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Promoting innovation and application of Internet of Things in an organization; Case Study from Petrochemical Commercial Company (PCC)

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ABSTRACT

Objective: The purpose of the study was to investigate factors promoting innovation and application of internet of things (IOT) in Petrochemical Commercial Company (PCC) which was as an organization in which massive various data is daily exchanged and processed. **Methodology:** Information professionals, information system technologists and queuing functions that normally consume big data and technological resources were involved in the process of data collection using structured questionnaire and content analysis. **Results:** The results of this study showed that the software development, potential opportunities and capabilities, specific features of IOT, auxiliary technologies, effective technologies and management strategies have tremendous impact on internet of things. **Conclusion:** Moreover, fitting test showed that the research model has properly fitted the collected data; however, this study suffered from some limitations which were basically beyond the control of the research.

1. Introduction

The Internet of Things (IOT) was initially used by Kevin Ashton in 1999 and described a world in which anything like lifeless things had a digital identity enabling the computers to manage and organize them. IOT is a new concept in technology and commination and in general is a modern technology which enables any human, animal or thing to send data through connected networks (like internet or intranet) and can be managed and controlled via available applications in smart phones and tablets. Technologic challenges and innovations leads to a mechanism which can bring a solution for technical problems of IOT all around the world. To reach this achievement, involved organizations and people in IOT should have acquired sufficient knowledge, technological skills and experience in innovation process management. Difference in understanding of innovation, is one of the problems. Nowadays, progress is technologies is daily up growing and organizations are compelled to be adopted to any peripheral changes. Whereas, pioneer organizations are also innovative, hence they are highly needed to have a proper understanding of innovation to resolve the technical problems in IOT. Tanwar et al., (2018) studied on the applications of IOT in development of smart cities and found out that IOT was the main object of this development, since by means of this technology an integrated network of relationships are connected to all elements of the city. Therefore they resulted that by more learning the IOT, development of smart cities will be possible in next years. Makori (2017) developed the application of IOT in scientific and research organization and found that innovation in utilization of IOT causes a big change in all processes of these organizations which leaded to promoting in data access, education and relationship between organization and customers. Hossain and Muhammad, (2016) studied the application of IOT and cloud computing in various organizations. In their research, they presented a new IOT based service framework in which customers' data were collected by portable sensors and were transferred to cloud system in a safe mode. Accuracy of their model then was examined by both simulation and field test which showed a good coverage on results. Pang et al. (2015) presented a new framework for utilization of IOT in sector of health and treatment. They formulated an IOT echo system-treatment and suggested a general structure for using IOT in intensive care unit (ICU) and they observed that the structure was properly applicable.

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Fernandez and Pallis, (2014) studied on opportunities and challenges of health and treatment area and expressed that IOT can be used in distant patients care, urgent alarming systems, body fitness programs, chronic illnesses and care of elders; however, some limitations like unawareness of treatment staff, high costs of the software and hardware and security bugs, …etc. had restricted the applications of this technology in this sector. Chiuchisan et al. (2014) worked on the applications of IOT in development of ICU and a general model including three units of monitoring, sensors and transmitter was used in a household ICU.

2. Materials and methods

2.1 Statement of the Problem

IOT and related technologies are transforming and changing information management and learning in academic and information organizations, where smart systems and solutions are applied in various industries. With reference to development of IT and new technologies such as IOT which have fundamentally changed organization relationship, the producing and servicing organizations have to adopt themselves with new ambience and apply these new technologies to serve the customers effectively; otherwise they have to quickly leave the territory to the competitors and ruin the future. IOT has been set as an undeniable innovation which makes the deep changes in organizations including governmental or private, producing or servicing …etc. Therefore, it is mandatory that application conditions of this technologic innovation to be recognized and effects of its utilization in various organization to be cleared in business sector for better understanding of impact area of IOT in multiple organizational activities. This study basically purposes on this problem.

2.2 Purpose and Objectives of the study

Purpose of the study was to investigate factors promoting innovation and application of IOT in the organization which are summarized as following:
Ideal objective: to develop a model for providing and applying IOT.
Main objective: assessment of effective factors on utilization of IOT.
Special objective: study on software development, potential opportunities and capabilities, specific features of IOT, technologies, effective technologies and management strategies on internet of things.

2.3 Necessity and Importance of the research

Modern and emerging aspects of IOT environment responsible for sustainable knowledge, research and learning must be supported and promoted in organizations. Return on investment and massive application of resources are fundamental elements in development and utilization of IOT technologies in organizations. Massive data and information resources are produced, and therefore, powerful business tools and insights for harvesting and mining relevant information for strategic planning and decision-making purposes are necessary (Makori, 2017). The most researches are conducted to introduce IOT in a descriptive approach, therefore a big research gap is observed in various angels of IOT and this study was to fill out this gap as a necessary research.

2.4 Research Method and Questions

Question 1: how does software development effect on utilization of IOT?
Question 2: how do potential opportunities and capabilities effect on utilization of IOT?
Question 3: how do specific features effect on utilization of IOT?
Question 4: how does auxiliary technologies effect on utilization of IOT?
Question 5: how do effective technologies effect on utilization of IOT?
Question 6: how do management strategies effect on utilization of IOT?
Research conceptual model of this study was mainly based on six variables of software development, potential opportunities and capabilities, specific features of IOT, auxiliary technologies, effective technologies and management strategies as shown in Figure 1.

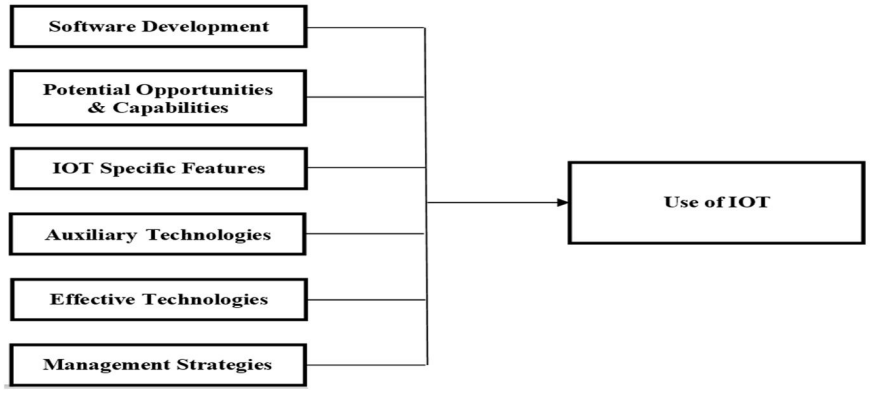

Figure 1. Research conceptual model

The main difference between the model of this study and those of other researchers is in its comprehensiveness and universality since the current model contributed both overall and individual influences of all variables which had been used in other researches. This model properly segregates the variables and then each variable was investigated, individually. Since the goal of this study was to use the existing IT knowledge in the subject organization and supposed to help the managers in making the decisions, therefore this model can be considered as an applicable model and study.
Practical steps of this work was according to bellow algorithm:

1- Library research
2- Finding the main variables and related factors
3- Designing the measurement instruments
4- Primary field studies
5- Correction and adjustment of measurement instruments
6- Field data collection
7- Collected data analysis and hypothesis test
8- Conclusion, suggestions and recommendations

The purpose of this study was to investigate factors promoting innovation and application of internet of things (IOT) in the subject organization and found out that all basic six variables in this study have significant impact on application of IOT in the organization. Primary data were collected through a questionnaire in Likret scale in two sections of general and specialized and finally reliability and validity of questionnaire were investigated and properly proven.

3. Discussion and results

Results and findings of this study can help the managers of subject organization to prepare a useful strategy in light of promoting innovation and application of IOT.
The first hypothesis test results showed that software development has a significant impact on utilization of IOT.
IOT is the process where network connectivity and computing capability are applied to objects, sensors and everyday items not normally considered computers, allowing the devices to generate, exchange and consume data with minimal human intervention. Therefore new software and software development in this atmosphere was very important. This result was also in accordance with that of other researches such as Tabatabaei and Vahedi, (2016) and Makori (2017).
The second hypothesis test results showed that potential opportunities and capabilities have a meaningful impact on use of IOT. Potential capabilities of the IOT are best exemplified through innovative education and information practices such as e-learning, mobile learning and online information. Quality of services in subject organization was a fundamental aspect of technological systems and solutions in the modern digital environment. In the contemporary sustainable development practice, the organization has to provide robust technological solutions so as to attain the educational and informational needs of the customers. Therefore second hypothesis proof was probable. This result was in conformity with those of other researches like Hossain and Muhammad, (2016) and Mojez et al. (2016).
The third hypothesis test results showed that specific features of IOT influence on utilization of IOT, expressively. IOT technology provides the possibility of generation, access and use of big amounts of peripheral data and information. In fact, utilization of IOT causes a re-innovation of the organization and simultaneously digital and internet information are quickly generated and available for the users. In this conditions, IOT is an information process machine means that organizations have to make changes in collection and analysis of the information; Not only decision making, but also in harmonization with artificial intelligence and even in volume and kind of information generated by IOT, will play a great role in strategies analysis and customers satisfaction. This finding was also in conformity with other researches like Wortman and Flüchter, (2015), Xia et al. (2012), Avazpour and Khajooei, (2016) and Mulani and Pingle, (2016).
The forth hypothesis test results showed that auxiliary technologies have undeniable impact on utilization of IOT. Applying these technologies. IOT in an organization necessitates other technologies such as auxiliary technologies. Cloud computing and management dashboards are two successful examples of such technologies. Cloud computing is the practice of using a network of remote servers hosted on the Internet to store, manage, and process data, rather than a local server or a personal computer and management dashboard is a visual software tool that helps company managers to enrich the objectives by analysis of information and are crafted according to the needs of the typical business management. This result was in similarity of those by other researches such as Dehghan et al. (2014), Mostafapour (2016), Botta et al. (2016) and Morton and Hanson, (2012).
The fifth hypothesis test results showed that effective technologies have entire impact on utilization of IOT. It was explored that the range of IOT effective technologies applied to heighten access to knowledge and learning in subject organization. Asked to mention the range of IOT technologies applied in the organization, majority of the respondents selected either strongly important or very important. Therefore this hypothesis was found highly probable, likely this result was in accordance with that of others such as Honarmand and Nazemi, (2015), Mahmoudabadi and Esmaeilpour (2016).
The sixth hypothesis test results showed that management strategies have tremendous influence on utilization of IOT. By providing enough financial resources, promoting organizational infrastructures and conducting the organization activities, management strategies can play an important role in utilization of IOT. Strategy planning for state and private organizations are highly essential. This result was found in accordance with those by other researches such as Banker et al. (2014) and Khorshid and Nojavan, (2013).

4. Conclusion

This investigation studied the factors promoting innovation and application of internet of things (IOT) in an organization in which various massive data is daily exchanged and processed. The results of this study showed that six considered hypothesizes like software development, potential opportunities and capabilities, specific features of IOT, auxiliary technologies, effective technologies and management strategies have tremendous and meaningful impact on utilization of internet of things in the subject organization.

For future works, it is highly recommended to use more hypothesizes to reach a better outcome of IOT utilization in the organization. Moreover, to minimize the uncertainty of the results, it is recommended to use Fazzy Logic or Grey Analysis instead of the PLS which we used in this work. Also instead of questionnaire, other research methods can be used to minimize deliberate and undeliberate bugs.

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