collect data by personal delivery, via social media or emails. This work uses quantitative statistics and analysis of the collected responses. This questionnaire was split into two parts: personal and demographic information and cultural factors adopted from Hofstede dimensions employed as a variable which was confirmed to be an effective manner in previous works [8, 25, 29, 30, 31]. There is a slight modification on items so that it is adopted to meet Saudi universities context. The variables in the current work include Femininity, Power Distance, Individualism, Long Term Orientation and Low Uncertainty Avoidance.

The questionnaire measured the responses using the 5-point Likert Scale to select respondents opinions on the items (1 for strongly disagree, 5 for strongly agree). In this study, the sample target was the students and staff of different Saudi universities. 450 questionnaires were distributed among respondents along with the introduction to make sure that responses are confidential and will be used for research purpose solely. Out of 450, 420

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questionnaires were returned by the respondents out of which 30 questionnaires were eliminated for not having sufficient data to be processed. Therefore, 390 questionnaires were analyzed in SPSS (Statistical Package for Social Science) to compute and analyze the data. The statistical test used in the analysis of data included reliability, correlation and regression analysis.

The proposed model as illustrated in Figure 1 includes five independent variables, power distance, individualism, Femininity, uncertainty avoidance and Long-term orientation, and one dependent variable, Saudi universities readiness.

The following hypotheses were generated for this research:

Hypothesis Zero: "There is a positive relationship between the availability of Hofstede cultural factors and the readiness of Saudi universities to implement IoT ". It is subdivided into several sub-hypotheses:

Hypothesis One: Femininity factor has a positive effect on the readiness of Saudi universities to implement IoT.

Hypothesis Two: Power Distance factor has a positive effect on the readiness of Saudi universities to implement IoT.

Hypothesis Three: Long-Term Orientation (LTO) factor has a positive effect on the readiness of Saudi universities to implement IoT.

Hypothesis Four: Individualism (IDV) factor has a positive effect on the readiness of Saudi universities to implement IoT.

Hypothesis Five: Low Uncertainty Avoidance (UA) factor has a positive effect on the readiness of Saudi universities to implement IoT

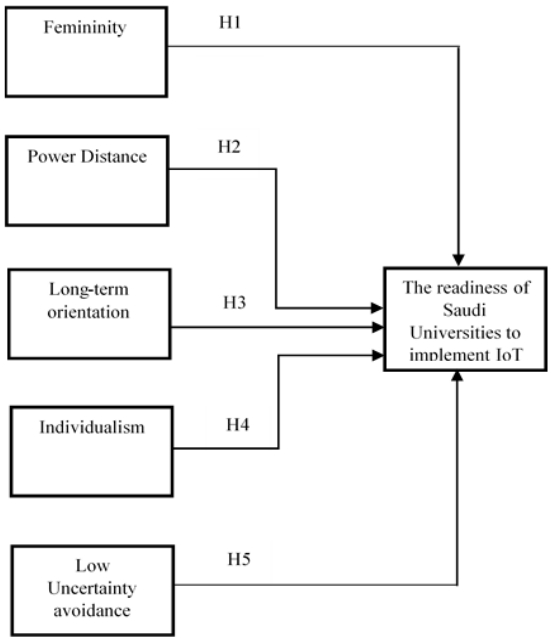

Figure 1: Research Model

4. RESEARCH METHODOLOGY

In this section, the data analysis of the research model, where the first step of the data analysis process is to screen the data to ensure it is usable, reliable, and valid to proceed further with statistical analyses. The data is captured on MS-EXCEL, and the information has been collected through a structured questionnaire (Google Doc) by conduction an online Survey. Only completed forms have been selected amounting to 390 respondents. Accordingly, this section consists of eight parts: data transformation, statistical assumptions for factor analysis, Cronbach's alpha test of reliability, communalities table, testing of the research hypothesis, factor analysis, description analysis and discussion.

4.1 Data analysis and results

The study population provided in Table 2 consisted of respondents are in all age groups, from different geographical locations in Saudi Arabia (6 universities), the majority of respondents hold the male (83.1%) and female (16.9%).

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Table 2: Demographic Data of Respondents

Object	The valid items	percent
Gender	Male	83.1%
	Female	16.9%
Age	Less than 25	20.1%
	25- Less than 35	13.9%
	35- Less than 45	39.3%
	45- Less than 55	19.3%
	Greater than 55	6.1%
Education level	Higher school	17.5%
	Intermediate college	8.9%
	Bachelors	66.7%
	Master	5.3%
	Doctorate	1.6%

All the questions which were measured on Likert Scale were transformed into Z-Scores with mean zero and standard deviation one. It was found that all the means were positive. The positive average Z-Score infers that the respondent on the average (majority) have replied in affirmative.

4.2 Statistical assumptions for Factor Analysis

- The data does not include any outliers, as it has been measured on a scale.
- The sample size is three hundred and ninety only (390), which can be said as adequate.
- Factor analysis is an interdependency technique. There should not be perfect multi-collinearity between the variables.
- Factor analysis is a linear function of measured variables; it does not require homo-scedasticity between the variables.

4.3 Cronbach's Alpha Test of Reliability

To ensure the consistency of collected data, compatibility and harmony among its contents, Cronbach alpha measurement of internal consistency was adopted to evaluate the overall reliability of the measurement scale for each defined construct of the study. Sekaran and Bougie [37] has been recommended an acceptable limit of reliability 'alpha' for this measure is (0.6). Cronbach Alpha coefficient was calculated at 82%, which indicates the stability of the data collection tool and the compatibility and harmony of its contents. Table 3 stated the results of the test of reliability using Cronbach's alpha as described in Table 3. Further, analyzing block (variable)-wise, we find Power distance, Long Term Orientation, and Low Uncertainty Avoidance and Femininity are good blocks, but not Individualism.

Table 3:Cronbach's Alpha Analysis Results

No.	Item.	Factors	Cronbach's alpha
1	HFT	Readiness of Saudi universities to implement IoT.	0.834
2	HFE	Femininity	0.848
3	HFP	Power Distance	0.894
4	HFL	Long Term Orientation	0.760
5	HFI	Individualism	0.655

4.4 Communalities Table

The Communalities table below in Table 4 describes the percentage of the variance of each variable explained by factors number of components (questions) is 24, and the communalities greater than 0.6 can be said as strong, while less than 0.57 can be said as weak. Item commonalities are considered "high" if they are all 0.8 or greater [39].

Table 4: The Communalities table

		COMMANALITIES	
NO.	Items	INITIAL	EXTRACTION
1	HFT1	1.00	0.57
2	HFT2	1.00	0.59
3	HFT3	1.00	0.73
4	HFT4	1.00	0.39
5	HFE1	1.00	0.59
6	HFE2	1.00	0.58
7	HFE3	1.00	0.74
8	HFE4	1.00	0.36
9	HFP1	1.00	0.61
10	HFP2	1.00	0.67
11	HFP3	1.00	0.53
12	HFP4	1.00	0.65
13	HFL1	1.00	0.69
14	HFL2	1.00	0.71
15	HFL3	1.00	0.73
16	HFL4	1.00	0.55
17	HFI1	1.00	0.70
18	HFI2	1.00	0.80
19	HFI3	1.00	0.57
20	HFI4	1.00	0.68
21	HFU1	1.00	0.67
22	HFU2	1.00	0.75
23	HFU3	1.00	0.60
24	HFU4	1.00	0.64

4.5 Testing of Research Hypothesis

The Chi-square test is run to test that the number of factors, extracted by Principal Component Method are sufficient as shown in Table 5.

Table 5: The Chi-square test

Chi-Square statistic	Degree of Freedom	p-value	root mean square of the residuals (RMSA)
512.78	207	<0.001	0.05

Thus, the Table 5 confirms that the factors are sufficient. Since the combination of p-value and RMSEA is less than 0.05 we will certainly reject the null hypothesis. So the alternative hypothesis is accepted.

4.6 Factor Analysis

The objective of the Factor Analysis is to clearly identify underlying dimensions, or factors, that explain the correlations among a set of variables and also to identify a smaller set of salient variables from a larger set for use in subsequent multivariate analysis. It is a complex statistical technique and does not directly test any hypothesis, like t-test or ANOVA. The test here is based on the process of data reduction. The Correlation Matrix, in this study, is positive showing thereby a positive correlation among all the six cultural variables considered:

- Readiness Of Saudi Universities To Implement Iot
- Feminity
- Long Term Orientation
- Individualism
- Power Distanc
- Low Uncertainty Avoidance

Also, the Component Analysis is a factor loading plot which is a plot of the original variables using the factor loadings as coordinates, which helps us evaluate the sub-hypotheses and Factor loadings are simple correlations between the variables and the factors. Since factor loadings can be interpreted like standardized regression coefficients, therefore one could also say that the variable has a strong association with other factors of the constructs.

Explanatory factor analysis described in Table 6 was assessed by four measures:

- Kaiser Meyer Olikin (KMO)
- Berlett's Test of Sphericity (BTS)
- Factor loading
- Total variance explained (TVE).

KMO value should be 0.6 or above and BTS value should be significant (that is the Sig values should be <0. 05 for the alternative hypothesis to be accepted) to judge that factor analysis is appropriate. Also minimum factor loadings required for the inclusion of an item within a construct is 0.50 [33]. A stricter recommendation of factor loading value is to be greater than 0.70 [32]. Finally, TVE measure values recommended to be greater than 0.50 [36].

Table 6: The Summarization of the Explanatory Factor Analysis

Factors	Items	Factor Loading	KMO	BTS	TVE
Readiness of Saudi universities to implement IoT.	HFT1	0.793	0.697	(212.724,0.000)	55.451
	HFT2	0.769			
	HFT3	0.698			
	HFT4	0.759			
Feminity	HFE1	0.891	0.619	(321.095,0.000)	57.419
	HFE2	0.791			
	HFE3	0.700			
	HFE4	0.690			
Power Distance	HFP1	0.826	0.699	(204.665,0.000)	69.502
	HFP2	0.855			
	HFP3	0.820			
Long Term Orientation	HFL1	0.918	0.634	(605.357,0.000)	61.826
	HFL2	0.930			
	HFL3	0.736			
	HFL4	0.701			
Individualism	HFI1	0.790	0.714	(191.327,0.000)	54.715
	HFI2	0.737			
	HFI3	0.775			
	HFI3	0.747			

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Low Uncertainty Avoidance	HFU1	0.763	0.754	(199.293,0.000)	56.359
	HFU2	0.767			
	HFU3	0.785			
	HFU4	0.684			

As shown in the factor analysis table above, it is observed that the values of KMO and the BTS are 0.6 and significant (sig =.000) respectively for all 6 factors. This indicates that the sample is adequate to perform this test. Furthermore, it can be seen from the table that most of the values were loaded quite strongly (above or equal to 0.7) on one component, which means that there is a factor for further investigation, and TVE measured between 60% to 64% of total variance for various factors. As all items were loaded significantly on one factor, a sum scale mean was created for these items, for each factor as HFT1-HFT4, HFE1-HFE4, HFA1-HFA4, HFA1-HFA4, HFG1-PFG4, and HFU1-HFU4 respectively. This sum scale means for all factors to reveal that all included items will be the key for further investigation.

4.7 Description Analysis

The aim of the descriptive analysis was to show to which degree each variable appears in this study as described in Table 7.

Table 7: The summarization of the Descriptive Analysis Results

Factors	Items	Mean	Standard Deviation	Average of mean
Readiness of Saudi universities to implement IoT.	HFT1	3.173	1.169	3.568
	HFT2	3.790	1.143	
	HFT3	3.461	1.424	
	HFT4	3.848	1.157	
Femininity	HFE1	3.842	1.213	3.890
	HFE2	3.317	1.141	
	HFE3	4.363	1.143	
	HFE4	4.039	1.163	
Power Distance	HFP1	3.457	1.174	3.238
	HFP2	3.417	1.020	
	HFP3	2.842	1.220	
Long Term Orientation	HFL1	3.979	3.129	
	HFL2	4.279	3.126	3.756
	HFL3	3.44	1.223	
	HFL4	3.326	1.396	
Individualism	HFI1	2.200	1.262	1.893
	HFI2	1.263	3.145	
	HFI3	1.825	1.046	
	HFI3	42.285	1.237	
Low Uncertainty Avoidance	HFU1	2.830	1.304	3.130
	HFU2	3.185	1.210	
	HFU3	3.041	1.242	
	HFU4	3.465	1.308	

As illustrated in Table 7 above:

- The average mean of the Readiness of Saudi universities to implement IoT is 3.568, which implies that the Readiness of Saudi universities to implement IoT is within the required level.
- The average mean of Femininity between males and females is 3.890, which implies that Femininity is within the required level,
- The average mean of power distance is 3.238, which implies that there is a moderate power distance. This factor should be enhanced.
- The average mean of long term orientation is 3.756, which implies that long term orientation is within the required level.
- The average mean of individualism is 1.893, which implies that individualism factor is not within the required level.
- The average mean of uncertainty avoidance is 3.130, which implies that the low uncertainty avoidance is not within the required level and it should be enhanced.

According to the results of the research, the researchers found that there are interaction, desire and acceptance of most categories of users in Saudi universities to accept the Internet of Things through the reflection of the role of Hofstede's cultural factors in the Saudi university, which will allow and help in applying the idea of IoT easily to reap services and benefits for the universities and users.

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5. DISCUSSION AND IMPLICATIONS

The primary contribution of the research is it has been able to demonstrate that culture has an impact on implementing IoT applications. It increases our knowledge about the culture dimensions proposed by Hofstede and its impact on the implementation of IoT in Saudi universities. We investigated Hofstede's cultural dimensions theory that leads to the readiness of IoT implementation in Saudi universities, the level Hofstede's cultural factors are present to implement IoT in Saudi universities, and determine which of the Hofstede's cultural factors have a significant positive impact on Saudi universities towards a successful implementation of IoT.

The result of this research shows that the Femininity factor has a positive effect on the readiness of Saudi universities to implement IoT applications. This can be explained from the survey due to the two important issues: the universities do treat all people fairly and lawfully, and they do hire competent employees. In other words, 72% strongly agree or partially agree to the awareness of the concept.

In terms of the Power Distance factor, the results of this research shows that it has a positive effect on the readiness of Saudi universities to implement IoT. In general, 85% of the participants either agree or partially agree that this factor has a significant impact on implementing IoT application. The result supports most of the previous experience in the literature and it also implies that the communication between people and universities will increase commitment to change and reduce confusion and resistance to change.

In addition, the results of this research show that Long-Term Orientation factor has a positive effect on the readiness of Saudi universities to implement IoT. 92% either agree or strongly agree with the question. This is an indication of people's interest to adopt technologies for automating things that could be more difficult for older generations. It also implies that the higher level of educational attainment in a society, the stronger the positive effects of long-term orientation on broadband adoption become.

Also, the Individualism factor increases the chance of the universities to implement IoT successfully. However, 14 % of participants have negative concerns about IoT in terms of privacy and technology maturity. Issues like location-based applications can cause some discomfort or a violation of privacy, which means that these issues are needed to be addressed. Also, some participants believe the IoT can have a negative consequence as it can cause more distractions to the learning process and consumes time to utilize new technology.

Finally, the results show that the Low Uncertainty Avoidance (LUA) factor affects the readiness of Saudi universities to implement IoT. Generally, 79% either agree or partially agree to the impact of this factor. This can be explained from the survey due to the awareness of people in Saudi universities about the future of the IoT applications. This finding is consistent with the researchers' viewpoint, in which the Low Uncertainty Avoidance has a very important role and determines the people's behavior toward implementing IoT system.

The results of this resarch are consistent and have supported in the literature [4, 12, 15, 20, 21, 26]. Moreover, the outcome of this research can be used as a reference for the universities in Saudi Arabia or the Middle East when they decide to implement the IoT applications at universities. In addition, researchers and knowledge seekers can use the research outcomes to enhance their knowledge for Arabic universities' readiness levels in developing countries to implement new technologies. Finally, this study can be used by top-level managers to guide them to the important cultural factors affecting the success of implementing and introducing a new information system.

6. LIMITATION AND FUTURE RESEARCH DIRECTIONS

This preliminary study only presents the IoT adoption readiness. The findings are limited to small number of participants and therefore do not permit further inferential analysis. Hypotheses cannot be tested using the preliminary data nevertheless they will be tested through inferential statistical analysis in the final study. Also, there is a difficulty in understanding some terms in Hofstede's cultural factors, and some other variables need to be added in future studies.

Future studies will be done with a wider audience of different categories of universities to provide stronger empirical evidence. Also, adding more other factors for example (trust, user acceptance, satisfaction and IS success factors, etc.) will be crucial to enhance the success of the Internet of Things application. It can also help in measuring the readiness of other universities in different countries to implement the Internet of Things project.

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7. CONCLUSION

The purpose of this study is to investigate the factors that influence on the readiness of IoT implementation in Saudi universities taking into consideration the cultural factors proposed by Hofstede mentioned in the literature. Based on the review of the literature, the researchers found that there is a need for more investigation. It is evident from the results that all the individual constructs demonstrate positive effect on the readiness of the universities in the Saudi Arabia towards implementing IoT. The analysis of all the components of femininity, power distance, long term orientation, individualism and low certainty avoidance strongly points toward the acceptance to implement IoT across the universities in the Saudi Arabia. This study creates a better understanding of the factors influencing the readiness of Saudi universities to implement IoT systems. Hence, based on the previous studies conducted on the subject and from the positive result of the current study, it is believed that IoT will add more values to the academics in future. IoT will also optimize management decisions by improving their capabilities, improving institutional operations and performance, mobilize employee engagement and enhance their technological knowledge and skills. The current study also advocates Hofstede's cultural factor as a key indicator to enhance operation and performance in the universities of Saudi Arabia.

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