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Exploring Internet of Things (IOT) To Improve IT Professional

Syed Muhammad Syed Omar, Darul Mutakin Ahmad, Mafaisu Chewae, Jamaludin Ibrahim

Kulliyah of Information & Communication Technology, International Islamic University Malaysia

Abstract- The world has dramatically evolved since the initial introduction of Internet as people, processes, data, and 'things' are becoming more and more connected. This era is also called the Internet of Everything (IOE) which has led to a significant effect on individuals, businesses, communities, and countries. This transition has brought an explosive development of Internet of Things (IOT) where 'things'; possibly an objects, people or animal are connected over a network with the ability to transfer data by utilizing unique identifiers provided. When it comes to IOE, it is important to think transformational in order to understand what the connected devices involved will be and what business opportunities they will create. A major change to the tech job landscape is just one big aspect of these new business opportunities emerging. Moreover, IOT can also possibly applicable to influences in IT professional practice mainly in development processes, service's delivery, project management and IT consultancy. Therefore, this paper aims to discuss on Internet of Everything (IOE) technology and its challenges for IT professional practices. Furthermore, this paper will emphasize on IT professional improvement and values that can be brought by IOT technology.

Index Terms- Internet of Everything, Internet of Things, IT Professional, IT ecosystem, Technology.

I. INTRODUCTION

The Information Technology (IT) professionals are people who directly work with IT as their main profession. They are extremely needed by people from every other profession as IT is needed to support most of the business processes exist today. The birth of the Interconnected World Wide Networks (Internet), few decades ago had changed the world. The way of how business processes are conducted has been improved significantly by the Internet. At the present time, started with the invention of Personal Computer (PC), online business transaction applications, Internet connection enabled mobile phones, and then recently smart phones that are connected to the Internet support many major activities of urban citizens. This situation however still does not benefit the Internet optimally. People still look at the Internet as a communication medium which related to several limited applications such as PC and smart phones only.

As the capability of technology advanced progressively, the need to extend the scope of Internet usage to its optimum level has become vital. The advance extended use of the Internet brings us to the world where every devices and tools around us able to bridge integration directly through their own Internet connection or in a simple words "everything is connected to the Internet". The Internet of Everything (IoE) which was first introduced as the Internet of Things (IOT) is a phenomenon by which the Internet usage integration trend on smart phones and other smart devices such as smart television and smart refrigerator be brought forward intended to reach the optimum use of the Internet. The term internet of things (IoT) was coined in 1999 by [1], a British technology pioneer who helped develop the concept [2] which was however in the early years mostly referred as Radio Frequency Identification (RFID) chip embedded objects using the Internet as the communication, [3] [4]. According to [5], the early Innovation of IoT is credited to the MIT's Auto-ID Lab on researches that were focused on the electronic identification of objects. These facts explained to us that in the early innovations of the IoT, it was not only the efforts on the extension of the normal Internet towards the optimum use of it rather it was also on the advanced development on the optimum use of devices, tools, machines and etcetera which can simply be referred as "objects" to improve the quality of our life. Therefore optimum use of the Internet and the objects here refers to the fully connected internet environment through objects which supports almost every single activity of a better lifestyle of mankind.

Further, according to Cisco Internet Business Solutions Group [6], in 2008, the number of objects that have Internet connection are outnumbered the mankind and from and this fact is strengthened by a prediction conveyed by [7],a market research firm, has predicts that more than 30 billion devices will form an IoT by 2020".This shows that the environment that we are living today already moving towards the ubiquitous of internet connection or conceptually, things around us are connected with active information interactions through the Internet. This environment is called the Internet of Everythings (IoE).

Apart of that, IoT has also led to noteworthy effects on businesses, education, and communication processes of individuals, communities, and countries. They [8] took the change brought by the Internet usage today as an argument stated that by having a mass Internet connection of things have a potential to change our lives via the wide attention that is given and as well as enormous number of application from different fields. This explosive development transition improved the approach on how the 'things' which are including man, animals, plants, machines, and the environments interact with each other. According to [9], in order to have an extended value chain created on IoT technologies, China promotes the IoT-related manufacturing, communication and service industries and has scaled up the applications of the technology. Furthermore, preliminary applications are made in several fields including

transportation, logistics, finance, environment protection, healthcare and national defense.

Furthermore, they [10] mentioned that a fact has been explained by (IoTWorld ,2010) stated that in China alone, with the annual growth rate of over 30 percent the IoT technology applications is expected to reach $114.38 billion by 2015. This fact indirectly tells us an unexpected high demand on IoT might be facing us as China market is a big market of the World with a lot of channels linked to almost everywhere on the Globe. Despite of the worries that might drive people away from IoT, it is an irrefutable norm that consumer negative perceptions will be disappeared sooner as the IoT technology is supporting their daily life and they perceived the usefulness of it. This can be supported by one of the situation told by [11] which explained that IoT technology can enable smart fridge to monitor the food consumption available in the storage autonomously. In addition, according to [12] listed the several scenarios and application that could contribute to trillion sensor market scaled (table 1) and stated that ," Growth in today's high volume applications alone will be insufficient to create a trillion sensor market and new applications will be vital". All these indicate that there will be many new business opportunities by the phenomenon of IoT and all those new and existed business are in need to be properly managed by IT professionals.

Function	Sensor Application
Feeding the world	Smart agriculture, e.g. monitoring soil conditions, nutrient concentrations, climatic variables, fertilizers and pesticide levels; highly automated and robotic farming; smart sensor tags on farm animals; remote sensing, etc.
Health care	Fixed, portable, disposable and wearable sensors for heart rate, blood pressure, breath and blood analysis, disease diagnosis, etc. including systems to care for a growing ageing population and the chronically ill.
Transportation	Sensors in road vehicles, ships and aircraft; smart and interactive public and personal transportation networks; traffic pollution monitoring; monitoring the integrity of bridges, railway tracks and roads, etc.
Communications	Sensors in phones and computers, telecommunication networks, satellites, tele-medicine, interactive home entertainment systems, etc.
Function	**Sensor Application**
Housing and built environment	Smart and conventional homes; the emerging IoTs; smart cities; monitoring the integrity of buildings and infrastructure; pollution monitoring; earthquake and flood prediction, etc.
Supply and utilities	Sensors used in the provision and distribution of water, gas and electricity, including photovoltaic, wind and other clean energy sources; liquid and solid waste disposal and recycling; pipeline and power line monitoring; smart grids, etc.

Table 1. The several scenarios and application that could contribute to trillion sensor market scaled.

A very interactive world is fashioned that instead of people be the main medium for 'objects' to get connected to each other via the Internet, every of the 'objects' can interact among them and process the information to commit their tasks directly even without human intervention. It is deniable that whenever a new technology invented and introduced to the world, IT professionals are required to get themselves aligned with the particular new technology as soon as the first day society got interacted with it. Moreover, the number of IT professionals needed for particular technology in every different domain is growing as more people embraced to use the technology. Therefore, the successfulness of IT professionals to play their roles in the new technology IoT is exceedingly determines the successfulness of IoT itself. Thus, the discussion on the IoT challenges and improvements should benefits the preparation and realizations on the requirements for IT professionals to manage the IoT and later IoE in the best efforts.

II. IOT CHALLENGES FOR IT PROFESSIONAL

It could be undoubted that the advanced technology especially in terms of IoT technology has been involved widely from millions to billions or might be trillions devices in the future generation. As a result, there will be significant effect on numerous aspects as well as IT professional, infrastructure, industry standards, security, and business models throughout the whole IT ecosystem [13]. Perhaps, it cannot be forecasted that how much IoT will be advanced, but its implicative effect that could be known is on computing and networking system especially in terms of people who join in the IT ecosystem. Therefore, these effects will bring several opportunities and chances for IT companies, enterprises, developers, investors, and startup entrepreneurs in the future and will hold significant values to them [13].

A. DRIVERS FOR CHANGE AS IOT INVOLVES

Once organizations need to enhance their performance or ability regarding to IoT, they should know the implications and clues of the IoT technology as guidance before they involve with IoT. According to [13], there are several key drivers to take consideration as IoT implementation:

- A smaller, lower power and less expensive devices which allowed more distributed networks to be set up. The community can now embrace not just computational devices but also all types of devices and sensors, chosen to be deployed to get closer to "the edge" of IoT.
- The devices and sensors enable the gathering of more granular data faster. Machine sensors can now report on conditions or even take immediate action in near real time. Previously, it only gathered data and stored it in a database for daily or weekly review and kept static.
- All granular data act as Big Data on steroids which further accelerate the need for thorough analytics. The analysis then put a best on examining insightful

questions to provide actionable answers for decision making.

- The IoT devices has produced new use cases, new applications, new architectures, new protocols and finally inspiring new standards. For example, company like Octoblu has emerged to address the need for cross-device integration.
- The new use cases then will penetrate different consumer journeys and unique value propositions that will spur the establishment of new innovative business models.
- The new business models will stimulate new markets and strengthen existing industries through creative annihilation which then providing new opportunities for the entire IT ecosystem.
- Through these innovations, some companies will transform from hardware, software or systems companies into service-oriented companies that provide consultancy service. Companies that are not acclimating to the new realities quickly, will be acquired or fade away.

B. KEY CHALLENGES

In this section, we will discuss on IoT's challenges which could encounter the IT professional to develop and service to their customers. The important challenges will include robust connectivity, Use Accountability (Ethic), useable security, information models and accountability (Ethic).

Robust connectivity. The basic principle for making IoT happen is connecting things among them. The factors that challenges the connectivity and make the engineering to be a tough is to work and develop on energy harvesting devices because the current objects and devices have a limited energy supply and have not a stable internet connection. Thus, they have to develop the devices to increase connectivity through self-catering energy mechanisms [14]. Then he stated also we need a standard of way for things can talk each other. For instance, replacing TCP/IP with IPv6.

Useable security. According to [15], the security is huge umbrella and it is a dominant thing in terms of Internet of Thing (IoT). Imagine that if your devices that contain of relevant information is lacking of security, what will happen to your information, for example what is good if our smart home can unlock by anyone [15]. It is the challenges for IT professional to handle that kind of problem. There are three specifics, Authorization which to ensure the sending and receiving a stream data between IoT devices has appropriate authorization. Open port which means it is not to be open port out to the internet and we need bisectional communication. Encryption which describe the encryption between devices and server that needed by IoT [15]. Furthermore, IoT connected devices together, it provides more decentralized entry points for malware. Less expensive devices that are in physically compromised locales are more subject to tampering. More layers of software, integration middleware, APIs, machine-to-machine communication, etc. create more complexity and new security risks [13].

Information Models. In terms of IoT, it is important to convert the physical world into a form that can be controlled by IT. To do that, the information model is needed, which is knowledge transfer into software. For example, connected home application that needs various information models like rooms, floors, and functions to be accessed. For the IoT, we have to get used to constantly using these information models and blending them with lessons learned from operations. At this point, the model becomes part of reality and reality becomes part of the model – which is basically the IoT: connecting the virtual with the physical world [14].

Accountability (Ethic). Accountability has the potential to show stopper for IoT because trust is significant part in the IoT which interconnect to accountability. In the line of code, we can not only shutdown the internet and examine the accident, but we have to find the root cause of defect. This is because line code is a supper connected with billions of devices and users. Therefore, with many of stakeholders from software agents to operators, service providers, system builders, programmers and users, the way that can accountability in the IoT is by creating trust-building mechanisms that are not focused on single-company or personal responsibility but on collective accountability [14].

III. IT PROFESSIONAL PRACTICE IMPROVEMENT THROUGH IOT

The IOT is a technology which expected to bring immense opportunities in the upcoming future which can be useful to improve IT professional practice because the expanding nature of IT forces IT professional to be highly adaptable to every changes and development. Furthermore, IOT is an innovative technology which can contribute to the improvement of workplace and marketplace [10], assuming the state of IT professional. The improvement of IT professional practice through IOT can be achieved in several domains:

A. STRATEGIC IT PLANNING

The IOT will change the way the company operate as well as to improve their products and services in order to attract and acquire users through extrinsic and intrinsic motivation of IOT [10]. IT plan or project initiated in a company would not be the same as before because the emergence of IOT will trigger an IOT integration plan to the underlined plan. IT professional in the company is responsible in identifying the area in which IOT can add value to the business and customers', ensuring by the end of the day it is aligned with company priorities and strategies. The strategies may include important business objectives of the company such as to reach new customers, provide new services, speed up the operation, reduce costs, optimize resources, etc. because nowadays, companies are viewing technology in a brand new way especially how to increase their relevance to their clients and strengthens those relationships [16].

B. BUSINESS PROCESS IMPROVEMENT/REENGINEERING

The current business process of a company may not efficient as they expected as efficiency played a vital role in delivering products and services. In this case, companies has to constantly monitor to ensure they are keeping up with technology changes and investing right technology in a right time in order to help deliver the best results [17]. Thus, the company has to undergo an improvement to their current business process. IOT technology has to be part of company consideration when they are intended to initiated new business process improvement

(BPI) and business process reengineering (BPR) project to current business process. The IOT incorporated with the BPI or BPR has to meet the business objectives, serving customers better and improve operation, not just a wasteful technology experiment. In other word, IT professional plays a role in integrating the existing systems, data and infrastructure such as ERP, CRM, mobile apps, website, networks, support systems, etc. with the introduced IOT technology. This is most probably makes the BPR planning become more complicated as we obviously must considering more medium of integration that involves for reengineering.

C. IOT AS NEW VENTURE OPPORTUNITY

As the IOT advancement gradually increases for the past decade, it provides new opportunity for new industry player to endeavor the IOT service offering. IT consultant in the field of IOT has a huge potential to growth in the near future because the rapid development IOT-related industries such microcontroller, sensor, cloud computing, big data, radio-frequency identification (RFID), etc. Despite that, large companies such as Cisco, GE, and Huawei, and government initiative like Industrie 4.0 by German government, have drawn their effort to accelerate the utilization of IOT in order to create new revenue streams and improve quality of life for citizens and consumers [18]. Those efforts will boost the IT industry as a whole and create opportunity for IT consultant to prosper due to strong support from large industry player and government. In addition, an IOT consultant obviously needed as IOT becoming “a must” in any upcoming product and service in the near future.

D. IT OUTSOURCING MONITORING

To outsource an IT business process or a project does not means that company’s IT professional do not have to monitor the process and project development progress. With IOT, companies will have a better way to monitor the outsourced business process. Apart from that, whenever a company decided to go for separated outsources vendors for certain part of their project, the IOT enables the testing for the integration to be done directly through Internet as every separated part can have IOT system of their own. IOT integration can become reliable and efficient communication tool for outsourced vendors to proof their capabilities to deliver the service level agreement that both parties have agreed upon because communication is crucial for a successful service delivery [19]. Thus, IT professional have to maintain a good relationship between company and outsourced vendors so that inefficient will not jeopardize company vision and goals.

II. CONCLUSION

IT professional has been a key role in an organization whether they are the internal or external entity of an organization. As the frequency of new technology invention growing rapidly, the need for IT professional increased as well. Their contribution becoming more crucial with the emergence of IoT technology which enhance the connection and communication of not only human but also devices and other objects or ‘things’. The IoT technology has extended the scope of IT professionals' role. The enhancement of IoT in communication integration among ‘things’; has opened up new business opportunities in which a good professional practices are needed. In addition due to the ubiquitous coverage of IoT, the effect also influences all of major domain of IT professional such as development processes, service’s delivery, project management and IT consultancy. The study has discover the importance for an organization but most importantly the IT professional to embrace the IOT technology in the strategic level and operational level of the business so that it can achieve the targeted vision and goals.

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AUTHORS

First Author – Syed Muhammad Syed Omar, Kulliyah of Information & Communication Technology, International Islamic University Malaysia, Email: syedmuhammadalattas@gmail.com

Second Author – Darul Mutakin Ahmad, Kulliyah of Information & Communication Technology, International Islamic University Malaysia, Email: darul_mutakin@yahoo.com

Third Author – Mafaisu Chewae, Kulliyah of Information & Communication Technology, International Islamic University Malaysia, Email: faaizoon@gmail.com

Fourth Author – Jamaludin Ibrahim, Kulliyah of Information & Communication Technology, International Islamic University Malaysia, Email: jamal55@gmail.com