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Investigating the Factors Affecting the Readiness Level of IoT Technology Acceptance

(Case Study: Financial Activists, Stock Exchange, and Financial Institutions)

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Abstract: *IoT, a state-of-the-art technology, faces many challenges in its growth and development. One of the main concerns is the potential threats posed by the spread of such technology in the world. The widespread adoption and spread of such a technology can threaten us much more seriously than the Internet currently availa-ble. The challenges we face in adopting such technology will include both the social and the technical aspects. Technical limitations include security considera-tions, privacy, as well as the resource, energy, and capacity issues for such a large amount of data and processing. Besides, socially, cultural infrastructure must first be provided for the diffusion of such technologies among the community. This study aimed to investigate the factors affecting the readiness level of the ac-ceptance of IoT technologies. The relationships are examined as six main catego-ries identified, namely the social aspect, the cultural aspect, the human aspect, the technological aspect, the financial aspect, the management aspect, government laws, and regulations. The opinions of senior ICT executives nationwide were collected. The statistical population of this study consists of experts and users of the financial sector, stock exchange, and financial institutions. Since the statistical population is infinite, 384 randomly available individuals are selected. SMART.PLS was used to validate the model and test the relationships between variables. The results indicate the impact of the identified categories on IoT adop-tion readiness.*

Keywords: Ecommerce, IoT, Technology Acceptance

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I. INTRODUCTION

In the IoT World, many objects around us, such as sensors and actuators, will be connected to global networks based on standard communication protocols and will share the data received between different platforms to a single target. The main strengths of the IoT idea are its signifi-cant impacts on different aspects of daily life such as smart homes, smart transport (a.k.a. intel-ligent transportation), smart cities, and electronic health [1]. IoT, a state-of-the-art technology, faces many challenges in its growth and development. One of the main concerns is the potential threats posed by the spread of such technology in the world. The widespread adoption and spread of such a technology can threaten us much more seriously than the Internet currently available. The challenges we face in adopting such technology will include both the social and the technical aspects. Technical limitations include security considerations, privacy, as well as the resource, energy, and capacity issues for such a large amount of data and processing. Be-sides,

socially, cultural infrastructure must first be provided for the diffusion of such technolo-gies among the community [2]. The unique ability to identify objects is critical to the successful use of IoT technology. This not only allows users to individually identify goods (commodities) in business processes but also enables remote control of equipment over the Internet. Among the most critical features to create a unique address are its uniqueness, reliability, consistency and persistence, and scalability. Any commodity that is already connected to, or intends to be connected to, the supply chain information must be identified according to a unique identifier, location, and characteristics [3].

According to IoT studies, it can be seen that various factors can influence the extent to which organizational users accept (or adopt) this technology. In this regard, Miltgen et al. [4] investigated the acceptance (or adoption) of IoT-based health services based on the TAM (Technolo-gy Acceptance Model) and UTAUT (Unified Theory of Acceptance and Use of Technology) models [4]. The results showed that the characteristics perceived by users influence the degree to which this technology is accepted. According to technology acceptance model studies, factors such as trust, social influence, perceived behavioral control, and structural factors influence the level of IoT users' willingness [5].

Wojcik suggested the potential of using IoT in libraries [6]. According to them, new-age technologies such as Augmented Reality, 3D printing, and wearable technologies can help con-sumers of the current age by creating new services based on the growing demands. While new technologies such as IoT have their benefits, they also pose infrastructure security challenges. Now it's time to look at the factors that drive consumers to use IoT as well as the factors that discourage them from using IoT.

IoT adoption is limited to just a few applications. In developing countries, the benefits of IoT adoption as a key factor in a country's socio-economic development have also been recognized by academics and practitioners. Currently, few studies have discovered IoT adoption from multiple theoretical perspectives, namely Theory of Reasoned Action (TRA), Theory of Planned Behavior (TPB), and Technology Acceptance Model (TAM) [5].

The Unified Theory of Acceptance and Use of Technology (UTAUT) provides appropriate fundamental information needed to study the adoption of electronic services. Venkatesh et al. [7] empirically tested the UTAUT model with eight technological models for the adoption of electronic services. These models include TRA, TPB, TAM, Motivational Model (MM), TAM-TBP, Model of PC Utilization (MPCU), Innovation Diffusion Model (IDM), and Social Cogni-tive Theory (SCT). Experimental studies focused on the adoption of electronic services [8].

IoT is advancing rapidly. Various statistics suggest that a network of 25 billion devices will emerge by 2020, bringing in nearly $ 2 trillion in economic profits. Although the enormous impact of this Third Industrial Revolution on the retail, manufacturing, transportation, and energy industries is well seen, these impacts are not yet sufficiently visible in the financial services sector. Since the core value of IoT is data transfer and the financial sector and Fintech (Financial Technology) is heavily dependent on data transfer and analysis, the evolution of the IoT finan-cial services industry is not impossible. Financial institutions, especially retail banks, have in-vested a great deal of money in developing internal infrastructure and customer-related technological capabilities. IDC Financial Advisory Institute firm has predicted that retail banks have invested $ 16 billion in digital transformation technologies and this investment will grow. Ac-cording to the sixth annual PwC financial services digital survey, IoT is ranked as one of the ten leading industries in investing in sensors for potential innovations. We live in an age where change and keeping up with change and speed are essential, so paying attention to electronic communications can help governments succeed and failing to pay attention can make them fail. Iran is no exception. Identifying the barriers to the implementation of this system by academics can help implement and advance IoT goals. Today's organizations have been able to create unique value for their customers by utilizing ICT features and capabilities. To this end, it is nec-essary to identify the factors influencing IoT adoption readiness. The remainder of the article provides an overview of the research literature. The next section deals with research and information gathering. After interpreting the research

findings, the conclusions are drawn.

In the next steps of the study, we will consider literature review in context of Technology acceptance for IOT among accounting and finance institutions, Importance of IoT for Account-ing and Finance, Technology Acceptance Model (TAM), The Internet of Things Readiness in Public Financial Organization, Financial Consumers' Acceptance of Internet of Things Technol-ogy, Factors affecting readiness to IOT-based banking service and Adoption of internet of things (IoT) in banks. Next, we will concentrate on the methodology of the research by consid-ering its Variables and Model, Validity and Reliability of Research Model Variables and General Structural Model Quality Test. The findings will be studied as six categories which are used in this study. Finally, we will review the conclusions and suggestion of the study.

II. LITERATURE REVIEW

The emergence and use of Internet-connected objects in various sectors and have improved our quality of life have experienced rapid growth in recent years, and these objects are present in all aspects of our lives. IoT has practically allowed objects around us to think and make decisions for us and to work together to improve the quality of human life by making it possible to communicate between objects and share information between them. IoT has been able to break away from the traditional notion of objects and transform them into smart objects through sophisticated computing technologies, technologies embedded in objects, communications technologies, as well as sensor networks and Internet protocols. Over time, with the ever-expanding IoT concept, standardization of its architecture has become an integral and fundamental principle in IoT and has created a competitive environment for different companies to present their products [9].

New business opportunities will be created with the help of IoT. Since the development of business applications and models is facilitated by IoT smart objects [10], successful business models always need sufficient information. The information collected automatically helps exchange information between devices to solve problems, embed new services, and develop a new revenue model [11].

The rapid advances in IT and its widespread use in all walks of life have led today's society to face unprecedented challenges. The everyday experiences and routine schedules of humans have changed so much that they cannot be found at any point in history. These changes have been linked to human life as one would expect stability in the present situation to be far-fetched. In the meantime, organizations have not been immune to the changes and transformations caused by IT, and these impacts have changed the foundation of organizations. Accordingly, the use of IT in organizations begins to reduce costs and speed up daily and repetitive work, and continues to fundamentally transform organizations. To improve their status and position by ICT, organizations need to plan rapidly to expand their capabilities and potential in various organizational, structural, and technical aspects, and to expand existing capabilities. This capacity is measured by the e-readiness level of the organization. It should be noted that the diverse applications of ICTs are slowly expanding and penetrating into most countries despite the investment in ICT. The main cause of this problem is the low e-readiness of the community to adopt and deploy ICT within and between communities and organizations. Therefore, it is essential to have a proper understanding of the extent of this readiness to enter the ICT realm as well as to keep pace with the developments of today's developed societies [12].

Despite the many potential benefits of IT in an organization, one of the problems and challenges facing government agencies is the adoption and application of new IT. In this respect, a key question is "how to ensure that users will adopt and use new IT in business processes [13]. Researchers have presented various concepts for technology acceptance and IT so far. Although, according to Fotino (2011), there is no clear definition of IT acceptance in previous studies [14]. According to information systems researchers, the adoption (acceptance) of IT and technological innovation virtually belong to the same category. Hence, it can be stated that IT acceptance is a multi-dimensional topic that requires a comprehensive definition specifically in organizations [15].

Parasuraman (2000) stated that each person's mental perceptions of technology are different emotions and attitudes that occur [16]. Technology can manifest itself in the form of

feelings of anxiety, amusement, or optimism that reflect the behavior and thoughts of each person. Moreover, negative or positive feelings about technology are different for each individual [17].

The challenge today is to understand to what extent the main theories explain the use, acceptance (adoption), and behavior. Three theories, namely TAM, TRA, and TPB, are compared within the IoT framework. Attitude structure is introduced as a reference to Behavior Intention (BI) and PEOU and PU are introduced as predecessors compared to using TAM 2, TAM 3, and UTAUT [18, 19].

According to TRA, the purpose of applying BI of a product or system is dependent on one's attitude toward the behavior and subjective norms of behavior. BI mainly predicts actual behavior. The Attitude toward the Behavior (ATB) is an individual assessment of a particular behavior as measured by behavioral beliefs about outcomes and characteristics [20]. The Subjective Norm (SN) is an area influenced by the beliefs and practices of parents, spouses, friends, teachers, and other influential individuals [20]. BI is one's readiness to perform an action and an introduction to real behavior [20]. TRA has been used to study user participation and involvement in a variety of areas such as consumer behavior, work behavior, and sociological behavior [21, 22].

Bendavid et al. (2009) evaluated the impact of RFID technology on a five-tier supply chain in the service sector [23]. According to their studies, RFID creates integration and collaboration in the supply chain, thereby increasing the efficiency of the evolution process. IoT opens the way for connectivity between humans, machines, and operations through a global network of small objects. While there are applications such as smart homes, smartwatches, and client-side smart refrigerators, Business Process Optimization (BPO) using smart tags and objects is a topic that seems to drive IoT adoption, smart tracking guidance, and system monitoring toward supply [24]. IoT manages market competition using a combination of smart equipment, expert systems, and communications technology [3]. It is assumed that RFID in consumer environments leads to privacy breaches; however, consumers will accept it if they feel that the value provided is far greater than the risks perceived by them [25]. For example, the core proposition of the Uber core depends on the real-time geographical location of drivers and passengers who create the value of the new service on the supply side as well as the consumer side. Currently, RFID technology is used in many areas, including healthcare, supply chain management, smart homes, urban planning, retail management, logistics, inventory management, transportation, and warehouse management. RFID technology provides efficiency in many industries and at the same time brings enormous benefits to the consumer [26].

Davis [27] has examined the impact of perceived usefulness (PU) and ease of use on technology acceptance. The acceptance of many technological innovations by TAM has been studied [7, 28]. Its application in psychological and behavioral fields has been studied in the context of TRA [28]. Application in marketing, advertising, and public relations (PR) has been examined mainly in the context of TPB [29-32]. It has also been used to study professional social behaviors, applied nutrition (al) interventions, and environmental psychology [33-35]. Nevertheless, very few studies have addressed the issue of exploring the adoption of IoT from the perspective of multiple theories, namely, TRA, TPB, and TAM. Our research is one of these efforts to investigate the adoption of IoT in India. This research is a step towards expanding research into a wide range of IoT applications such as healthcare, elderly wellbeing and support, smart cities, and smart supply chains, etc.

In this regard, Francisco examined the collaborative structure of IoT-based behavioral models [36]. This paper considered the requirements to perform a wide range of computational tasks on a set of devices in a user interface with limited computational resources. This approach has considered the structure of the social aspect of the IoT using client-side computational resources without damaging the performance of other embedded IoT devices. The framework mainly consists of a computational load model, a scheduling mechanism, and an add-on approach to transfer between devices. Experiments show the feasibility of the approach and compare different implementation options. Park et al. [37] examined holistic approaches to IoT adoption by users in a smart home environment and found that key determinants of

users' technology acceptance behavior consisted of three positive drivers, namely adaptation, communication, and control, and a negative barrier, namely the cost. This study can be used as a basis for future research to improve IoT technologies in a smart home environment, taking into account user experiences. Mital et al. (2017) investigated the use of IoT in India by testing competing models using a structural equation modeling (SEM) approach [38]. The use of IoT has been reviewed from the perspective of multiple theories, namely TRA, TPB, and TAM. According to the results, IoT has created the necessary application areas for IoT, health, elderly well-being and support, and the urban supply chain. Karahoca et al. [5] examined the tendency for IoT acceptance in healthcare and showed that perceived benefits, perceived structural ease (facility), and perceived image plays an important role in the intention to adopt IoT technology. Banafa [39] examined three major challenges facing IoT and found that IoT acceptance faces three major challenges: customer, business, and industry. Lu et al. [40] systematically reviewed IoT literature from the perspective of users and organizations and showed that privacy and asset security play an important role in the exploitation of IoT. They also showed that facilitating technology infrastructures, and supporting and equipping technology, can increase the efficiency and effectiveness of IoT and enhance its acceptance and use in organizations. Salvatore et al. [41] investigated a method to support the acceptance of IoT innovation and its application in the security of Italian bank branches. Business Process Reengineering (BPR) steps were considered to create an appropriate organizational framework for IoT adoption. The results showed that the working environment and the amount of work support affect the development and adoption of IoT [42].

1. Technology acceptance for IOT among accounting and finance institutions

With the recent advancements, a new technology called Internet of Things (IoT) which is simply an interconnected network of many different types of devices gained great importance with its wide range of use. This network covers from huge computerized production machines in factories to everyday use home devices like refrigerators. By using this intercommunication-based technology between devices, many novelties and conveniences come to human and work life. By using IoT everyday devices may collect usage data at home and can share it with their counterparts. Refrigerators may check their stock levels and automatically order products. Beds may use MEMS sensors and may ask you to use new clean sheets because of bacteria level. Wide spreading broadband internet, faster wireless connections, RFID enabled devices, more useful MEMS chips and many other technological advancements support IoT technology. The Internet of Things simplifies the management of workflow in production areas, reduces costs during storage, material tracking and distribution, and increases efficiency by saving time. Internet of things provides data to be collected in a pool to provide more accurate results in the analysis of data. The Internet of Things is not only used in supply chain and production management, but also in finance, banking, payments and accounting issues [43].

Similarly, with other sectors, product diversity, customer satisfaction and customer-specific products in the finance sector will prevent the customer from choosing another bank, especially in the banking sector. Banking transaction security, accurate information flow and speed are important in financial services. With the rapid development of technology, the use of mobile devices in the banking sector, the use of face recognition systems that are safer than the PIN code used in ATM transactions, and the creation of wearable credit card systems contributed to the speed and security of the banking system. Technology Acceptance Model (TAM) is created to be able to predict users' level of acceptance for computers. In this study, it is examined technology acceptance level of accounting and finance students for Internet of Things. It is perceived that the use of this new technology is gaining importance day by day for both disciplines [43].

2. Importance of IoT for Accounting and Finance

Industry 4.0 is a revolution in the industry by using technology and artificial intelligence together and reflecting it into our lives, especially in the production process. Almost all business

functions may be adapted with internet of things and create new business opportunities. As a revolution, Industry 4.0 transformed all devices from their shape to their hardware. By interconnecting devices and sensors, businesses may find the opportunity to conduct more efficient operations. Technology, artificial intelligence and the Internet of things are main advancements related to Industry 4.0. With the use of these innovations, information can be gathered in a pool to be analyzed. Thus, defective production can be reduced, and time and cost savings obtained. Industry 4.0 is envisaged to increase productivity and efficiency. High technology applications related concepts not only concern the production process, but also enable efficient work in finance and accounting issues [43].

Uses of IoT in Banking may provide the attributes seen in Table 1 below.

Another challenge is to create new accounting models which can incorporate information coming from sensors of billions of devices. IoT has changed the way business is done today. IoT led to advancements in the accounting discipline as well. Internet of things may help the accounting professionals in the following areas:

TABLE I
IOT AND BANKING [43]

Wealth management personalization	It is related to the accurate and fast data collection, which creates better insights.
Improved payment security	By using internet of things, new forms of payment tools-including smart cards, biometric tokens, and more can be created.
Transaction automation	Ensures that security and control of transactions can be done from a single place.
Improved transparency	In the future, for banks, IoT means that credit providers will be provided with detailed customer data: credit debt and history, asset details and value, as well as commodity yields produced by the client.
Optimized capacity management	Considering the customer numbers visiting the bank, the number of workers per customer optimization is made.
Voice assistants	loT will facilitate banks embrace voice-driven communications. Operations can be performed by the customer himself without the need for an intermediary.

TABLE II
IOT TECHNOLOGY FOR ACCOUNTANTS [43]

Providing Data for Business Models	The loT can provide an abundant amount of past and present data. This provides data to business models for decision making. Past data is needed to form models and to correct them.
Asset Management	lot always allows businesses to know the whereabouts of their assets. The information system may alert when maintenance is needed on any of the assets. This enables better planning and resource allocation.
Inventory Management	Smart storage allows businesses to know where the inventory is stored at all times. Moreover, it gives a correct count of the inventory. Instead of manually counting inventory at certain times, it is possible to know its quantity precisely at a given time. When an inventory is below a certain level, the accounting software can automatically reorder it directly from a supplier. This helps inventory management and enables to use resources more efficiently. lot does not only help to track inventory in the warehouse but makes it possible to track the shipments worldwide. RFID chips can be integrated to products to keep tabs of the current status and other information about the shipment (Rathore, 2019). The cost of materials is a fundamental component of the product cost. IoT can assist businesses to get better price quotes on materials. Moreover, information on inventory transportation, time needed to supply the materials and other relevant information help to calculate the cost more accurately.
Billing Services	Since lot connects devices on a global scale, it is suitable to automate invoicing and billing services. Accounting systems of customers and suppliers can be connected to automate the billing services.
Auditing	Audits are time consuming for the accounting team. Accountants are expected to gather all the related documents and compile them in an order so that the financial information is ready for the auditors to check. Since all ledgers are connected in lot, sorting transactions will not take too much effort and time (Rathore, 2019). This would decrease the stress on the accounting team. When loT technology is used in accounting, it is expected that high volumes of data and transactions are processed. It is imperative that this data is audited. The classical auditing method of sampling leaves out large quantities of transactions unaudited. This increases the possibility of not finding anomalies in the data during audits. Moreover, most of the data captured by loT is in real time. Computer aided audit tools and techniques can be used to audit the full audit domain. Continuous auditing technique can be implemented to make audits in real time.
Budgeting	loT technology improves the budgeting process. The information received from many networks helps the planning and forecasting stages of budgeting (Chandi, 2017). The forecasting models can be tested and refined using the versatile and generous amount of data. This increases the predictive ability of the forecasting model.
Providing Advice to Clients	The accountant's role has shifted from providing manual services to providing advice in financial matters (Tucker, 2017). Tax planning and financial analysis have been the top priority areas in which businesses seek advice. Since gathering information from different ledgers, or even from different networks, is easy with lot technology, accountants can provide timely financial advice to their clients.

Resource: Created by using the Proceeding by Komsuoglu Yilmaz & Boydas Hazar [39] The Rise of Internet of Things (lot) and its Applications in Finance and accounting, Istanbul Finance Congress, November 1, 2019.

3. Technology Acceptance Model (TAM)

Technology Acceptance Model (TAM) is created to be able to predict users' level of acceptance for computers. In his study he added new scales for two variables as fundamental determinants of acceptance: (1) Perceived usefulness, (2) Perceived ease of use. Individuals decide to use or not to use a new technology by understanding the level of help comes from the new technology for their current job. This is called perceived usefulness. To be able to use a technology its features should also be easy to use. This variable is called perceived ease of use. In the literature many studies have been made about TAM. Some researchers analyzed the model with an historical perspective. The others) analyzed the model's use in the related literature. There are researchers who conducted a meta-analysis on the subject. In his study, Pavlou [31] analyzed technology acceptance for electronic commerce; in a very similar study Ha and Stoel (2009) examined technology acceptance of consumer on e- shopping [44]. Lu et al. [40] have been researched on the acceptance of wireless internet by using TAM. Lin, Shih, and Sher (2007) added a new variable -technology readiness- to the model in their study [45]. Walczuch, Lemmink, and Streukens, (2007) have been tested employees' technology readiness on technology acceptance [43, 46].

In some recent studies, Herrenkind, Brendel, Nastjuk, Greve, and Kolbe (2019) investigated end-user acceptance of autonomous electric buses to accelerate diffusion [47]. Hamdani (2019) analyzed technology acceptance in the use of social networks by teachers and employees of education offices in Ahwaz [48]. Rafiee and Abbasian-Naghneh (2019) have tested technology acceptance of e-learners in language learning [49]. Gao and Bai (2014) conducted a study on the factors influencing consumer acceptance of internet of things technology [50]. Park, Cho, Han, and Kwon, (2017) tested the acceptance level of smart home products [51]. In a similar study, Kim, Park, and Choi (2017) analyzed technology acceptance of smart home products by using value-based adoption model [43, 52].

In the last 20 years, information and communication technologies have become used more and more intensely in all areas of our lives. In particular, digital and informational advancements in Information and Communication Technology have started to make people altered to use new technologies. Adaption to use these information technologies can vary with consumers and conditions. Among the many models suggested to explain technology acceptance and usage, Technology Acceptance Model (TAM) is the most accepted model in the field of IS over the past decade. Technology Acceptance Model is developed by Davis [27] to investigate the acceptance and behavior of use of new technology. It is adapted from Theory of Reasoned Action (TRA). According to Theory of Reasoned Action, the best way to forecast the behavior is the individual's intention to complete the behavior. Technology Acceptance Model consists of two main dimensions as; "perceived ease of use" and "perceived usefulness". These dimensions are substantial factors of behavioral intention and technology use. Perceived ease of use is defined as "the degree to which one believes that using the technology will be free of effort". On the other hand perceived usefulness is defined as "the degree to which one believes that using the technology will enhance his/her performance". In Technology Acceptance Model, external factors such as subjective norms, quality, response time, system accessibility are also included to understand the effects on believes, attitudes and intention of individuals. Besides, perceived ease of use and perceived usefulness contribute like antecedent for attitudes toward using technology, than move to identify the intention to use, and lastly create the actual usage behavior [53].

Original Technology Acceptance Model is given in Fig. 1.

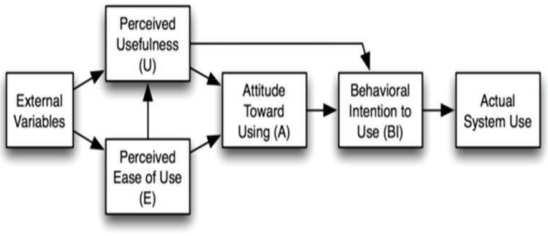

Fig. 1. Technology Acceptance Model [40]

Technology Acceptance Model has been used in many different studies to identify acceptance of new technology such as; adoption of internet banking, Smart Grid technology, smart watches,

wearable fitness technologies (WFT), mobile technology, mobile banking adoption, the adoption of virtual reality devices, acceptance of urban technologies, teachers' technology adoption. Therefore, although Technology Acceptance Model was developed to predict IT system usage, TAM variables were applied to predict consumer acceptance in various technologies. Consumer acceptance is "the relatively enduring cognitive and affective perceptual orientation of an individual" and intention to use dimension is the way of conceptualzation consumer acceptance in measurment models. [53].

In this study, Technology Acceptance Model is chosen as the theoretical framework to explain IoT usage acceptance. TAM is validated to be a key framework for analyzing innovative and recent information-related technologies. According to theory, perceived ease of use and perceived usefulness determine the behavioral intention of using a new technology. A study which is conducted in India, compared Theory of Reasoned Action (TRA), Theory of Planned Behavior (TPB) and Technology Acceptance Model (Model) in the context of IoT usage intention. The results of this study showed that TAM and TRA models help to predict intention to use internet of things [53].

In the original Technology Acceptance Model, attitude towards the technology was included in the model. Nevertheless, Attitude toward information technology systems did not fully mediate the relationship of perceived usefulness and perceived ease of use with intention to use so Davis (1989) excluded it from the model. Consequently previous studies excluded attitude variable from Technology Acceptance Model. In our study attitude also excluded from the model. [53].

Ease of Use

The term ease of use means that it does not require great effort or is not difficult to use. The user considers the system as easy to use if the system is very useful for the job; it does not need a lot of training to learn and the system can be used without any effort. The perception that the application is easy, directs users to use and accept the system. This also means that the system will meet user expectations as user- friendly. Within this study perceived ease of use for IoT consumer refer as they feel that IoT usage is easy and user-friendly. Previous TAM studies in different fields have found that perceived ease of use has significant effect on behavioral intentions to use technology such as, e-learning, mobile devices wearable technology. [53].

Blog usage which is also a relatively new IT application used by individuals was studied through the use of TAM model. Perceived ease of use was found to significant affect the attitude towards blog usage. Gao and Bai (2014) that investigated the effects of ease of use on intention to use IoT applications. Besides, Technology Acceptance Model argues that perceived ease of use also positively affects perceived usefulness [53].

Social Influence

In Technology Acceptance Model, social environment and interaction is crucial dimension that should not be ignored in decision-making process. Social Influence is important especially for consumers, who do not have much information about the usage details for newly released products and services, and who can reach reliable information via social interaction. Social influence is "users' perception of whether important people for them perceive that they should engage in the behavior". Davis pointed that in some cases, the users place more emphasis on the feelings of their relatives, friends rather than their own feelings, thoughts and beliefs [53].

Alolayan's study which explores the attitudes towards adoption of smart refrigerators in U.K, supported the relation between social influence and adaption of smart refrigerator. He found that social influence was the most important factor for the adaptation of the smart refrigerator. Besides, Gao and Bai argued that social influence effected the adoption of IoT technology. The study results showed that there was a significant relation between social influence on the adoption of IoT technology [53].

Perceived Usefulness

Davis (1989) defined perceived usefulness as the degree to which a person using a particular technology would improve the job or task performance. According to Venkatesh and colleagues, there was not any difference between the perceived usefulness in Technology

Acceptance Model and the performance expectancy of The Unified Theory of Acceptance and Usage of Technology Models. Consumers are more likely to accept new technology when companies explain the benefits and advantages of new technologies with logical arguments, which increase the perception of usefulness. Extensive previous studies pointed that there is a positive relationship between perceived usefulness and behavioral intention to use the new technologies [53].

4. The Internet of Things Readiness in Public Financial Organization

The Internet of Things (IoT) currently receiving much research attention and effort from the academia as well as the industry player to provide the backbone of modern and smart societies. Therefore, most of the organizations together with government sectors hunger for leverage the latest IoT solutions so that they can harness the IoT capabilities and extend their reach well beyond their traditional parameters like usual perception amongst citizens. IoT technology has had a profound impact to our lives such as interactions with others to the tasks we perform and the way we entertain ourselves [54].

The IoT refers to a collective of Internet-connected consumer devices, manufacturing systems, business tools, customer service appliances, medical equipment, agricultural sensors, and other things. Hence, IoT is a system of interrelated computing devices, mechanical and digital machines, objects, animals or people that are provided with unique identifiers and the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction. As IoT continues to evolve, communication is not only dialogue between people, yet the information is gathered and shared between people, devices as well as machine-to-machine. IoT allows to create a digital shadow of everyday processes and everyday items that are being used in our daily life as all the devices are connected and present around us in a variant types object such as putting sensors along with actuator, a radio-frequency identification (RFID) tags, mobile phones etc. Despite of all that technology to support the blooming of IoT, it is still considered as very early stages as everyone is verge trying to envision the roadmap to persuade the stakeholders with respect their needs. The growth forecast of IoT is very high as it uses a set of technologies to connect to objects. Besides this new paradigm is bound to impact new business models along with consumer experience and everyday life. Moreover, this evolve of technology in IoT will brings new opportunities, threats and solutions, with that it can trigger the organization as well as the stakeholder to be ready to adopt it. Based on that, the technology as well as security can be appropriate factors towards IoT readiness in Malaysian public organisation. Increasing number of mobile users nowadays represent Internet users with mobile device penetration in Malaysia beyond 150 percent. According to Badarudin et al, this number will be increasing up to 280 percent in 2025. This factor encourages effort towards IoT readiness in public agencies and this require intensive study about human issues such as attitude, usage and expectations in the application of smart city areas including smart lighting, smart home, smart roads, smart phone detection and smart parking. Hence, with the advancement of digital era have accentuated the use of smart devices has surpassed the number of populations in which Internet requirements are no longer an option but a necessity. As reported in Invest KL Malaysia, the extensive of this growth of connected devices in Malaysia, is expected to generate over 14,000 new jobs and contribute billions of ringgits to the economy. This factor can have led technology opportunities that originated by IoT with predicted for: 1) Application and services amounting to RM34 billion in 2025 compared to RM7.5 billion for 2020; and 2) Produces of the devices at RM1.0 billion an RM4.3 billion for years 2020 and 2015 respectively [54].

Due to significance of IoT, the government of Malaysia has introduced the National IoT Strategic Roadmap in 2014 as a way to sustain the economic growth. The importance of IoT that will be reframing and widespread driver of change and enhancement by potential append new dimensions to the industry in Malaysia. The potential new dimensions to the industry are in following ways: 1) Testing facilities for interoperability, standards compliance and export-related testing; 2) Development of

standardization software to address standard silos in order to facilitate the creation of niche application and services; 3) System integration services in order to create some specialists from speculators through interaction with various contributors in the ecosystem. In regard to IoT in public service, Dachyar et al. found that these include intelligent transportation system, smart campus, smart school, general education, city, traffic management, transportation system and water. According to analysis based on Google, The major challenges for the government are to understanding citizens‟ changing needs, as well as the obstacles they face in attaining those services. Therefore, it is a major concern to investigate the readiness amongst public agencies to adapt and understand of IoT along with the issues or challenges that might exist during implementation National IoT Strategic Roadmap reported the strengths and weaknesses of IoT Implementation based on Technology, Resource, Societal and Political factors. Among the key challenges include security and privacy concerns, adoption and adaptation fear, broken linkages across industries and multiple agencies working in silos [54].

Kauffman et al. propose categories and measures to evaluate the readiness of adoption cloud computing and assess the required adjustments in strategy and management, technology and operations, and business policy. Four relevant categories were identified in this readiness model, which is: 1) technological; 2) organizational; 3) economic; and 4) environmental. Moreover, they also identified the sub-category for each of category and proposed a metrics suite consists of 21 measures to identified the readiness of firm level to adopt a cloud computing. Indeed, when evaluating the technology related to industry 4.0, it is important to develop a readiness model considering respective standard and structure to support managers for identifying the strategic action in improving readiness level. In the other study done by Lokuge et al., multidimensional constructs to measure organizational readiness for digital innovation with sample of 189 firms were used. They proposed a construct under seven categories with 21 measures, to identify the readiness of organization to implement the digital innovation since the rise and growth the products that strongly attribute to the advancements in modern technology. About the industry 4.0, presence of a digital infrastructure coupled with the analytical capabilities in dealing with big data appear as dimensional indicators to readiness for Industry 4.0. A study accessing consumer readiness for participation in IoT based demand response business model yielded the importance of individual factors such as attitude as well as security perspective such as trust in organization [54].

5. Financial Consumers' Acceptance of Internet of Things Technology

The main idea of Internet of Things (IoT) concept is the prevalent existence of interacting objects, things like Radio-Frequency IDentification (RFID), tags, sensors, and actuators by unique addressing designs. The term "internet of things" was first used in a presentation about the benefits of radio-frequency identification made for Procter and Gamble by Kevin Ashton in 1999. The Internet of Things (IoT) is the network of physical objects that contain embedded technology to communicate and sense or interact with their internal states or the external environment. IoT enables analog world objects to be connected with other objects, communicate and operate ubiquitously without human interaction. Internet started with ARPANET (Advanced Research Projects Agency Network) which provided communication among limited number of devices. The evolution of internet can be epitomized in four phases. Phase 1 is the transfer of information to the digital environment and digital access to information. Phase 2 is the collaborative use of information on digital environment and start of e-trade. In phase 3, use of social media, mobile media and cloud informatics were widespread. Phase 4 is the digital connection of things to the internet [53].

This new era, enabling not only virtual world but also physical world integration has many promises for the business life and also daily routines of the individuals. IoT business applications have been widespread for many sectors. Continuous tracking, real time information sharing and connection among objects make it attractive for individual users as well as the business world. The convenience and the ease of use IoT applications such as smart homes, smart appliances and wearable technology

make it enticing for individuals to inaugurate these applications in their lives. This new consumer IoT market, is predicted to reach 104.4 billion USD by 2023, which is a 17.39% increase during 2018–2023 period. Recently the market is 46.3 billion USD as of 2018. As the forecasts shed light consumer IoT applications will be a huge market also IoT applications are and will continue to be used in marketing practices. IoT applications have been used in retail practices excessively such as Amazon Go, Dash. Smart shelves, automated checkouts, personalized discounts, beacons are the most popular IoT marketing applications that the consumers are exposed to. Consequently IoT has become an irrefutable phenomenon for marketing already [53].

It is very important to examine this new technology which has already a big market of applications and a huge future potential from the consumers' perspective. Consumers' acceptance of this new technology will impact both the growth of the consumer IoT devices market and how consumers will react to marketing practices which employ IoT applications. Along with the advancements IoT provides, there are some issues that potential users still have not figured out which causes apprehension of adapting this new technology. The widespread usage of every new technology necessitates acceptance of the technology and adaption [53].

6. Factors affecting readiness to IOT-based banking service

Information technology and digital economy have reshaped the business landscape around the world by changing the way organisations conduct business and the way services are delivered. Digitalization involves, but is not limited to, the digital transformation of business processes through the interaction of digital technologies such as mobile networks, cloud computing, artificial intelligence, and Internet of Things (IOT) with physical ICT infrastructure. It also shows the influence of growing use of computers and communication channels. Digitalization is the next industrial revolution and IOT is its core technology. IOT is a new paradigm promising a smart human being life by allowing communications between objects (things) such as televisions, lamps, cars, mobile phones or even plants connected by sensors through the Internet anywhere, anytime. IOT applications include Wristbands that act as an alarm and recognize sleeping patterns, Smartphones that can scan barcodes on food packages to provide information about its ingredients, and the gym that has a variety of applications enabling gathering information about the calories or body fat content. Accordingly, IOT is expected to play an important role in many business areas [55].

Despite the emergence of IoT applications, organisations face great challenges keeping up with an acceptable transformation pace, and achieving the expected results. Research on IOT has been recognized by academics, and has gained banks' attention; especially in developing countries. Yet, most of the studies were conducted on IOT adoption in general, with only few tackling factors that affect readiness to IOT applications in banks, negligible investigations on mediating and moderating factors, and almost none in the Egyptian context. The Egyptian banking industry in particular is one of the oldest and most critical in the region; especially due to its high population and steady steps it takes towards technology adoption [55].

The digital economy has been identified as a wide network of economic and social activities, supported by digital technologies with an enormous potential to affect any organisation. Digitalization has been the upcoming trend; as it is the ability to turn existing products or services into digital variants, and thus offer advantages over tangible product [55].

In the last decade, IOT has played a significant role in the business landscape, making it fast moving and more competitive. Its great potential to enhance sustainability; which in turn optimizes operations and services, makes it an important topic to investigate. IOT is a network connectivity and computing capability that extends to objects, sensors and everyday items. Internet services have created new sets of data that include social networks data, pictures, videos, and a lot of textual information. But the real explosion of data variety is happening with the establishment and massive development of IOT. Data generated from various domains helps to create valuable insights for optimizing operations and quality standards. IOT is considered a wide-ranging network of smart 'things', associated with programs, electronics, hardware and network connectivity

that empowers these things to accumulate and exchange data. According to the Internet Architecture Board, IOT is a technology with a large number of embedded devices that employ Internet Protocols Communication Services and are not directly controlled by people. It is a computing concept that describes a future where everyday objects are Internet-connected such as wearable devices or other sensor technologies. In 2017, IOT was reported as a huge industry that is worth over USD 745 billion was predicted to increase to billions of connected devices by 2020. This brings great potential for both businesses and academia. However, the more IOT applications are weaved into the fabric of everyday life, the more security concerns will be raised; which if neglected could threaten its existence [55].

7. Adoption of internet of things (IoT) in banks

In developing countries, like India, Internet of Things based applications for banks is in the

evolutionary stage. Adoption of Internet of Things is still limited to a few application areas. As per a joint report by IAMAI and Deloitte, Industrial IoT is expected to surpass the consumer IoT space in India by 2020. It also predicts a 12 USD billion IoT opportunity. Ashton introduced the term internet of things (IoT) in 1999. The IoT aims at extending benefits of the internet, data sharing, remote control ability, constant connectivity and so on, to goods and services in the physical world [56].

In today's increasingly connected ecosystem, banks can rely on IoT-driven data to increase revenue streams and improve customer experiences. the commencement of branchless banking, phone banking, mobile banking, SMS banking, provide value-added services to the custo- mers as per their needs and requirements with the help of IoT technology, so it's an opportunity to retain and grab customers by providing them quality services. According to Del Giudice et al., the banking sector affected highly by the phenomenon of IoT for two reasons that are; the first customer can save time through using new technology (like internet banking, smartphones, tablets). The second reason is that investors and customers need real-time information about investment, expected consumption, cash flow, etc. In addition, banks need to use IoT technology to reduce both operational costs and fixed costs. Therefore, banks need to do more investment in new technology to enhance customer value and strengthen market position. Due to increasing use of smartphones and connected objects, IoT has become a new tool for a better customer relationship too. IoT describes a world where just about anything can be connected to communicate in an intelligent fashion", a report of RBI states. The use of IoT in banks will provide the banks an unprecedented level of real time data of customers. These data enable the banks to provide the world-class insightful services to their customers [56].

The IoT phenomenon has been approached technically as well as conceptually. Many researchers like Khan et al. (2012) [57], Gubbi et al. [3], Sundmaeker et al. (2010), and Uckelmann et al. (2011) investigated the technical aspect of IoT, like implementation, architecture [58, 59], and design. In the same line, Tan and Wang (2010) addressed many IoT technical aspects like interoperability [60], architecture, etc. In addition, Haller et al. (2009) discussed many technical issues of IoT like identification [61], heterogeneity, addressing, and interoperability. In contrast, many other researchers investigated the IoT theoretically from the perspective of users, governments, and firms. According to Gao and Bai (2014) "The research into the IoT acceptance from the consumer perspective is still in its infancy" [50]. In addition, Bandyopadhyay and Bandyopadhyay (2010), Luarn and Lin (2005), and Venkatesh et al. (2012) investigated the factors influencing user's adoption of IoT products and services [62-64], they found that the acceptance of IoT applications determines the usage behavior. The factors affecting consumer adoption of IoT are still limited and need more investigation [56].

Adoption

Davis [27] proposed the TAM (Technology Acceptance Model). According to TAM concept, there are two conditions that determine the adoption and acceptance of technology; that are perceived usefulness and perceived ease of use. TAM had applied to many research fields related with technology like online purchasing/shopping, financial services via mobile, mobile advertising, using of e-health and e-learning. According to Gao and Bai (2014) "TAM can serve as a useful

foundation for investigating consumer acceptance of IoT technology, as IoT system is a type of new IT" [50]. Marketing literature confirmed that there are many factors affecting the adoption of IoT like enjoyment. In addition, social influence has a significant influence on adopting new technology. Other factors influencing the adoption of IoT are perceived usefulness, perceived ease of use, and attitude toward using, social influence, trust and safety [56].

Also, Hsu and Lin (2018) mentioned that users perceived the cost of using new technology as a function of free [65]. Furthermore, the cost of using IoT banking services is an important factor that determines the adoption of this new technology. In addition, Zeithaml (1988) considered IoT adoption as "a trade-off between perceived benefits and perceived sacrifices [66]. In other words, the adoption of new technology, like IoT, is directly influenced by comparing the perceived benefits with cost (perceived sacrifices) [56].

Convenience

The term of convenience is introduced in marketing by Copeland's (1923). The meaning of this term is changed over time from a descriptor of products to its unique term with emphasizing on time-saving and time buying. The convenience concept is related to saving time, avoiding crowded markets, solving parking problems, and 24 accessing to online services. Previous studies confirmed that ease of use is significantly determining the behavior intention toward adoption of new technology like IoT in banks. This view is also supported by TAM and UTAUT model of using new technology. Also, Jannatul confirmed the importance of convenience concept in the online environment, especially emphasizing on the terms of accessibility 24 hours a day and seven days a week. Today, the only problem than customers face is to deal with internet. Customers, especially in rural areas, still find it hard to deal and work with the new technology like smartphones, laptops, etc.; which are essential to adopt the IoT services of banks. The government aims at making the country digitalized, through the Digital India Program, which will help in ensuring convenience (ease of using) and ease of access to digital resources (DeitY) [56]

Social influence

When evaluating the adopting of new technology like IoT adoption, the social context shouldn't be ignored. According to Hsu and Lu (2004), the social context is an essential factor in the decision process [67]. This is the case for any services and products in the stage of diffusion or development. Venkatesh et al. (2003) defined social influence as "a person's perception that is important for others to believe that he should use new technology" [16]. Therefore, influence from family, friends, peers, and media may influence the consumers' intention to adopt IoT products and services of banks. Social influence is an essential factor in accepting and using new technology like IoT banking services. In addition, Chong et al. (2012) found that the social context significantly affects the consumer intention to accept new technology [68]. In Al-Momani et al. found that social influence has a significant impact on the consumers' intention to adopt IoT products and services. In the same quest, Alolayan (2014) found that social influence is an essential factor for the adoption of smart fridges in the UK [69, 56].

Habits

Limayem and Hirt (2003) mentioned [70] that habits are developed in the history of the human being. Therefore, habits are what customers always do. Limayem et al. (2001) confirmed [71] that habit is an essential factor that influences adopting and using new technology IoT banking services. In the field of new technology, like IoT banking services, the habits became a critical factor that influences people's adoption. Only a few studies on the habits of automatic nature had been done. Abushakra and Nikbin (2019) [72] found a strong relationship between habits and IoT adoption. The study shows that customers are more likely to adopt the technology, if using the IoT services becomes a habit, this compound with the result of Venkatesh et al. (2012). In addition [64], Alalwan et al. (2015) confirmed the significant relationship between habits and adoption of new technology like internet banking [56, 73].

Privacy and safety

Medaglia and Serbanati (2010) identified the

privacy and safety issues "as the major challenges for user-oriented IoT applications" [74]. In the same quest, Kim and Lennon (2013) and Luo et al. (2010) mentioned [75-76], "The perceived risk associated with a product or service has gained significance in consumer research on innovations". In the era of IoT, the inexperience with new technology led consumers to concern in the security especially the security of financial data. In the same quest, Hsu and Lin (2018) mentioned that the payment via IoT is related to many risks like losing personal data and losing the transaction [65]. Therefore, the use of IoT banking services is always associated with high-risk; especially the consumers cannot see or even touch the products. Similarly, Lin (2011) confirmed "Enhancing the consumer's trust is an effective tool for reducing risk and uncertainty and increasing the sense of safety" [77]. Therefore, the trust of consumers in IoT banking services plays an essential role in IoT adoption [43]

Weber (2010) defined the privacy risk as an "individual's belief regarding potential losses of confidential, personally identifying information through the use of IoT services" [78]. Consumers may concern that the providers of IoT banking services may use personal data for profit, or may collect personal data without permission. Such concerns will impact negatively on the adoption of IoT banking services. Many researchers like Weber (2010) and Sun et al. (2015) supported this argument [78, 79]. Similarly, Wu et al. (2012) confirmed that privacy risk had a negative influence on willingness to transact [80], intention and trust to reveal location information, and con- tinuous usage of IoT products and services. Therefore, IoT adoption in banking services not only is related to some costs, but it also entails to high risk of personal privacy [56].

Awareness

Gupta and Srivastava (2013) defined awareness of IoT as "Understanding how to use the new technology" [81]. In this regard, mentioned that increasing the awareness of innovation of new technology, like IoT, is an essential catalyst to enhance the consumers' adoption of IoT banking services. In addition, Kaled recommended that banks leaders, while providing internet solutions, should improve the awareness of customers about the provided services, which result in building a good relationship between the customers and the bank. To adopt IoT banking services, consumers should be aware of the used technology and how it can be utilized effectively. Furthermore, Han et al. found that technology awareness is an essential factor for accepting and adopting new technology like IoT [56].

Cost

Kim et al. (2007) defined perceived fee as "the amount of economic outlay that must be sacrificed to obtain the IoT service" [82]. Also, Cheong and Park (2005) described the IoT cost as the comparison between sacrifice (cost) and the benefits of using IoT services [83]. Therefore, if the cost exceeds the benefits, service is considered as expensive and users may be less interest to adopt it. Also, the cost could be seen as a monetary value that consumers may pay for the product or service providers. Many studies about the adoption of IoT services confirmed that cost is a crucial factor. For instance, Kim and Shin (2015) confirmed that there is a significant relationship between cost and adoption of IoT products and services [84]. In the same quest, Acquity Group revealed that the cost is an effective factor that influences on consumers behavior toward the adoption of IoT banking services [56].

Lastly, since the IoT in banks is new, cost could be a key determinant of the acceptance of this new technology by the customers. Based on the mentioned findings, the cost is a major obstacle that may lack the adoption of IoT in banking services mainly in India where 40% of the total population lives below the poverty line [56].

III. METHODOLOGY

This study finally identified six main categories, namely social aspect, cultural aspect, human aspect, technological aspect, financial aspect, management aspect, government laws, and regulations, as factors affecting IoT adoption, using qualitative research results at the level of expertise of senior ICT executives nationwide, directly through technology and IoT. This study investigated the extent of the impact of variables on the paradigm model. The statistical population of this study consists of experts and users of the financial section, stock exchange, and financial

institutions. Since the statistical population is infinite, 384 randomly available individuals are selected. SMART.PLS was used to validate the model and test the relationships between variables.

In open coding, meaningful units of data are first labeled using a concept name, and then, using more abstract names, the resulting concepts are categorized, which are called category categories. In open coding, the smallest conceptual units in qualitative data collected through interviews are extracted with an exploratory approach based on the levels of causal, contextual, intervening, strategies and consequences in grounded theory strategy.

In axial coding, separate categories are placed next to each other in a meaningful framework, and the relationships between them, especially the relationship of the axial category to other categories, are determined. Axial coding leads to the creation of groups and categories. All similar codes are in their own group. In this regard, all generated code is reviewed and compared with the texts so that nothing is left out.

The results of axial coding are shown. It can be seen that 63 primary codes are classified into 6 categories as follows:

1. Social, cultural dimension
2. The human dimension
3. Technological dimension
4. Financial dimension
5. Management dimension
6. Government laws and regulations

Finally, in the selective coding stage, according to the results of the previous coding step, the main category was selected and systematically related to the other categories. Improved. It should be noted that the above steps have been done in the process of going back and forth. Therefore, the selected coding process is not explicitly separated from each other and is done through an interactive process, along with open and pivotal coding. Final model to present their opinions, most of which approved the obtained model, and some of them also had corrective opinions that were applied in the reciprocal process of corrections, and the final opinion of experts on the approval of the model was taken. In order to integrate and present the final model of acceptance of Internet of Things technologies, after identifying the central category and linking other categories in the form of a systematic paradigm of data foundation theorizing, the designed model was refined and the main factors were developed and the final research model was obtained.

1. Research Variables and Model

Validity and Reliability of Research Model Variables

Since a standard questionnaire was used to measure the variables, the indices were translated first, and then necessary adjustments were made by referring to the elite. The strength of the relationship between the factor (ie, latent variable) and the observed variable is shown by the factor loading, a value between 0 and 1. If the factor loading is less than 0.3, the relationship is considered weak and thus ignored. A factor loading between 0.3 and 0.6 is acceptable and is highly desirable if it is greater than 0.6. It can be seen that the value of all factor loadings of the variables is greater than 0.5, which confirms that the reliability of the measurement model is acceptable.

In the present research questionnaire, demographic information includes the following:

Type of gender of the respondents: Number of respondents to the questionnaire by gender (male and female)

Education level: The level of education of the respondents in terms

Age of respondents: The age status of respondents in terms

Service history: Respondents' service history

In the initial questionnaire, the following dimensions are extracted, which are provided to the experts. According to the experts, these sub-criteria are screened and the final questionnaire is extracted.

Based on the data, it is clear that 384 correct data have been collected about the research variables. The average score of the variables was between 3.406 and 4.803, among which the human dimension has the highest average. The dispersion rate is high in terms of amplitude index and ranges from 1 to 5. According to the standard deviation index, the human dimension variable has the highest dispersion.

To evaluate the qualitative validity of the research, face validity and qualitative validity of the content are used. In qualitative face validity, in order to receive the opinions of the target

group or the respondents, it is better through interviews with a number of respondents (between at least 10 and up to 30 people) to find difficulty in understanding phrases and words, appropriateness and optimal relationship of indicators. The possibility of ambiguity and incorrect perceptions of phrases or the existence of deficiencies that may exist in the meanings of words, should be done and then their corrective points of view and the necessary changes in the questionnaire should be applied.

In order to measure the qualitative validity of the content, 10 experts are interviewed and they are also asked to present their corrective views in detail and in writing after careful study of the variables. After collecting the experts' evaluation, with consultation. With respected professors, the necessary changes in the tool are considered. Validity is the answer to the question of whether what the researcher is observing and examining is what he or she is measuring and measuring. In this study, in order to check the validity, the research findings are presented for the participants and the text of the theory is studied by them and their points of view are applied. Finally, this research has been studied and reviewed by professors and some cases have been stated to correct or change the final theory.

To ensure the content validity of the questionnaire and its localization, the initial version will be distributed among a number of elites and company managers to provide the necessary suggestions regarding its content.

Finally, to extract the final questionnaire for the overall evaluation of the model, we will examine the confirmatory validity and divergent validity to extract the items.

219 people, ie 57.0% of the sample are men and 165 people, ie 43.0% of the respondents are women. To facilitate the age of the respondents, we have categorized them into four age groups. 118 people, ie 30.7% of people are under 30 years old. 137 people, ie 35.7% of people are between 30 and 40 years old. 86 people, ie 22.4% of people are between 40 and 50 years old, and 43 people, ie 11.2% of people are 50 years old and older.

75 people, equivalent to 19.5% of the respondents, have a diploma or lower. 96 people, equivalent to 25.0% of the respondents, have an associate degree. 132 people, equivalent to 34.4% of the respondents, have a bachelor's degree. 81 people, equivalent to 21.1% of the respondents, have postgraduate education.

Then, the reliability of the research variables was assessed by Cronbach's alpha indices with a standard value above 0.7 (Cronbach, 1951), Composite Reliability (CR) with a standard value above 0.7, and Average Variance Extracted (AVE) with a standard value above 0.5 (Fornell and Larcker, 1981) using Smart-PLS. According to Table 2, it can be seen that the research variables have convergent reliability and validity.

TABLE IV
CONVERGENT RELIABILITY AND VALIDITY OF RESEARCH MODEL VARIABLES

Variables	Cronbach's alpha	Composite Reliability (CR)	AVE
Financial Aspect	0.923	0.934	0.566
Government Aspect	0.938	0.945	0.506
Management aspect	0.893	0.913	0.513
Cultural Aspect	0.856	0.888	0.500
Technological Aspect	0.921	0.933	0.519
Human Aspect	0.863	0.907	0.709

Cronbach's alpha for all variables is greater than 0.7; therefore, all variables are confirmed in terms of reliability. The value of AVE is always greater than 0.5; thus, convergent validity is also confirmed.

2. Divergent Validity (Fornell and Larcker Method):

In the divergent validity section, the differences between the indices of a construct are compared with those of the other constructs in the model. This value is calculated by comparing the square root of AVE of each construct and the values of the correlation coefficients between the constructs. To do so, a matrix must be formed whose main diagonal values are the square root of the AVE coefficients of each construct, and the values of below and above its main diagonal are the correlation coefficients between each construct with the other constructs. This matrix is shown in Table V:

TABLE III
FACTOR LOADINGS AND RESEARCH VARIABLES

Direction	Factor Loading	t-Statistic	Direction	Factor Loading	t-Statistic
q01 ← Cultural Aspect	0.797	22.801	q32 ← Financial Aspect	0.745	20.969
q02 ← Cultural Aspect	0.746	16.472	q33 ← Financial Aspect	0.834	34.569
q03 ← Cultural Aspect	0.702	13.369	q34 ← Financial Aspect	0.788	22.793
q04 ← Cultural Aspect	0.645	10.473	q35 ← Financial Aspect	0.797	24.676
q05 ← Cultural Aspect	0.664	11.048	q36 ← Financial Aspect	0.753	22.757
q06 ← Cultural Aspect	0.65	11.428	q37 ← Management aspect	0.667	12.371
q07 ← Cultural Aspect	0.712	14.496	q38 ← Management aspect	0.78	22.668
q08 ← Cultural Aspect	0.73	14.502	q39 ← Management aspect	0.681	15.126
q09 ← Human Aspect	0.827	27.557	q40 ← Management aspect	0.624	12.097
q10 ← Human Aspect	0.866	38.83	q41 ← Management aspect	0.796	22.574
q11 ← Human Aspect	0.823	27.513	q42 ← Management aspect	0.584	7.316
q12 ← Human Aspect	0.851	33.175	q43 ← Management aspect	0.676	15.482
q13 ← Technological Aspect	0.689	16.755	q44 ← Management aspect	0.805	23.172
q14 ← Technological Aspect	0.681	11.252	q45 ← Management aspect	0.777	25.468
q15 ← Technological Aspect	0.809	28.763	q46 ← Management aspect	0.738	19.29
q16 ← Technological Aspect	0.602	10.626	q47 ← Government Aspect	0.819	26.778
q17 ← Technological Aspect	0.647	10.547	q48 ← Government Aspect	0.701	15.65
q18 ← Technological Aspect	0.583	10.296	q49 ← Government Aspect	0.679	13.284
q19 ← Technological Aspect	0.853	32.213	q50 ← Government Aspect	0.708	15.8
q20 ← Technological Aspect	0.802	19.259	q51 ← Government Aspect	0.627	11.602
q21 ← Technological Aspect	0.713	15.867	q52 ← Government Aspect	0.609	9.826
q22 ← Technological Aspect	0.605	9.416	q53 ← Government Aspect	0.727	15.667
q23 ← Technological Aspect	0.697	13.754	q54 ← Government Aspect	0.674	14.364
q24 ← Technological Aspect	0.782	27.579	q55 ← Government Aspect	0.814	26.376
q25 ← Technological Aspect	0.833	35.359	q56 ← Government Aspect	0.75	19.384
q26 ← Financial Aspect	0.682	12.468	q57 ← Government Aspect	0.708	15.8
q27 ← Financial Aspect	0.796	27.471	q58 ← Government Aspect	0.737	21.876
q28 ← Financial Aspect	0.724	20.493	q59 ← Government Aspect	0.737	17.232
q29 ← Financial Aspect	0.766	23.635	q60 ← Government Aspect	0.746	20.407
q30 ← Financial Aspect	0.638	12.661	q61 ← Government Aspect	0.698	18.633
q31 ← Financial Aspect	0.729	16.21	q62 ← Government Aspect	0.698	16.194
			q63 ← Government Aspect	0.621	12.304

TABLE V
COMPARISON MATRIX OF SQUARE ROOT OF AVE AND CONSTRUCT CORRELATION COEFFICIENTS

	Financial Aspect	Government Aspect	Management aspect	Cultural Aspect	Technological Aspect	Human Aspect
Financial Aspect	0.752					
Government Aspect	0.381	0.711				
Management aspect	0.504	0.662	0.717			
Cultural Aspect	0.181	0.114	0.537	0.707		
Technological Aspect	0.425	0.159	0.541	0.140	0.721	
Human Aspect	0.334	0.112	0.382	0.179	0.502	0.842

According to the matrix above, the square root of AVE of each construct is higher than the correlation coefficients of those constructs with other constructs, indicating the acceptable divergent validity of the constructs.

3. General Structural Model Quality Test

Tennenhouse et al. (2005) introduced the Goodness of Fit (GoF) to investigate the model fit. The general criterion of fit can be obtained by calculating the geometric mean of the average commonality and the coefficient of determination (R2). For this index, values of 0.01, 0.25, and 0.36 are described as weak, medium, and strong, respectively.

TABLE VI
COMMONALITY AND R2

Variable	Commonality	R^2
Financial Aspect	0.566	0.254
Government Aspect	0.506	----
Management aspect	0.513	0.804
Cultural Aspect	0.500	----
Technological Aspect	0.519	0.252
Human Aspect	0.709	----

According to the table above, only endogenous variables have value. After the calculation, the value of the GoF index is 0.491, which is a strong index indicating the overall high quality of the model.

IV. FINDINGS

The relationship between the investigated variables in each of the research hypotheses has been tested based on a causal structure using the Partial Least Squares (PLS) technique. In the general research model depicted in Fig. 2, the measurement model (ie, the relationship between each of the observed variables and the latent variable) and the path model (ie, the relationships of the latent variables to each other) are calculated. Furthermore, t-statistic has been calculated to evaluate the significance of the relationships using the bootstrapping technique presented in Fig. 3.

1. Investigating the Impact of Causal Conditions (i.e., Human Aspect) on the Core Category of Technology

The severity of the impact of causal conditions (ie, human aspect) on the core category of technology is calculated to be 0.502 and the test probability statistic is obtained to be 7.757, which is greater than the critical value of t at a 5% error level, ie 1.96, indicating a significant observed effect. Thus, causal conditions (ie, human aspect) have a significant impact on the core category of technology, at a 95% confidence level.

2. Investigating the Impact of the Core Category of Technology on management strategy

The severity of the impact of the core category of technology on management strategy is calculated to be 0.395 and the test probability

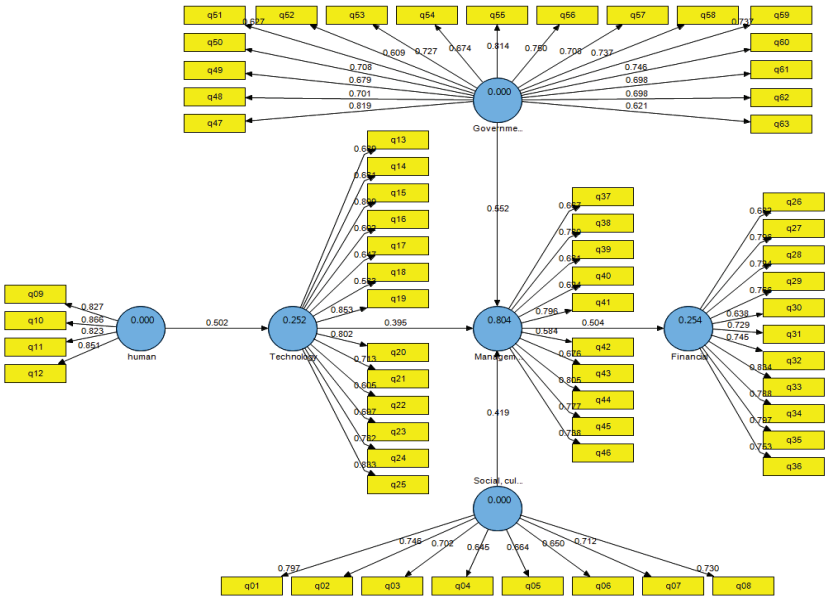

Fig. 2. Partial Least Squares Technique for General Research Model

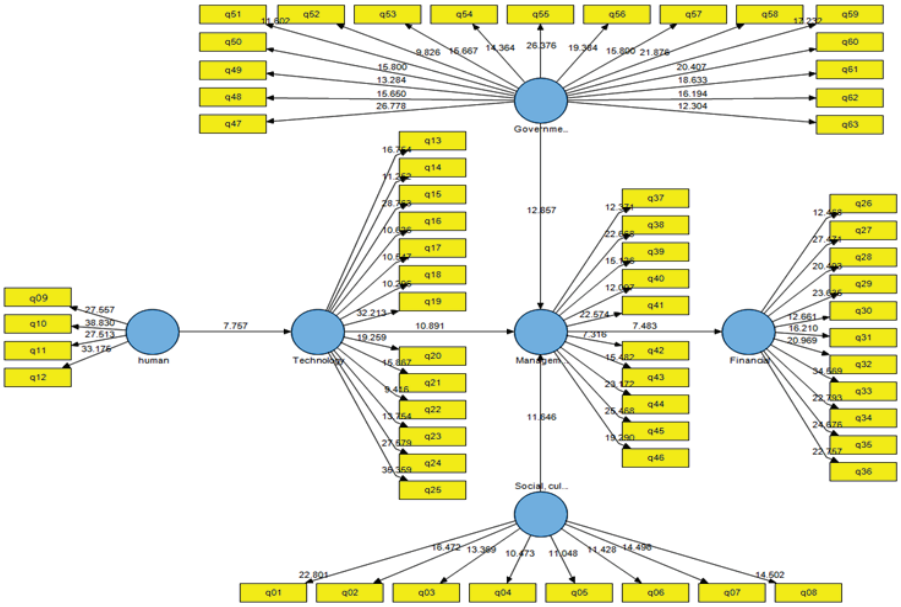

Fig. 3. The t-Statistic of the General Research Model Using the Bootstrapping Technique

statistic is obtained to be 10.891, which is greater than the critical value of t at the 5% error level, ie 1.96, indicating a significant observed effect. Therefore, the core category of technology has a significant impact on management strategy, at a 95% confidence level.

3. Investigating the Impact of Contextual Conditions (i.e., State Laws and Regulations) on Management Strategy

The severity of the impact of the contextual conditions (ie, government laws and regulations) on management strategy is calculated to be 0.552 and the test probability statistic is obtained to be 12.857, which is greater than the critical value of t at a 5% error level, ie 1.96, indicating a significant observed effect. Therefore, contextual conditions (ie, state laws and regulations) have a significant impact on management strategy at a 95% confidence level.

4. Investigating the Impact of Intervening Conditions (ie, Social, Cultural Aspects) on Management Strategy

The severity of the impact of intervening conditions (ie, social, cultural aspects) on management strategy is calculated to be 0.419 and the probability statistic is obtained to be 11.464, which is greater than the critical value of t at a 5% error level, ie 1.96, indicating a significant observed effect. Therefore, intervening conditions (ie, social, cultural aspects) have a significant impact on management strategy, at a 95% confidence level.

5. Investigating the Impact of Management Strategy (ie, Financial Aspect) on Outcomes:

The severity of the impact of management strategy (ie, financial aspect) on outcomes is calculated to be 0.504 and the test probability statistic is obtained to be 7.483, which is greater than the critical value of t at a 5% error level, ie 1.96, indicating a significant observed effect. Therefore, management strategy (ie, financial aspect) has a significant impact on outcomes, at a 95% confidence level.

6. Investigating the Indirect Impact of Causal Conditions (ie, Human Aspect) on Management Strategy

The severity of the impact of causal conditions (ie, human aspect) on management strategy is calculated to be 0.198 and the test probability statistic is obtained to be 5.680, which is greater than the critical value of t at a 5% error level, 1.96, indicating a significant observed impact. Thus, causal conditions (ie, human aspect) have a significant impact on management strategy, at a 95% confidence level.

V. CONCLUSION

IoT is introduced as a broad social and technical phenomenon, covering various technical, physical, social, and economic elements. IoT provides exciting opportunities for consumers and businesses; however, it comes with a whole host of new security challenges. IoT technologies are deeply embedded in the ecosystems of the Internet, developing them. As a result, they inherit all Internet-related security issues and create new special topics. Due to the important nature of IoT devices and applications, these security issues are of paramount importance and in some cases critical. For example, a team of researchers (2008) demonstrated the possibility of extracting personal information from a pacemaker or threatening a patient's life by changing the behavior of this device. Similar to the Internet, IoT can also be a victim of many threats, such as attacks targeting different communication channels, physical threats, Denial of Service (DoS), impersonation, etc.

This study considered human and management aspects as causal factors, governmental laws and regulations as contextual factors, technological aspects as a strategic factor, socio-cultural aspect as an intervening factor, and financial aspect as results and outcomes. Validation, including "CV-Commonality" and "CV-Redundancy", was used to check the quality or validity of the model. The results showed that the indices of independent and dependent variables were positive and greater than 0. Therefore, it can be said that the model has acceptable quality and reliability. The Goodness of Fit (GoF) index was used to evaluate the fit of the general model. The value of GoF was 0.491, which is a strong index indicating the high quality of the general model. All the variables identified in the model, as well as the relationships between the endogenous and exogenous variables

of the model, were significant. The results of the model showed that the categories defined in the paradigm model derived from the qualitative part were significant and the variables considered had a significant impact on each part. Technology infrastructure facilitation and technology support and equipment can also increase IoT efficiency and effectiveness and enhance the extent to which they are accepted (adopted) and used in organizations.

It is recommended that corporate executives facilitate appropriate procedures for IoT implementation and use flexible organizational structures.

For IoT adoption, it is recommended to employ sufficiently skilled IT professionals in the fields of IT to easily implement IoT.

Extra-organizational factors have a great effect on the lack of deployment. To this end, it is advisable to provide sufficient support by the executing companies as well as the procedures and policies needed to implement IoT.

The company must provide the infrastructure needed for IoT adoption. Technology and Informatics units should be deployed in the company and the necessary tools should be made available to the company management.

As executives play an important role in IoT adoption, they need to be trained. Moreover, the benefits of using IoT should be explained to managers so that no stance or resistance can be made against these organizational changes.

Corporate executives should develop policies for implementing IoT in the company. These policies should be well explained to employees.

Employees play a major role in implementing organizational change. As such, it is important to pay close attention to employees as executors of new policies and provide them with the necessary training.

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