Determinants of rfid adoption intention in hajj organizations

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Abstraction

Hajj (Pilgrimage) is one of the five pillars of Islam, and it is mandatory to all able bodied and financially Muslims to execute at least one time in their whole life. Millions of Muslims go to Mecca to execute their Hajj. Care of pilgrims is duty of Saudi Arabia governments and Hajj organisers in all Islamic universe states. Managing of Hajj activities is a really complex undertaking due to the immense figure of pilgrims, the limited geographical country for the motion of pilgrims and the limited period of the Hajj. Radio Frequency Identification (RFID) engineering can be used in assorted applications during Hajj season to supply good solutions to many jobs and lend in get the better ofing many troubles. Despite this, RFID as an emerging engineering has non been studied from Hajj position. Using the Technology-Organization-Environment (TOE) model, this survey develops a theoretical theoretical account for RFID acceptance purpose in Hajj Organizations. Nine variables (comparative advantage, compatibility, complexness, top direction, house size, organisation preparedness, local authorities support, willingness to join forces, and Saudi authorities support) are proposed to assist foretell RFID acceptance purpose. We include the willingness to coaction among the organisers, which is an of import factor in environmental context, but has been ignored in IS literature. In add-on, we include Saudi authorities support as moderator variable. This survey proposes to through empirical observation prove the theoretical account with equal sample size of Hajj organisations.

I. Introduction

Hajj is one of the five pillars of Islam, and it is mandatory to all able bodied and financially Muslims to execute at least one time in their whole life. Hajj is the largest one-year pilgrim's journey for Muslims over the universe. Every twelvemonth, 1000000s of Muslims from all around the universe go to Makkah (Mecca) in the Kingdom of Saudi Arabia to execute their pilgrim's journey. Hajj governments in Saudi Arabia are responsible for having pilgrims so lodging them, service and keep their safety. Managing of Hajj is a really complex undertaking. The complexness in Hajj direction is due to the immense figure of pilgrims, the limited geographical country for the motion of pilgrims and the limited period of the Hajj.

The entire figure of pilgrims coming from exterior or inside the Kingdom of Saudi Arabia increases every twelvemonth as shown in the Table 1.

Table I

THE NUMBER OF PILGRIMS FOR THE YEARS FROM 1996 TO 2011

(Beginning: CENTRAL DEPARTMENT OF STATISTICS & A ; INFORMATION IN THE KINGDOM OF SAUDI ARABIA)

Year	From Inside The Kingdom	From Outside The Kingdom	Entire
1996	784769	1080465	1865234
1997	774260	1168591	1942851

1998 699770	1132344	1832114
1999 775268	1056730	1831998
2000 571599	1267555	1839154
2001 549271	1363992	1913263
2002 590576	1354184	1944760
2003 610117	1431012	2041129
2004 592368	1419706	2012074
2005 629710	1534769	2164479
2006 700603	1557447	2258050
2007 724229	1654407	2378636
2008 746511	1707814	2454325

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2009 679008	1729841		2408849
2010 699313	1613965		2313278
2011 989798	1799601		2789399

This continues increasing in the figure of pilgrims causes many jobs for governments and organisers of Hajj. The most outstanding job is the overcrowding which consequences in other jobs such as hold a big figure of pilgrims at the chief ports, where pilgrims required standing in a long waiting line for several hours, sometime up to a full twenty-four hours for the intent of their in-migration processing because of the big figure of pilgrims. In add-on, the trouble of identify, monitoring and trailing of pilgrims in the crowded topographic points at the Holy sites particularly when natural catastrophes occurred and there are a figure of the dead and wounded. Furthermore, the immense figure of pilgrims causes the loss of big Numberss of pilgrims, particularly the aged, which adds a load on the Hajj ' s governments to seek for them. In add-on to the presence of big Numberss of lost pilgrims and who need person to steer them to their cantonments. From other side, the healthy governments confronting trouble to cognize the healthy record for patients pilgrims no record or papers shows the healthy province of pilgrims and the diseases they suffered, particularly the inveterate ailments, every bit

good as the trouble of communicating with them as they speak different and multiple linguistic communications [1] .

RFID engineering can lend in work outing some of these jobs. In general, all pilgrims can be provided by a wristband RFID ticket that can be worn at all times. The most important information of the pilgrim should be stored in the ticket. When present the ticket to an RFID reader, this information can be retrieved and displayed on a handheld portable unit.

Examples of RFID applications include rush up the procedure of pilgrim ' s in-migration processing at Saudi Ports, designation of pilgrims (dead and injured) , supervising and tracking of pilgrims, steering lost pilgrims to their cantonments, and cognizing the medical record of patients.

With regard to RFID acceptance literature, there are many old surveies conducted for this intent, but most of these surveies addressed the acceptance of RFID engineering in the concern sector, particularly in the supply concatenation direction (SCM) where RFID used to track and supervise merchandises. However, surveies examine the cardinal factors act uponing RFID acceptance purpose in the country where RFID used to supervise and track people particularly in Hajj are still really scarce. There is no survey addressed the issue of RFID engineering acceptance purpose in Hajj organisations.

For intent of analyzing invention acceptance at the house degree, the technology-organization-environment (TOE) model considers a moderately theoretical footing [2] . Using the TOE model, this paper proposed a theoretical account for RFID engineering acceptance purpose in Hajj

organisations. In the following subdivision, background of RFID engineering is showed. The literature on the acceptance purpose of RFID is reviewed in the subdivision III. In subdivision IV research theoretical account and hypothesis are proposed. Research methodological analysis is described in subdivision V. The decision is in the last subdivision.

II. Radio frequence designation engineering

RFID (Radio Frequency Identification) is an emerging engineering that used for identifying, tracking and following objects, people, minutess or events where alone consecutive figure (individuality) and informations of the object is transferred wirelessly utilizing wireless moving ridges [3] . All automatically captured informations can so be send straight to a computing machine system, avoiding less efficient and more error prone human intercession required to put to death operational undertakings and concern intelligence analysis. The information that temporarily stored is so processed to feed other internal or external IT systems. Data is stored on an electronic data-carrying device called ticket. The ticket is attached to the object being tracked. The operations of power supply to the ticket and informations interchanging between the ticket and reader are performed without holding any physical contacts with the reader devices [3] .

A. Architecture Of RFID System

In RFID system architecture as shown in Fig. 1 Data is exchanged between different beds where system and application maps are arranged

1. RFID Tag (Transponder) : An RFID ticket is a bantam Si micro chip composed of an aerial, memory, an encapsulating stuff and optionally

a little processing unit. It is combined with an aerial in a compact inlay. The inlay is converted into different signifier factor to let the RFID ticket to be attached to an object for tracking intent. The ticket ' s aerial picks up signals from an RFID reader or scanner and so returns the signal, which is the information with a alone consecutive figure or other customized information.

2. RFID Reader (Interrogator) : An RFID Reader is an electronic device that generates and receives RF signals. The RFID reader uses an aerial to direct and have signals to and from RFID tickets. The nucleus portion of the reader is a microprocessor embedded on the electronic circuit. Depending on their type, RFID readers can hold assorted capablenesss, which include: reading and composing informations to tickets ; runing on either a individual or on multiple frequences ; executing anti-collision processing [4] .

3. Middleware: In order to place the informations transmitted by the aerial, one or more particular functional beds are required for IT system to make this undertaking. This bed is the middleware bed. In this bed, the informations are cleansed from any read or multiple readings mistakes which are non already cleansed by the readers and buffer it in a database. In conformity with the concern procedure the informations are filtered and so transferred to the backend systems [5] .

4. Backend Systems: This is the highest bed in RFID system architecture. It involves IT systems from standard package shapers such as SAP, Oracle, Retek, and Microsoft or systems that have been programmed

independently. These systems use the informations received antecedently to back up organisation ' s concern processes [5] .

B. RFID Potential Applications in Hajj

RFID has many possible applications in Hajj season. In general, each pilgrim can be provided by a wristband RFID ticket that can be worn at all times. The most important information of the pilgrim (e. g. the name, reference, nationality, age, blood type, wellness record, etc.) should be stored in the ticket. When present the ticket to an RFID reader, this information can be retrieved and displayed on a handheld portable unit.

The followers are description for some of these applications.

1. Pilgrims Immigration Processing at Saudi Ports: To rush up the pilgrim in-migration processing at Saudi ports, each pilgrim should be provided with RFID wristband ticket at the clip of their grant of visa. This ticket contains the most of import information as mentioned above and should be linked to the backend database. At the ports, the Gatess should be installed with RFID readers in order to read RFID ticket. Once the transition of pilgrims through these Gatess, the reader would pick up the information from backend database by the ID embedded in the RFID ticket. In this manner each pilgrim can acquire immigration permission without any hold [1] .

2. Designation of pilgrims (dead and injured) : Overcrowding and stampede can non be avoided in many Hajj activities particularly in instance of natural catastrophes, which may ensue in the decease of some pilgrims, particularly the aged. In this instance, designation of

the dead organic structures or severely mutilated organic structures it becomes a challenge peculiarly in the absence or harm of designation ' s papers of organic structure. The RFID wristband ticket supported by backend database would be able to track the losing pilgrims, and happen all the other inside informations [6] .

3. Monitoring and Tracking of Pilgrims: There are many troubles during different stages of Hajj. One of them is trouble of manage crowds of pilgrims in crowded topographic points where tonss or even 100s of pilgrims are killed because of the stampede. To avoid such instances, utilizing RFID wristband ticket given to each pilgrim, the Hajj governments and organisers can supervise and track pilgrim ' s motion and number the figure in each topographic point section. Once the figure reaches the bound capacity, they can take appropriate action such as halt or airt the flow of pilgrims through other waies less crowded [7] [8] .

4. Steering Lost Pilgrims to Their Camps: big figure of pilgrims comes to the service centres or constabularies officers around the clock to steer them to their abodes or cantonments because the topographic points and waies in Mecca are non well-known for them as they came from different states over the universe. It is non ever easy to happen a talker of the lost pilgrim ' s native linguistic communication. Return to the information stored in RFID wristband tickets which include all pilgrims ' abode information, police officer or other official forces can scan RFID ticket by fixed or nomadic reader and so give all needed information to help her/him [8] .

5. Knowing the Medical Record of Patients: Large figure of pilgrims comes to medical institutes for intervention around the clock. In the absence of medical record related to the pilgrim, wellness attention staff complains that they find it hard when they examine the patients and diagnosis their wellness position. A farther trouble is that pilgrims who came from different states from all over the universe speak different linguistic communications and this consequence in the trouble of pass oning with people who need medical aid or other services [1] . Storing patient pilgrims ' medical record in RFID wristband ticket will assist medical governments in supplying right intervention seasonably and hence cut downing the hazard of inaccurate intervention and speeds up the procedure of primary trials [9] .

III. LITERATURE REVIEW

A. Determinants of RFID Adoption

The general acceptance of RFID began to take measure frontward in 2004 because of the authorizations of big retail merchants such as Wal-Mart, Target, and Albertson every bit good as assorted authorities bureaus such as Department of Defense and Department of Homeland Security. A important figure of surveies were devoted to look into the factors act uponing the acceptance of RFID Technology in assorted industries such as health care industry, retail sector, supply concatenation and logistics industry, fabrication, automotive industry and other industries.

Lee [10] proposed a theoretical account to look into the motives and driving forces behind RFID acceptance within organisations in the health care industry. The theoretical account posited that engineering push, need pull,

and presence of title-holders are determiners for the likeliness of RFID acceptance within organisations. Chen [11] identified sensed usefulness and public presentation anticipation as Influential factors on the purpose to utilize RFID invariably in the infirmary. Furthermore, Sun [12] found that ethical/privacy factors are every bit of import as other environmental, technological, and organisational factors to do a engineering acceptance determination.

In supply concatenation and logistic industry, better stock list direction, obtaining competitory advantage, and cost decrease are the three most important motives for RFID acceptance [13] . Using discriminant Analysis, the environment, organisation, engineering and merchandise factors have impact on the acceptance of RFID by fabricating companies in China [14] . An empirical survey shows that explicitness and engineering accretion, organisational encouragement, quality of human resources, and governmental support are important influences on the willingness to follow RFID engineering [15] . Furthermore, harmonizing to [16] force per unit area of competition andA dealing spouses, providers ' industry environment, cost, integrating of supply concatenation scheme, complexness and common criterion are impacting RFID acceptance in the Taiwan ' s logistics industry. Yung-Hsiang [17] extracted the factors cost, globalisation tendency, proficient interoperability and purpose of upstream and downstream spouse industry cooperation as most of import factors for the acceptance determination.

In the retail and fabrication industries, advantage, complexness, organisational preparedness, and supply concatenation integrating are

significantly impacting RFID acceptance purpose [18] . Furthermore, compatibility, house size and competitory force per unit area presented as a cardinal variables act uponing RFID acceptance purpose [19] . Furthermore, an exploratory survey has been conducted to analyze RFID acceptance in the South African retail sector. The writers proposed TOE model consists of technological factors (e. g. , perceived benefits) , organisational factors (e. g. top direction consciousness and involvement) , and external factors (e. g. , the attempts of standards-making organic structures) . All factors within these three contexts have been found positive drivers of RFID Adoption [20] .

B. Technology-Organization-Environment Framework

To analyze acceptance of general technological invention, Tornatzky and Fleischer [21] proposed the technology-organization-environment (TOE) model. In this model, the writers argued that technological context, organisational context and environmental context influence the procedure of technological inventions acceptance and execution by a house. The technological context refers to the internal and external engineerings that are relevant to the house [21] . This may includes both the existing and emerging engineerings. The organisational context refers to the features and resources of the house such as human resources, house ' s size, managerial construction, grade of formalisation, grade of centralisation, sum of slack resources and linkages among employees [21] . The environmental context refers to the house industry and its traffics with trading spouses, rivals and authorities [21] .

The TOE model has been through empirical observation supported and found practical in understanding the procedure of technological inventions acceptance in many Information Systems (IS) domains such as EDI, unfastened systems, material demand planning, electronic concern, e-commerce, cyberspace, and digital transmutation [22] , [23] , [24] , [25] , [26] , [27] .

The TOE model is besides consistent with invention diffusion theory of Rogers [28] , which identified five technological features (comparative advantage, compatibility, complexness, trialability, and observability) as ancestors to any acceptance determination and besides emphasized on both the internal and external features of the organisation as drivers for engineering diffusion [13] , [27] . The TOE model can be used for analyzing different types of inventions [29] , in add-on to specific IT inventions such as RFID [30] . Therefore, TOE model is more appropriate for this survey and it provides a good starting point for look intoing and analysing the factors act uponing RFID acceptance purpose by Hajj organisations, because it has many consistent empirical supports.

Technological factors are often studied among the three contexts in the literatures. Within this context, compatibility and complexness are found two most of import factors followed by comparative advantage, cost, public presentation, and so on. In the organisational context, top direction support comes as the most cited factor followed by technological preparedness, organisation size, endeavor integrating, et Al. Environmental context includes competitory force per unit area, external support, governmental policy, information visibleness and so on.

RESEARCH MODEL AND HYPOTHESIS

A. Research Models

Accommodated to the technology-organization-environment model, a theoretical account for RFID acceptance within Hajj governments and organisers context is developed as shown in Fig. 2, which involves the three contexts. Technology context includes three features of RFID engineering which are comparative advantage, compatibility, and complexness. Organization context includes besides three features of the organisation which are top direction support, organisation size, and organisation preparedness. Finally, environment context contains the two factors viz. : local authorities support and willingness. In add-on to these variables within the three contexts, this studyA add another factors which isA A Saudi Government Support as moderator variableA and the survey will prove the consequence of this variable on the relationship between the variables within engineering, organisation, and environment and the dependant variable which is the purpose to follow RFID.

B. Hypothesiss

1) Technological Context: as mentioned above, technological context typically describes IT invention features that influence organisation acceptance of the IT invention such as comparative advantage, compatibility, complexness, trialability and observability. However, Prior research have merely suggested that among these five invention features, factors including compatibility, complexness, and comparative advantages are systematically of import during the procedure to do an acceptance determination [31] , [32] . Therefore, this paper considers merely these

three factors in the RFID acceptance context: comparative advantage, compatibility, and complexness.

Hypothesiss about Technological context include:

H1. A Relative advantage will hold a positive consequence on Hajj organisations purpose to follow RFID engineering.

H2. Compatibility will hold a positive consequence on Hajj organisations purpose to follow RFID engineering.

H3. Complexity will hold a negative consequence on Hajj organisations purpose to follow RFID engineering.

2) Organizational Context: Organizational context of an organisation typically describes the features of an organisation that influence organisational acceptance of technological invention [21] . On the footing of reappraisal of organisational RFID acceptance literature, the present survey considers three organisational features that are most often found to act upon organisational acceptance of the RFID engineering. These organisational features are: top direction support, organisation size and organisation preparedness.

Hypothesiss about organisational context include:

H4. Top direction support will hold a positive consequence on Hajj organisations purpose to follow RFID engineering.

H5. Organization size will hold a positive consequence on Hajj organisations purpose to follow RFID engineering.

H6. Organization preparedness will hold a positive consequence on Hajj organisations purpose to follow RFID engineering.

3) Environmental Context: Harmonizing to the TOE model, factors related to environmental context influence organisational acceptance of IT inventions.

On the footing of reappraisal of environmental RFID acceptance literature, this survey considers merely twoA environmental factors that are more likely to impact RFID acceptance purpose in Hajj organisations which are local authorities support and willingness to join forces.

Hypothesiss about environmental context include:

H7. Local authorities support will hold a positive consequence on Hajj organisations purpose to follow RFID engineering.

H8. Willingness to join forces will hold a positive consequence on Hajj organisations purpose to follow RFID engineering.

4) Moderator Variable: Since the acceptance of RFID engineering in Hajj foremost is the duty of the authorities of the Kingdom of Saudi Arabia which is the chief responsible for organize and pull off the Hajj ' s personal businesss among all other Islamic states because the Hajj is performed on its ain place, it is necessary for any other Hajj organisation wants to follow RFID engineering or take part in the acceptance to acquire support from the Saudi authorities. the Saudi authorities plays a cardinal function in the success or

failure of the acceptance of this engineering by foremost O. K. ing on the thought of following this engineering in the Hajj, and so by supplying legal installations and fiscal support to the concerned governments to implement this engineering, and besides by stimulates Hajj organisations to utilize this engineering and makes pilgrims cognizant of the benefits of utilizing this engineering and so on.

Therefore, it is expected that Saudi authorities support will moderator the relationships between nucleus concepts and RFID acceptance purpose. Consequently, the undermentioned hypothesis was proposed:

H 9: Saudi authorities support will chair the relationships between technological, organisational and environmental concepts and RFID acceptance purpose by Hajj organisations.

V. RESEARCH METHODOLOGY
A. Questionnaire Design
A self-administered questionnaire was developed for informations aggregation intent. The questionnaire consists of figure of points that were either adapted from bing graduated tables in old similar surveies and relevant literature or freshly developed for this survey in conformity with the proposed hypotheses presented in above. In entire, 50 points covering the technological, organisational, and environmental contexts in add-on to the basic information about respondents and organisations. A 5-point Likert graduated table was used for each point, anchored by strongly hold to strongly differ.

B. Study Sampling

Since the survey population consists of all Hajj organisations around the universe, it is so hard to stand for all of this population. So the research worker turned to the choice of a representative sample of the population. This sample is the Hajj ' s organisations in the South-east Asia ' s states in add-on to Hajj service suppliers in Saudi Arabia represented by National Tawafa Establishment for South-East Asian Pilgrims as a representative of the Saudi Arabia governments and responsible for modulating the personal businesss of the pilgrims from South East Asia.

There are several grounds and justifications for the choice of the sample. First, South-East Asia Islamic states are the states where the writer, as a research worker, is good connected since he presently lives in one of these states viz. : A Malaysia.

Second, Islamic states in South-East Asia represent a important proportion of the entire figure of Muslims over the universe. Third, the South-East Asiatic states are the more Muslim states advanced, peculiarly in field of information engineering compared with other Islamic states and this is what will let the research worker carry oning the survey which is expected to have a high response compared with other Islamic states that live in the backward side in footings of information engineering. So, we believe that choosing the sample from Hajj organisations in South- East Asia and National Tawafa Establishment for South-East Asian Pilgrims is appropriate for the present research.

The sampling frame of this survey contains the names, references and contact information of 184 organisations. The research worker will reach with these organisations in order to indentify all individuals who will take part in the survey study.

This survey targets the senior and in-between directors who are straight responsible for RFID acceptance determination in their organisation. Thereafter, the sampling frame is expected to transcend this figure in much. The simple random trying technique will used to pull samples from the sampling frame.

C. Data Collection Method

Using questionnaire study method, the informations will be collected in order to prove the research theoretical account. The questionnaire will be reviewed before send it out by faculty members experts in the country of this survey to do certain that the study ' s points completeness, efficiency, relevance and besides to look into the construction, sequence, diction, and overall visual aspect and agreement of the points in the questionnaire.

After that, a web version of the questionnaire will be developed. The online questionnaire will so pre-tested by little sample that will be indiscriminately drawn from the trying frame to guarantee that the points will be interpreted decently and the study format will be in order and besides to guarantee that the study questionnaire captured the phenomena desired.

Based on the consequences of the pre-test, alterations will be made to the questionnaire if there is a demand. Then, the nexus to the online

questionnaire will be e-mailed to all participants with a screen missive that describes the intent of this survey and explicate RFID engineering.

All responses will be received electronically from the respondents who completed the questionnaires online.

Decision

In this paper, the factors impacting RFID acceptance purpose in Hajj organisations are explored based on technology-organization-environment model. The research theoretical account involved factors within engineering context, organisation context, and environment context. The willingness to coaction among the organisers is added to the theoretical account as new variable which is an of import factor in environmental context, but has been ignored in IS literature. In add-on, the theoretical account included Saudi authorities support as moderator variable. We believe that our current apprehension of RFID acceptance and extract will increase as a consequence of this survey. Form RFID engineering acceptance position, the proposed theoretical account will be able to clear up the acceptance purpose and diffusion of RFID engineering in Hajj organisations context. From a practical position, based on the chief findings, the survey will pull of import deductions to assist directors in Hajj organisations to do appropriate strategic determinations on RFID acceptance and execution.