

The Internet of Things (IoT): What is the potential of the internet of things (IoT) as a marketing tool?

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ABSTRACT

This paper identifies the marketing aspect of the Internet of Things applications as well as the general technological aspects of the Internet of Things. The focus in this paper lies in the investigation of how the Internet of Things can be taken as a marketing tool in the IoT applications. The experiences so far, based on the literature, is that the IoT will have a huge impact in the near future. There is 51 percent of the worlds's top global marketers expect IoT will revolutionize the marketing landscape by 2020. And based on the case study, this idea is also confirmed. IoT has its huge potential in the future and the marketers can fully make advantage of this advantage in the real cases. But there is not a lot of literature so far which is designed for marketing perspective for IoT. Thus, this paper can give a small view on this. On the other hand, more researches should also be conducted to make up this field since this IoT topic is going to be more and more popular and important.

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Keywords

Internet of Things, Marketing Trend, Cognitive technology, World-wide network, Future Internet, Sensing Service, Big Data, IoT Applications.

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1. INTRODUCTION

The Internet of Things, also known as ambient Technologies or Embedded Systems, is a global system of IP-connected computer networks, sensors, actuators, machines, and devices, merging this physical world with the virtual world of the Internet. (Constantinides, 2016) The Internet of Things is a key part of the Future Internet. Many new opportunities can be foreseen for businesses and marketers, but also for the society as a whole. (Haller et al.) Cognitive IoT technologies will make it possible for business leaders to understand what is happening in the world more deeply. By infusing intelligence into systems and processes, businesses will be able to not only do things more efficiently, but to improve customer satisfaction, to discover new business opportunities, and to anticipate risks and threats so they can better deal with them. (Green, 2015)

IoT is an integration of wide variety of smart devices, and influencing human routine towards, e-health, e-learning, remote monitoring, surveillances. Similarly, IoT plays a key role in industries such as automation and intelligent industrial manufacturing, smart logistics, smart transportation and many. (Atzori, L., Iera, A. and Morabito, G.) In addition to the Internet of Things, there is the Internet of Services, 3D Internet, Internet of Content, and Next Generation Networks, just to name a few. It is important to note that these terms should not be regarded as different “Internets” that will exist in parallel, but rather as different aspects of a common Future Internet. (Haller, S., Karnouskos, S. and Schroth, C.) By browsing the literature, it is hard to make a comprehensive understanding what IoT really means and what social, economical and technical implications from IoT will have. For the IoT, it is composed of two terms. The first one pushes towards a network oriented vision of IoT and the second one focuses on generic “objects” which are integrated into a common framework. (Atzori, L., Iera, A. and Morabito, G.) In the simple words, it is either “Internet oriented” or “Things oriented” and it depends on their specific background, internets and finalities. In fact, “Internet of Things” semantically means “a world-wide network of interconnected objects uniquely addressable, based on standard communication protocols”. (INFSO D.4 Networked Enterprise & RFID INFSO G.2 Micro & Nanosystems)

It is essential to note that, in the definition, I don’t talk about technologies. Sensor network, embedded systems, RFID, etc.

They are just enabling technologies but the main concept behind the IoT will remain, In addition, the key is that the seamless and ubiquitous integration of these “Things” (objects) into the business processes.

1.1 RESEARCH GAP

The current literature mainly focuses on the technical perspective of IoT. However, there is limited research on IoT in connection with the marketing perspective, although there is a few literature about IoT related to Business.

There are several domains and trends in the marketing part in terms of IoT. Due to the time constraints, this research will mainly focus on the two dimensions which are raised in the research questions.

1.2 RESEARCH GOAL

Due to the lack of literature in marketing section in terms of Internet of Things, this paper is aiming to analyze the potential of the IoT as a marketing tool during the business activities. The research goal is to identify opportunities which would be caused during the change of the new data era related to the internet of things for the organizations during the business. The classification of marketing domains where the IoT is likely to play a role in the future and identification of the main changes expected to happen in the marketer’s work because of the IoT.

1.3 RESEARCH PROBLEM

With the development of the new technology of IoT, what will be the impact of the IoT on future marketing and how the marketers could use the advantage of this technology?

1.4 RESEARCH QUESTION

Why delivering a connected customer experience becomes increasingly critical for companies and how the companies can take advantage from it/these data? And how can the cognitive IoT technologies be utilized in real life, such as, manufacturing, personal home, e-health, automation and transportation and logistics?

1.5 METHODOLOGY

Design:

This research paper will use two research methods to analyze the raised question. First, a critical literature review of the extant literature will be conducted. Second, the qualitative case study will be presented. By using this method, I can combine the theories from the literature together with the practice in real life to have a comprehensive analysis in terms of IoT for my topic.

Procedure:

In terms of the literature review, Google scholar will be the main tool for searching the relevant literature. And the literature provided by the professor will also be an important source. In the middle time of the work, I will search some companies which are relevant for this study.

2. LITERATURE REVIEW

The extant literature has aimed for the IoT in a technical perspective. And this means that most of the literature has been written for the technical fields and also the enabling technologies of IoT. In addition, authors also have written the industry applications of IoT in several domains. At the same time, they also raised the technical issues of from IoT which are needed to be solved.

However, there are very limited researches from IoT in relation with marketing field. Especially, how the future business activities would change based on the development of IoT. Such as, the consumer relation management, retailing, logistics, product development, online marketing, etc.

In this paper, the literature review is composed by several parts. Firstly, the general overview of IoT will be introduced. Secondly, the key elements of IoT will be conducted. The key elements I chose from the IoT are cognitive technology and big data. The reason for choosing these elements is because these are the main and essential topics in IoT. Thirdly, after introducing the overview and key elements of IoT, the problems and challenge part of IoT will be presented. In this part, the current technology issues of IoT and the raised privacy

problems caused by IoT will be discussed. Fourthly, the marketing part of IoT will be conducted. In this part, I will introduce the current state of IoT in marketing, the most important trends and the future scope of IoT in marketing. Lastly, it will be the IoT application part. Based on these applications, it can give a more vivid background for IoT in real life. In this part, five application directions will be introduced. They are: manufacturing, personal and home, E-health, Automation and transportation and logistics.

Based on this approach, the literature review will give a relatively comprehensive overview of the mostly discussed topics of IoT. The readers could understand what the IoT is about, how IoT technologies are inserted in the real life, and what the current problems caused by IoT. Last but not least, readers could see what the IoT in marketing is and what the future trend of IoT in marketing will be, how IoT will reach the customers, and how IoT will revolutionize the marketing landscape in the future.

2.1 GENERAL OVERVIEW

The Internet of Things is a term that has been aroused for several years. It was first introduced by the MIT Auto-ID Center. (Haller.S, et al) And at that time, it stood for the vision of the world where all physical objects are tagged with an RFID transponder with a global unique ID. Since then, the meaning of the Internet of Things has expanded. (Haller.S, et al) Currently, The IoT is a novel paradigm that is rapidly gaining ground in the scenario of modern wireless telecommunications. (Atzori.L, et al) The US National Intelligence Council even listed the IoT as one of the six disruptive civil technologies with potential impact on US national power. From all the literature, it can be conducted that IoT has a huge impact in the future.

2.2 KEY ELEMENTS OF IoT

In the following session, the topic of cognitive technology and big data will be raised. These are the two main and essential elements to understand the Internet of Things. For understanding the topic better, I also use the examples to interpret the concepts.

Today, the applications of IoT have become mainstream, so, it is time to take advantage of a second generation of Internet of Things technologies and capabilities. (Green, 2015) And this is something called Cognitive Internet of Things from IBM.

According to the research from IBM, it is said that Cognitive IoT technologies will make it possible for business leaders to understand what is happening in the world more deeply and comprehensively and it will make the things or businesses operate more efficiently and the business leaders could better deal with the activities during the business processes.

As we all know, the sensor networks are powerful. They do not depend on the task of uncovering the complex interrelationships between people, places and objects (things) which drive the economy and the businesses. In order to reach the next level, businesses need cognitive technologies which enable them to gather and integrate data from many types of sensors and other sources to reason and analyze over that data. In addition, to make use of the data and learn from their interactions with it. (Green, 2015) The first generation IoT technologies already brought us the information which made a huge difference in achieving operational efficiencies. The second generation creates immense and extensive communities of devices that share information. And in return, the information can be interpreted in a larger context and managed by people who use cognitive systems. By that time, about 90 percent of the data that's gathered by sensors is lost for a variety of reasons. This is because of the bandwidth limitations and constraints driven by security and privacy. (IBM) So, in this case, it is necessary to add the cognitive technologies to IoT portfolio. Such as, natural language processing, machine learning and video, image and text analytics. Furthermore, it is important to make the cooperation with the leaders from the industries. To make a start, retailing, real estate, financial institutions, insurance companies, etc can be essential during the development. To increase the customer satisfaction, companies should put the data where the customers want to store and utilize the data at the right time and right place. As an example, today, you want to make the heating system (networks) of sensors at home to be

more utilized for temperature and energy use. Later soon, your home will be self-aware because of the cognitive technologies. These kind of new technologies help the managers understand what is actually going on and what the actual needs from the customers are. As another example, in the shop, there are a large amount of customers pick up the certain products but they do not really buy it. Then, the machine learning algorithms notice this patterns and therefore, the manager from the stores will get this information (data) via this cognitive assistants to do some research for why the certain products are not popular to buy.

Since the topic of sensors are raised, then it is necessary to mention the big data and the sensing service. There is no clear definition for "Big Data". It is defined based on some of its characteristics. The big data is not meant by the size. There are three characteristics can be used to define big data. They are: volume, variety and velocity. (Eaton, C., et al) (figure 1) Volume relates to size of the data such as terabytes (TB), petabytes (PB), zettabytes (ZB), etc. Variety means the type of data. Velocity means how frequently the data is generated. Big data is everywhere in daily life. One example, Nike+iPod/iPhone application is the application of sensing technologies. (Apple Inc.) It is an application that collects and tracks information such as workout details, calories burnt, walking and running distances, etc. The big data is big when we consider its users. Big data is important for us in many perspectives. The significant amount of data generated allows us to make the right decision at the right time in both public and private sector. For example, in retail business, consumer behavior and preferences can be understood by analyzing the big data which includes, customer movement in the store or online website, transactions, product searches, etc. (Christopher J. Bucholtz.) Big data allows Data-Driven Decision Making. (Benedict,K.) In business perspective, big data has the potential to generate more revenue, reduce risk, and predict future outcomes with greater confidence in low cost. (Yunan,B.) IBM has identified some of the challenges which can be addressed by using big data. For example, detect life-threatening

conditions at hospitals in time to intervene, predict weather patterns to plan optimal wind turbine usage, and optimize capital expenditure on asset placement, make risk decisions based on real-time transactional data, identify criminals and threats from disparate video, audio, and data feeds.

(Zaslavsky, A. et al)

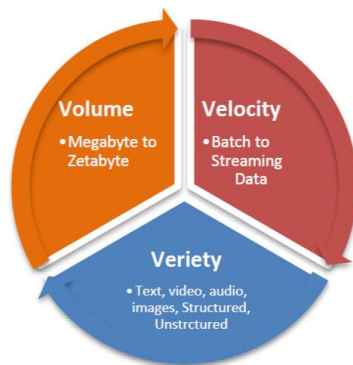


Fig 1: Characteristics of Big Data.

Providing everything as a service is model that emerged with cloud computing. Cloud computing is expected to play a significant role in IoT paradigm. (Zaslavsky, A. et al) Garter defines cloud computing as a style of computing in which massively scalable IT-related capabilities are provided “as a service” using Internet technologies to multiple external customers. IoT gives a view that sensors can be attached everywhere. In this case, owner will be able to publish and send their sensor data to get the fee or they could get the discount as a return from the people who needs these data. And the potential customers can be reached more easily by the marketers under this technology.

2.3 PROBLEMS AND CHALLENGES

2.3.1 Technology Issues

As we can see, there are many opportunities and socio-economic benefits from the Internet of Things. Although, IoT is a fast-developing thing in this stage, there still exist some technical issues which are needed to be solved.

Capacity is the thing which should be mentioned in priority. Since more and more devices are going to be part of the

Internet, there are some 50,000 billion objects (“Things”) on Earth. (Lemoine) Moving to a new Internet address space will be essential. Not only the quantity is an issue, the quality is much more important. In China, Europe and Japan, major efforts are being made to bring IPv6 online in parallel with IPv4 system. (COM, 2008) Not only the capacities of the computers needed to be developed, the new models and algorithms are also needed to be created to help the enterprise systems.

To be able to address the entities in the IoT, these identities first are needed to be identified with a unique ID. In supply chain management, tracking and tracing objects is one of the function from IoT.

There is research challenges which are listed by the ISTAG (Information Society Technologies Advisory Group) and the European Commission.

- Edge technologies, such as sensors and actuators, passive/active RFID tags, embedded systems, making devices that are attached to real-world objects smart enough to participate in Internet of Things application scenarios;
- Networking technologies, such as fixed, mobile, wired and wireless networks, allowing the highly available bi-directional communication on different levels;
- Middleware systems and service-oriented architectures putting real-world data into the context of various Internet of Things applications;
- Platform services ensuring scalability, high availability, and the safe and secure execution of the requested functionalities;
- Web service technologies making information and services available while reducing interoperability issues and enhancing extensibility, platform independence and standardized exchange of messages.

It is essential to note that IoT is one of the private network, public (open) network and hybrid network use. In the supply chain set, a need for the secure data sharing and selective

visibility into business entities will be significantly needed. It must be emphasized that things will not be, in every aspect, in the world reachable same as the Internet. Therefore, interoperability will be a key issue in the future in terms of IoT.

2.3.2 Privacy Problems

In the IoT vision, every object has a virtual component which can produce and consume services. Such extreme interconnection will bring unprecedented convenience and economy, but it will also require novel approaches to ensure its safe and ethical use. (Roman.R, et al)

Privacy is one of the most sensitive subjects in any discussion of IoT protection. Everyone will be affected by the IoT, but not many people or organizations may realize it quickly and equally. People may experience a feeling of lost control as IoT implementations create data in largely invisible and unnoticeable manners. Additionally, automatic decisions may results from control shifting toward devices and algorithms. Depending on the application, some people may find this desirable or beneficial while others may not. (Ebersold.K)

So, this is a challenge in the IoT development. Since the big data era is coming, privacy from people also is needed to be concerned.

2.4 IoT IN MARKETING

There are not a lot scientific articles concerning marketing utility of IoT. However, there will be a marketing trend in the future regarding the Internet of Things. According to the research paper from IBM, only 22 percent of consumers say the average retailers understands them, and just 21 percent say the marketing messages they receive from average companies are “usually relevant”. Most marketers understand this must change. But the challenge is that only 37 percent feel they have tools they need to provide exceptional customer service and experiences.

So, in order to have a suitable approach to attract the potential customers and to keep the loyalty from the existing customers, marketers must take action. There are four technologies will be particularly important for marketing success in the near future:

cloud computing and services, mobile solutions, the Internet of Things and cognitive computing. (IBM)

As we can foresee in the future, there are different fields of knowledge in Internet of Things, such as informatics, electronics, telecommunications and social science. (Atzori, L., et al) Internet of things appliances and sensors become a real factor in customer engagement and data collection. As more objects will be connected, marketers could have a message to deliver to the customers and the customers would have a device on which to receive the messages from the marketers. In the coming years, we can see a significant transformation. Since more “things” become connected, there will be more interactions between marketers and the customers. The marketers will have the challenge to act and react based on the feedback and interactions from the customers. No matter the marketers will engage with the customers “in store” or “on screen”, they will be challenged to interact with the customers with the right messages and at the right time based on the technology from the Internet of Things. The effect of IoT can be spread not only at home, but also outside the home. (Rochlin.J) We have already seen a penetration into the home by Google with its Nest products, Apple with the capability of Siri on its newest Apple TV, Amazon with its echo device and the newest HiFi products.

As a marketer or even a consumer goods manufactures, they should pay attention to this new marketing trend and think what this new technology mean for the business. Outside the home, it is also a challenge and opportunity in terms of the IoT. As what mentioned later(Manufacturing, Personal and Home, Health, Automation, Transportation and Logistics), it is evolved everywhere in life. Marketers and retailers will be able to tackle “entry” and “dwell” events (similar to how digital marketers tackle the websites and the apps). (Rochlin.J) In addition, they will be able to adjust and improve the products at the right time from the feedback of its customers and this will increase or even maximize the efficiency and customer experience.

From the report from IBM, the most essential thing is that how the marketers use this IoT strategy to operate a marketing orchestration platform from which they can receive, consume and leverage the data from these connected “Things”. With this new marketing trend, marketers in the following years will be able to conduct the effective cognitive marketing activities which will meet the needs from the customers and serve to their intent. The key thing is that and it is also foreseeable that the customers would be evolved in the NPD (New Product Development) due to these connected “Things”. And these using data from the customers is valuable for the companies who are going to improve and develop the new processes and new products. Under this case, the marketers not only can make the new products that meet the needs from its customers, but also they can reach the potential customers more easily since they know what these particular customer needs are.

According to the infographic, 51% of the world’s top global marketers expect that IoT will revolutionize the marketing landscape by 2020. From the blog of i-scoop, it says that IoT is affecting virtual all industries. And it has a tremendous impact on the volume of data and on network traffic. Lastly, it is increasingly popular in a consumer context.

From the marketing view, i-scoop gives a view that IoT is the interconnectivity of our digital devices that provides endless opportunities for brands to listen and respond to the needs of their customers- with right message, at the right time, on the right device. And it is expected that by 2020, the worldwide market for IoT solutions will be \$7.1 trillion. The estimated IoT connected devices will be +13 billion by 2020. And i-scoop also gives a view that the marketing power of the Internet of Things is connectivity for better customer interactivity.

2.5 IoT APPLICATIONS

In order to solve the research problems, to develop the required infrastructure and to produce the essential software and hardware, it is important to mention the economic benefits. And it will only happen if there is a clear economic benefits from the history. In the following context, I will explain the several

applications from the real world that stand to profit most from the potentials and possibilities in the Internet of Things.

As we all know, RFID (Radio-Frequency identification) and related technologies have been widely applied in the supply chain logistics applications in the retail industries and consumer products and transportations. While this technologies will be remained in the near future, we can see that the potentials and possibilities from the IoT technologies could expand its benefits in almost every area. Several main promising domains are discussed in the following context.

2.5.1 Manufacturing

Since SOA (service-oriented architecture) concepts are going to be de-facto standard to connect to enterprise applications, there is a trend that putting web services on the devices themselves and giving them the capability of providing their functionality as a service. This will create eventually cross-layer web service mash-ups, with services hosted at the enterprise, middleware and device level. (Moreira Sa de Souza, L, et al) Device integration therefore means the service integration. This not only creates a new paradigm on the shop floor, but it also would encourage the development of new devices in the automation industry that offer embedded web services. (Haller,S. et al) Currently, there is a large number of “dumb” devices. But in the future, the intelligence and behavior are designed and each application will be programmed individually. Thus, the factory can be the robotically factory.

2.5.2 Personal and Home

Home can be a smart environment due to IoT. It can be easy and comfortable because of the intelligent objects. The heating systems can be adapted to our preferences and to the weather. The lights can be changed and adjusted according to the daytime and nighttime. With the appropriate monitoring and alarm systems, the incidents and burglaries can be decreased or avoided. Energy costs can be lowered by automatically switching off the electrical equipment when they are not being used.

2.5.3 Health

In health care domain, IoT has made huge improvements. Remote patient medical monitoring and advanced medical diagnosis is possible using IoT. Tracking the staff, patients and objects is under control. Identification and authentication of people, automatic data collection and sensing is carried out for remote monitoring of patients from diverse geographical locations. The Internet of Things will be essential in realizing the vision of ambient assisted living. (Haller, S. et al)

2.5.4 Automation

As we can see, sensors and embedded systems already play a role in the automotive industry. According to the related researchers, they predict that these will become more important when they are integrated into the Internet of Things. It can also be called “Internet of Vehicles”. Every car will be linked to the internet and will be inserted the sensor inside. When detecting the hazards, these “Internet of Vehicles” can deliver and generate the accurate and correct messages containing a description to the car owners, insurance companies and people who need these data. Despite the safety use from this new technology, it can also be used in the business scenario. Cars may consume services, such as, remote diagnosis in case of break-downs, software version management and others.

2.5.5 Transportation and logistics

By the technology of Internet of Things, it is possible to track the location and the status of an object throughout the full product life-cycle and throughout the supply chain. First of all, sensors can be used to make sure that the products were never exposed to damaging environment. For example, the products are in the right temperature places. And the hazardous products won't be transported through polluted or sensitive environment. On the other side, the green transportation can also be realized. IoT technologies will be able to record all the emissions which were generated during the transportation. And this can avoid some legal issues in this area. The companies can track all the processes and checking the records.

3. CASE STUDY IN IoT APPLICATIONS

In the following context, I will introduce 3 cases of IoT applications. They are Google's Next Learning Thermostat, DHL and automobile industry. The reason for choosing these cases is because they are the mostly well-known IoT applications and they are also ones of the promising applications from the Internet of Things. For each case, there will be 3 sections. Firstly, the outline of the company/industry will be introduced. Secondly, the product which is related to IoT will be presented. Last but not least, the utilization of marketing of these IoT applications will be analyzed. In the parts of utilization of marketing and product outline, the theories which are mentioned in the literature review will be applied and combined with the practical cases.

3.1 GOOGLE'S NEXT LEARNING THERMOSTAT

3.1.1 Company outline

Nest is a home automation company. It designs and manufactures programmable thermostats and smoke detectors. The company has introduced its first product- the Nest Learning Thermostat in 2011. The company focuses on delighting customers with simple, beautiful and thoughtful hardware, software and services.

3.1.2 Product introduction

The Nest Learning Thermostat is an electronic, programmable, and self-learning Wi-Fi-enabled thermostat that optimizes heating and cooling of homes and businesses to conserve energy. (Pogue, David) It is based on a machine learning algorithm: for the first weeks users have to regulate the thermostat in order to provide the reference data set. Nest can then learn people's schedule, at which temperature they are used to and when. Using built-in sensors and phones' locations it can shift into energy saving mode when it realizes nobody is at home. (Nest official website)

A Connected Home can be defined as different things by different people. In general, it is essentially a home with one or more devices which are connected together in a way that allows

the owner from the home to control, monitor and customize their environment. And this can mean anything from a programmable learning thermostat to a security system of window, door and motion sensors and also to the future of smart appliances. Their common denominator is that all of the best of these devices should unite to become a connected ecosystem, makes it easy for homeowners to access and control. If things fundamentally make our lives more convenient and comfortable then for a truly connected home influence is to change the rules of the game.

3.13 Utilization for Marketing

Home automation is not a new concept in the market and it has been around for a certain time. But the market has witnessed the rapid growth during the last five years. It mainly is due to the development of faster wireless networking technologies and the increasing need of home owners to save money on their home energy bills. All of these devices from part of the Internet of Things. From the researchers, it is expected that 50 billion objects worldwide will be connected to the IoT by 2020. (Curtis, 2014) According to Curtis, Google gets a head start against tech rivals like Apple and Microsoft by buying Nest.

Getting using data from the customers means that Google will soon know millions of people. Smart ovens and washing machines will release the burden from the households. The smoke alarm indicates whether the house is burning down or not. Such these smart devices will benefit the customers who use these products.

The analysis which is conducted in Hamburg, Germany in March, 2016 has revealed that the \$ 879M (4.9M devices) Smart Thermostat market is currently seeing its strongest ever momentum as Smart Home adoption and assisted-living solutions are quickly becoming more prevalent in the consumer market. The uptake has been especially strong in North America in 2015 and was driven by very strong Q4/2015 sales.

The study examines the Smart Thermostat market of 14 countries in detail (USA, Canada, Mexico, Great Britain,

Germany, France, Spain, Italy, China, India, Japan, Russia, Brazil, Korea) on a monthly basis for the past 18 months, both by number of devices sold as well as realized revenue. The study also gives an outlook by key country until 2021 with the total market size reaching \$4.7 billion by 2021.

3.2 DHL

3.2.1 Company outline

DHL Express is a division of the German logistics company Deutsche Post DHL. It provides international express mail services which is founded in 1969.

3.2.2 Product introduction

DHL Trend Research in close collaboration with Cisco Services has launched a new topic: IoT (Internet of things). With the advent of the Internet of Things, the Internet connection and the computer now are linked to the physical objects in the traditional sense. A connection tray, for example, it can tell the masters of their own fate and condition of the shipment. Intelligent truck can even predict their own maintenance requirements. Even street car can sense the presence of ambient intelligence and send it to the driver. These are some of the latest version of the DHL Logistics Trend series of many interesting possibilities of things to capture.

3.2.3 Utilization for Marketing

Due to the technologies from the Internet of Things, DHL has developed this new research. By doing this, the logistics can be monitored in a correct way. By using the traditional way, it is always hard for workers to know what kind of components are being used in the factory and what kind of new components are needed and what are the things lacking in the factory. Sometimes, they will buy the components twice even under the case that they already have this special ones in the inventory. So for the logistics, it is very helpful to use the IoT technology to avoid the unnecessary mistakes. This either can save money, or save the labor work from the employees.

The Trend Report, which estimates that there will be 50 billion devices connected to the Internet by 2020 compared to 15 billion today, looks at the potential impact this technological revolution will have on business. The value at stake, combination of increased revenues and lower costs that is created or will migrate among companies and industries when new connections are made, reveals the huge potential when the Internet and networks expand their connections to warehousing, freight transportation and other elements of the supply chain. For any organization with a supply chain or logistics operations, IoT will have game-changing consequences, from creating more 'last mile' delivery options for customers, to more efficient warehousing operations and freight transportation.

According to Cisco's economic analysis, the Internet of Things will generate \$8 trillion worldwide in value at stake over the next decade. This will come from five primary drivers: innovation and revenue (\$2.1 trillion); asset utilization (\$2.1 trillion); supply chain and logistics (\$1.9 trillion); employee productivity improvements (\$1.2 trillion); and enhanced customer and citizen experience (\$700 billion).

"Digital disruption is all around us and it is having massive implications for business. Digitization and the expansion of the Internet of Things is a catalyst for growth, which is driving new economic models and enabling organizations to remain competitive and embrace the pace of change happening globally. The report clearly demonstrates that digitization and the IoT will deliver long term efficiencies and growth opportunities across a wide range of industries," commented Chris Dedicat, president, EMEA for Cisco.

3.3 Automobile Industry

3.3.1 Industry background

Google's self-driving cars are well known. Things are getting connected to the possibility of the car but it is going slowly. It is an accepted fact that any new technology requires at least a year or two mainstream auto industry to spread. That is why things are not examples of such hype around the Internet connection. It

is still in the start-up condition. And the companies will use the innovative technology to support connected car platform.

Industrial automation applications is one of the most profound things. With advanced sensor networks, wireless connectivity, innovative hardware and machine-to-machine communication support with the help of the Internet, the traditional process automation industry will completely change. Like from NEC, Siemens, Emerson, Honeywell, all the big networking industry automation solutions are already on the market.

3.3.2 Utilization for Marketing

A customer service activity in the automobile industry, based on customers calling a service line could be supplemented or replaced by sensor technology that alerts the service center when the sensor detects an anomaly in the car operation that could lead to a serious problem and alerts automatically the service center before the driver even knows about this. By doing this new technology, more and more accidents can be avoided.

Our cars have been connected for years, in ways that by now seem routine: They seamlessly link to our smartphones, register real-time traffic alerts, stream our Spotify playlists, and offer emergency roadside assistance at the touch of a button. Indeed, the automakers began linking vehicles to information streams back in the early days of the Internet. When it comes to connecting drivers and technology, the auto industry has a longer and richer track record than the other sectors.

That is true that automakers have yet to turn the "connected car" into a significant revenue generator or a key driver of vehicle sales: Although two decades of TV ads promoting advances in in-vehicle connected services, drivers have resisted paying extra for those features. This is due to that they either not understanding the new technologies or simply seeing little value in the services offered. But this is going to change. The automobile industry is on the edge of a revolution, and the driving force is the set of technologies known as the Internet of Things (IoT). With IoT applications—grounded in advances in

everything from sensors to artificial intelligence to big-data analysis—all manner of objects, from wristwatches to road signs, can be not only connected but also “smart.” And both industry insiders and everyday drivers/users will soon see a fundamentally different world of mobility.

Analysts differ in their estimates and expectations, but they all agree that the prospects are promising and will be in surprise. Gartner predicts that by 2020, more than 250 million vehicles will be connected globally, with the number of installed connectivity units in vehicles worldwide increasing by 67 percent and consumer spend on in-vehicle connectivity doubling. Deloitte’s consumer research suggests that drivers of the next generation want their cars to act as smartphones on wheels, like to remain connected and productive while on the go, consider fully connected vehicles among the most beneficial vehicle in a complete connection with the future technology and it is ready to pay large amounts of money to meet their needs and desires of all technical tools. It can be expected that the impacts on the industry to be transformational, rather not to be incremental.

As we all know, new opportunities bring fresh and new challenges. As IoT technologies and services transform the automobile, the ecosystem is witnessing a steady influx of new players and the continued evolution of the roles of key stakeholders and the balance of power among them. Of particular interest is the evolving relationship between automobile manufacturers and software providers. Each of them has a viable and different claim on the driver’s seat in the rapidly changing auto-industry ecosystem, even with each new generation of services commitments to throw into question just how long whoever might have their hands on the wheel can keep them there.

4. CONCLUSIONS AND RECOMMENDATIONS

Internet of things is an upcoming technology that takes advantage of internet to control or monitor devices, automobiles

and other physical objects connected to the internet. IoT gives users the ability to control more than digital things easily over the internet. More and more researchers and developers concentrate on researching innovative IoT projects that could benefit the human beings.

From the literature review and the case study, it can be concluded that the experts all agree that the IoT will have huge impacts on the future. But how big this impact will be is still a question. From the literature review, it already show that the connected customer experience is critical for the companies and the companies can make advantage of these data in the New Product Development. And from the literature, it is concluded that the marketing power of the IoT is connectivity for better customer interactivity. From both literature review and the case study, it can show that the IoT technology is inserted in the products. From the case study, it confirms the theory in the literature review that digitalization and the IoT will deliver long term efficiencies and growth opportunities in industries. And it also confirms that the companies could receive tremendous volume of the data from the customers. Therefore, the marketing power of the Internet of Things is connectivity for better customer interactivity. Although the technology of IoT is still developing, a lot of pioneers in the market already started to use this new technology.

The current IoT projects have been proposed on existing system improvements and new innovative solutions to different problems. With the emerging possibility of connecting more and more hardware to the internet, IoT researches are never ending and it will benefit to the mankind more and more in the future. It is exciting to see how the world will be changed by IoT.

5. LIMITATIONS OF THE STUDY AND ISSUES FOR THE FUTURE RESEARCH

Due to the time limitation and limited resources, the information from the case study part is all from online and the company official websites. There are five perspectives in application in this paper. However, there must be more

perspectives in IoT application. Currently, there is no related model which can be applied for interpreting these IoT cases. In the current research field, I can find a lot of related information about IoT technologies. In other words, it is relatively hard to find the related information about IoT in terms of business field.

In addition, this research paper did not include other factors which may affect the other perceptions from IoT. Such as, security of the data, privacy and trust for the customers and users. And this paper mainly focuses on:

- What is IoT about?
- What are the IoT applications and in practice?
- What are the main elements from IoT? Such as, big data and sensing data, cognitive technology, etc.
- What are the marketing trend in terms of IoT?

We can already foresee that IoT would bring a lot of business opportunities. However, it is not easy for the industry to widely adopt the new technologies from IoT. There are several reasons behind. As mentioned above, there are still some lacks in the technology field. Secondly, the research papers related to the business in IoT field is limited and they are not in a large-scale basis. Furthermore, the bottom-line from the companies to use these new technologies is a thing. At last but not at least, it is essential and it is needed to have the explicit regulations and the open global standards as well. For example, the service infrastructures, object addressing and unique identification, etc. For both academic field and industry, this is a challenge to make up this lack in terms of the Internet of Things. On the one hand, the technological gap is needed to be addressed and it is needed to be solved in the future. On the other hand, more and more new business models and more qualified business cases are needed to be developed by the researchers and other people. In the end, the collaboration from the whole world will be essential for this specific topic.

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