Internet of Things in e-Business[1]

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Abstract **-** Internet of Things (IoT) is the network of physical objects or things embedded with electronics, software, sensors, and connectivity to enable objects to exchange data with the production, operator and/or other connected devices based on the infrastructure of International Telecommunication Union's Global Standards Initiative**.** IoT is gaining more and more popularity in every field including e-Business. This paper will discuss IoT for a smarter world, IoT applications in e-business, IoT in e-business in the US, IoT in e-business in the UK, IoT in e-business Canada, IoT in e-business in Australia, IoT in e-business in India, and IoT in e-business in China.

Keywords - Internet of Things, IoT for a Smarter World, IoT in e-Business, IoT in e-Business in the US, UK, Canada, Australia, India, and China.

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1. Introduction

This Section will start with the introduction to the term "Internet of Things". From Wikipedia [1], "Internet of Things (IoT) is the network of physical objects or things embedded with electronics, software, sensors, and connectivity to enable objects to exchange data with the production, operator and/or other connected devices based on the infrastructure of International Telecommunication Union's Global Standards Initiative" [2]. The term "IoT' was coined by Kevin Ashton in the year 1999.

Since sensors are important parts of IoT, images of sensors are shown in Figure 1.

Figure 1. Images of Sensors

(Source: http://www.societyofrobots.com/sensors_currentsensor.shtml)

The next term to agree upon is e-Business. From Wikipedia [3], e-Business is "the application of information and communication technologies in support of all the activities of business". The term was coined by IBM in the year 1996.

Internet of Things is getting more and more popular in e-Business as can be seen by searching "Internet of Things in e-Business" from Google in August 2015 which resulted in about 550 million entries. Machina Research which specializes on advice about IoT claimed on 27 April 2015 that IoT market will increase from 900 millions US$ in the year 2014 to 4.3 trillions US$ in the year 2024 [4]. The McKinsey Global Institute (MGI) on 25 June 2015 published a report that by the year 2525 the economic impact of IoT will be 11.1 trillion US$ [5].

This paper will discuss IoT for a smarter world, IoT applications in e-business, IoT in e-business in the US, IoT in e-business in the UK, IoT in e-business Canada, IoT in e-business in Australia, IoT in e-business in India, and IoT in e-business in China.

2. IoT for a Smarter World

From the article on "How the Internet Of Things Creates A Smart World - Infographic" [6], examples of smart world applications of IoT are given. They are smart air pollution control, smart forest fire control, smart health care, smart lighting, smart living, mart parking, smart perimeter access control, smart shopping, smart traffic control, and etc.

From another article on "50 Sensor Applications for a Smarter World" [7], 50 examples are given. They are Smart Cities such as smart phone detection, and smart road; Smart Environment such as smart air pollution, and smart landslide detection; Smart Water such as smart water leakage, and smart river flow; Smart Metering such as smart electricity grid metering, and smart water flow metering; and Smart Health such as smart fall detection, and smart patients care.

3. IoT Applications in eBusiness

Searching Google in August 2015 for " IoT in e-Business", about 10 million entries were found. From the article "Can the Internet of Things Work for You" [8] published 18 February 2015, more than 900 IoT vendors presented their products and services at the Consumer Electronics Show 2015. The research firm "Gartner" predicted that by the year 2020, IoT will reach 26 billion different devices.

From the article "How the Internet of Things (IoT) can Improve E-commerce Experience" [9], IoT can be useful in Inventory Management to manage inventory real-time, Logistics Management and Delivery Tracking to manage route and speed that logistics crew are allowed to handle, Personalization for customized offers and customized delivery times, and After-sales Services to update purchase date and warranty period.

4. IoT in eBusiness in the United States of America

From the web "Networkworld.com"[10], 12 most powerful US IoT companies in alphabetical order are Amazon, AT&T, Axeda, Cisco, GE, Google, IBM, Intel, Microsoft, Oracle, Salesforce, and Qualcomm. Searching Google in August 2015, for "Success stories of IoT in US companies", about 1.5 million entries were found. As an example, one of the 900 IoT vendors, "Jasper", presented 56 customers with success stories [11]. Five of them will be presented here. The first example is Garmin which is a worldwide provider of navigation products for the automotive, aviation, marine, and etc. The second example is Amazon which delivers e-book content and Internet access anywhere, anytime -- using creative connectivity business models. The third example is Boston Scientific which uses IoT to extract patients' data wirelessly from implanted pacemakers and transmits to doctors via cellular connectivity. The fourth example is Hallmark which uses IoT to enable employees to upload inventory

information as they merchandise store displays. The fifth example is Heineken which uses IoT to monitor beverage age (quality) and inventory level in kegs in public venues.

5. IoT in eBusiness in the United Kingdom

From the web "Gov.uk" [12], the Department for Culture, Media and Sport (DCMS) and Innovate UK are offering up to £10 million for a single collaborative research and development project to demonstrate the capability of IoT in a city region. The competition is part of a wider £40 million government investment in IoT announced in March 2015. Examples of IoT at work in cities already include smart lighting, and smart traffic which allows a city to gather and share information on lighting, and smart traffic which collect data from traffic to help in easing congestion. It has been said that the Internet of Things is being implemented for connecting communities and commerce across the UK, and that the UK has the opportunity to become a world-leader in this sector.

Projects must be collaborative and led by a local authority or local enterprise partnership. Projects should involve at least one local authority, one local enterprise partnership and several businesses.

6. IoT in e-Business in Canada

Searching Google in August 2015 for "IoT in e-Business in Canada", about 1.7 million entries were found. From IDC Canada survey published 15 July 2014 [13], 6% of Canadian medium and large business were using or planning to use IoT in the year 2014, 30% were planning to use IoT innte next 24 months, and Canadian businesses would spend 21billions Canadian $ annually on IoT by the year 2018.

From the web "cantechletter.com" [14], a major telecom company in Canada by the name of "Telus" announced on 11 December 2014 that it was offering IoT turnkey solution to 38 Canadian leading tech companies, such as blueRover Inc., Sensor Suite, Think! Wireless Solutions, and PEI's ScreenScape Networks. Actually Telus partnered with the US IoT company "Jasper" mentioned in Section 4 of this paper.

Examples of services provided by BlueRover Inc. are the service to help restaurants comply with Food Safety Canadian Act, and the service to monitor fire hydrant to be ready to use in emergency. For Food Safety, 45 sensors were employed to report on air temperature, and food temperature to ensure the quality of food. For fire hydrant, many sensors check for water pressure and leaks to ensure sufficient water to use in emergencies.

7. IoT in e-Business in Australia

Searching Google in August 2015 for "IoT in e-Business in Canada", about 1.8 million entries were found. From the article "Sensus & BAI bring FlexNet smart metering network to Australia" [15] posted 29 July 2015, BAI (formerly Broadcast Australia) will provide smart metering services thru IoT to Australian utilities. The metering will be performed by sensors attached to the meters for water, electric, and gas.

In the article "Could South East Queensland become the world's first smart region?"[16], posted 14 August 2015, IoT may make South East Queensland the world's first smart region, adding 30,000 jobs and 10 Billion $ to its economy. CISCO has been involved with about 150 smart city projects in the world but South East Queensland will become smart region which include 12 smart cities. It may be said that a smart city "uses IoT to enhance quality and performance of urban services, to reduce costs and resource consumption, and to engage more effectively and actively with its citizens. Sectors that have been developing smart city technology include government services, transport and traffic management, energy, health care, water and waste, and etc. [17].

8. IoT in e-Business in India

Searching Google in August 2015 for "IoT in e-Business in India", about 2.3 million entries were found. From the article "Rise and rise of Internet of Things in India" [18], the Government of India announced in the year 2014 to create a US$15 billion IoT marketplace in India by the year 2020. The Draft Policy specifies plans to undertake capacity development for IoT specific skills, in order to undertake research and development activities for all assisting technologies, and to develop IoT products specific to Indian needs in different domains.

From the article "Which Indian IoT businesses are Venture Capitalists likely to fund?" [19], it was said that Indian IoT companies should build the best service delivery network or a value-add on top of hardware, should focus on Indian specific applications and not just copying western concepts, and that a much bigger source of funding is from China and not US or Europe.

9. IoT in e-Business in China

Searching Google in August 2015 for "IoT in e-Business in China", about 2.3 million entries were found. From the article "China embraces the Internet of Things – to the tune of €1.45 trillion a year" [20], posted 9 July 2015, international consultants McKinsey predicted that in the year 2025, China could generate about about €1.45 trillion from online activities including IoT.

From the article ""China's top e-commerce firms, Alibaba and JD, jump onto the Internet of things bandwagon" [21], posted 26 June 2014, Alibaba and JD have joined IoT. Alibaba's cloud service Aliyun has just gone live aiming to help manufacturers with services they may need in their process to produce smart home appliances. Alibaba has not announced any partnerships yet, which makes its approach slightly more passive, but the site is available for manufacturers to access. They can tap on the cloud storage service, payment mechanisms, as well as developer platforms to help with app solutions. JD has pushed into IoT wih partnership with Tencent, which took a 15 percent stake in JD.

10. Concluding Remarks

IoT is gaining popularity in every field including e-business. This paper discussed IoT for a smarter world, IoT applications in e-business, IoT in e-business in the US, IoT in e-business in the UK, IoT in e-business in Canada, IoT in e-business in Australia, IoT in e-business in India, and IoT in e-business in China. Those who are interested in IoT should search the Internet regularly to find up-to-date information to use for the benefits of themselves, their organizations, and their countries.

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