



Internet of Things (IoT). The Key of Global Evolution in Supply Chain Procedures and the Significant Impact of IoT to Employees Who Work from the Time That the Requirement of Product Is Aborning Until the Time Which Arrives at the Hands of Customers.

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Abstract - This paper has written in order to show the advantages and the disadvantages of Internet of Things (IoT) in the supply chain procedures.

At the first part of this study a range of information describes the operations in supply chain cycle based on the technology which IoT offers. Companies which are connected in the same network provide the beneficial IoT points for them from the time which customer makes his order until the time which the product arrives at his hands. All the environments of IoT are presented in this way which the benefits of them become obvious. Then the wider meaning of IoT is analyzed referring current and valid examples and results based on researchers. The development in the production procedures into SCM is displayed providing the advantages of IoT as well as the benefits of IoT in global market and its contribution in SCM procedures.

Also, the benefits of companies to implement IoT and the current procedure of companies which don't be integrated to a common network are referred via examples and relative outputs.

Furthermore, the opportunities of technology in the supply chain departments of companies as well as into warehouses and the role of transferring Data between connected devices in order to facilitate the procedures of people who work for the production of new orders from customers are described via examples as the keys of current improvement of logistics into SCM.

At the end of this paper, the impact of IoT in SCM and a relative advice to companies who are going to use or want to be integrated with IoT is suggested.

Keywords: SCM, network, IoT, logistics, procedures, impact of technology, companies, information.

I. INTRODUCTION

Technology is the key of development for these transactions among suppliers and retailers. People can buy anything from anywhere. Via global connected networks customers can be informed directly via Internet to official online stores for the process of their order. On this way, they know not only the delivery time of their products but in which stage is theirs orders. Speed and efficiency are substitutes of effectiveness. These 3 important points are connected and constitute the steps of the successful supply chain. The needs of consumers have provoked a lot demands from manufacturers. Logistics companies can exchange data and information more quickly than previous years. Thus, the procedures are operating with accuracy. The key of development is called Internet of Things. A range of wireless devices provide speed and efficiency from the time that the need of a new product is

created until the moment which the product arrives to the customer ready for personal use.

The successful design of a new product is based on the successful connection between things which are working under the same network and produce the same kind of work for supply chain. Factories, humans, appliances, machines, vehicles are Internet of the things which are connected operating for the completion of products. The wireless systems permit to connected devices via sensors, actuators and software to be synchronized and operated together in the same time. The Internet of Things (IoT) development improves the procedures of supply chain management. The automation of devices or machines as well as new methods of digital supply chain via networks between companies constitute the future development of supply chain procedures.

Operation of supply chain based on IoT

A range of technology standards have changed the production of companies. The demanding period from production level of product until the time of delivery criticize if the supply chain management of this company is successful. Either vertical or horizontal supply chain company uses the purpose is common for all them. When the product is ready for delivery and customer goes to buy it from retailer, he doesn't know how many people and things has worked for its creation.

Customers want to know the time of delivery, raw materials which probably used, whose belongs the order, how materials are available and if is necessary to order new materials for the production of a new item. Details which no one can answer them with 100% certainty if these are valid or directly available. Internet of things (IoT) via ERP program can maintain repositories in order to have access in data directly. Thus, files with personal details of companies, customers and employees will be contained into them for notifying purposes.

Connected supply chain and operation results.

Things have sense and communicate each other in order to act, criticize and make assumptions for future benefits or accidents. Connected things are exchanging data and information during procedures. Thinking what exactly is IoT imagine a computing cloud which contains plenty of information as inventory, current process of product and availability of it. Digitized supply chain permits monitoring of goods in real time. On this way, companies

can have better management for their costs and calculate with accuracy unneeded expenses.

Understanding the function of digitized supply chain have in your mind a digital universe in which there are many tablets, smartphones, H/Y and other connected things and devices. For example, a retailer which sell many types of shoes make an order from wholesaler 50 set of black shoes. The availability of shoes is referred clearly on the official online shop of wholesaler. Thus, Retailer is searching directly details as size, color and number of shoes which desires to order. This example of purchase and delivery via wireless things as computers, mobile phones, software and data which probably has used for the successful procedures among retailer and wholesaler. This operation can be characterized as "digitized supply chain procedure".

Wireless supply chain not only develop higher demands from customers but using digital technology new opportunities are displayed. Also, unprecedented operations for new methods are discovered via Internet and connected hardware, also. On this way, experts can make specific assumptions for future problems and avoid them. E-commerce is promoted by new digital technology. Everyone can buy from an online store and informed for the process of his order or time of the delivery. Thus, the supply chain services become more efficient and effective. Furthermore, smart Manufacturing is improved by internet technology. Scientists have created robots in order to work into factories for huge periods without breaks.

From one hand, people lose their positions every day because of technology. Supply chain development is ameliorated by Internet of Things. Machines having sensors, actuators, knowledge, information as well as data in their software work offering speed, efficiency and effectiveness into supply chain operations. Energy systems and transport machines, wireless things can sense and communicate creating artificial intelligence between things into the same network.

II. Benefits of Technology

As detailed above customers demand higher levels of services and quality of products due to benefits of technology. Wireless devices as smartphones give the opportunity to customers to have access on the online platforms of companies checking the process of their orders. Specially, to having delivery visibility of products and image of the process of product, online stores advice customers in order to have directly access to the network to create a personal account in the electronic platform. Thus, they can watch previous orders for analysis purposes of their expenses. Thus, they can make common reports to all groups of supply chain.

Customers can be integrated in different channels and networks using "Apps" or visiting official online stores of retailers making transactions with other companies of the same network. On this way, the transparency and

visibility of supply chain is developing. The result of that is to be visible every transaction until the product delivered to the customer. The source of materials and the methods of production as well as the sustainability of development the steps of supply chain cycle.

III. Internet of things (IoT)

Understanding what IoT means, draw a pizza in your mind which is included by 3 ingredients. According to chef, into recipe all ingredients should be included as required. A similar procedure is imposed in supply chain cycle. Specific rules should be followed in order to have a successful cycle of supply chain. IoT or Internet of Everything is operating based on three designed environments.

A. Technological environment

First of all, the technological environment including by hardware, software, integrating platforms, networks and data connects all these devices which are exchanging data during supply chain procedures. Namely, the necessary details of product which suppliers, manufactures, wholesalers and retails will need until the product arrive to hands of consumer.

The technological environment of IoT is constituted by wireless devices. For instance, there are laptops, Radio-Frequency Identification(RFID) tags and readers, smartphones and wireless sensors which are connected with other human and non-human objects in order to communicate. Using server-side software customers can watch processing details for their products via applications which have designed for a specific number of people. Software have designed from out-sourcing vendors not for the same companies. Consequently, companies' ERP programs have an exclusive way of management operations. A common network is constituted from devices which can be connected with Bluetooth Personal Area Network (PAN) technology. But, only a specific number of connected devices is permitted to be member. These devices are exchanging data each other for the production purposes.

Network groups are connected and operated via satellites, Bluetooth technology, mobiles network or other wireless networks. Thinking of technological environment contribution imagine a big house. The kitchen of house contains different types of home-appliances which are necessary to cook. All these objects as knives, pans and saucepans are useful for the mother to cook for her family. Without one of them mother will face a lot problems in order to succeed a meal for her children.

B. Physical environment.

Understanding the wider function of physical environment imagine every type of things which can be used by humans or can be operated without human's help. The central idea of IoT is divided in human and non-

human objects for supply chain researchers. The real meaning of human objects is that they are people from different locations around the world who are interacting each other directly via IoT using wireless devices as smartphones, tablets, RFID tags and laptop computers.

Non-human objects are characterized the physical objects as cars, food items, moving or stationary objects, fruits, factory equipment and electronic devices. IoT promotes a global connectivity including by everyone and everything. Animals also can be connected to the global network. Scientists installing in animals' bodies sensors and actuators and via RFID technology make analysis and experiments based on the reaction of environment. These two sections of physical environment exchange data via big networks to a bigger centralized data for analyzing or reading purposes. Thus, suppliers can have a clear attitude for the raw materials which promote to manufacturers.

Every type of objects either human or non-human is embedded with a real surrounding. A room or a house, stores and houses, an office building even a large city can be connected with this network. For instance, the doors at the entrance of the company are connected with wireless chips integrated with cards. Employees should check their cards in order to can pass the doors and enter at the building.

C. Socio-economic environment.

IoT applications via RFID hardware are constructed based on legislation bodies. The construction of applications should be followed by legislation in order to operate legally and effectively. For example, a healthcare application as e-health should be operated under the prerequisites of Health Insurance Portability and Accountability Act (HIPAA).

On the other side, RFID hardware should be structured and operated in compliance with Federal Communications Commission (FCC). Consequently, constructors should be careful how they start designing applications. They should be operated with some standards into their mind. Customers are displayed as the main characteristic of socio-economic environment. According to market rules, a business idea should be responded in a specific team of customers. Either big or small group. A designing plan in order to be profit should be carefully analyzed before manufacturers bring it to market. Making effective results and predicting future revenues of that, the profit process can be predicted in higher levels.

IV. Promotion of products into SCM and IoT contribution into her

Customers don't know what product they would like to buy until the moment which retailers show it to them. From the other hand, industry associations are responsible to take important decisions for future developing business plans for the others smaller companies. Specially, the developing way of a plan should be approved from bigger industry group in order to proceed to operate. Industry

associations are responsible for setting standards and guidelines which adopt safety and developing changes of IoT applications

Consumer privacy groups constitute a valuable part of socio-economic environment. The main purpose of them is to collect significant repositories of data for individuals.

V. Advantages of IoT in the supply chain cycle

Thinking all these details which are analyzed in this article probably you still haven't understood yet why researchers want to connect everything on planet. Goods, objects, machines, buildings are manipulated by things, Internet of Things. Plenty of scenarios have developed from scientists with different words but with same meaning.

- A. Combining digital and physical products or services, IoT captures real data from supply chain and make assumptions for future problems or even the bankruptcy of a company.
- B. Via Applications (Apps) all items are exploded in a global network. For example, an IT approach as Demand-Driven Value Network(DDVN) companies can access to all their activities directly. DDVN is a business system which improves the management of companies. On this way, DDVN constitutes a source which offers ultra-efficiency for the enterprise.
- C. In the terms of time supply chain procedures are succeeded by digital technologies in relation with previous years. Suppliers, manufacturers, logistics partners, distributors are connected in real time. Namely, all processes and events are registered the same time into an online system. People from different places of world work together via H/Y. This way is more intelligent, efficient and responder.
- D. Applications via data aggregators offer a plenty of important operations which facilitate and enjoy the lives of people and promote a different function of supply chain into companies. First of all, the chance to have connected things constitute a new way to interact in different networks and learn for things that you benefit.

VI. BENEFITS

Benefits of IoT in global market and its contribution in SCM procedures.

Today, the vast development of technology offers speed and efficiency in higher levels than last 10 years. Monitoring of things via smartphones and location opportunity, users can know useful details as where is the closest hospital or pharmacy. E-health and e-medicine are presented as the most famous applications in social industry. Furthermore, a user can search for personal things as information or the availability for his summer

vacation. But the most significant clue is that client can be informed for private details of products. For instance, the time delivery of food or what will be its temperature when it arrives to customer. All these operations which Apps offer nobody can deny that are useful for most of people who use them. But they discovered for more important factors. In supply chain, via IoT manufacturers, retailers as well as all members of supply chain can manage, control and criticize. The 51% of world live in cities. Consequently, the demand and supply of products are based on citizens who live in megacities. Thus, companies should check constantly the flows of supply chain operations. Via Digital Supply Chain (DSC) the management of companies can be informed directly for events which are happening into the primary product flow, information flow, finance or cash flow and in demand flow. Also, managers can be informed for details in primary cash flow and reverse product flow. Connected things can decipher in digital view payments and invoices of products as well as information of suppliers in order to be clear into system who has paid off and who is charged off. Via online cards personal invoices and orders are in digital form and can be sent to customers via e-mail. On this way, the cost of transportation stays on low levels constantly and customers have a clear attitude for the process of their products. A personal online card offers details for materials, services and finished products for customers, also. The benefit in supply chain is that all processes are obvious to all and if someone has a problem as the return of a product, company knows everything as time, shape and size of his product in order to have quick response to her customer.

The benefits of companies to implement IoT for SCM purposes

Thinking of IoT advantages in supply chain function, imagine a plenty of different keys elements which are connected each other and provide a step by step integrated planning and execution connectivity from customer to distributor and from distributor to supplier. This function is known as the "horizontal method" of supply chain. Using connected devices, all data can be stored with safety in data fields. On this way, the transparency and visibility of actions are obvious to everyone. Customers' needs are increased and management departments of companies make efforts in order to provide efficiency, speed and effectiveness between their transactions.

VII. REALITY

A. Current situation of Supply Chain Methods into companies

Customers demand more and more details than previous years for materials which are included into products the true source of product as well as the procurement of that.

For a long time, companies used to have a unique supply chain. In fact, supply chain methods of companies had the priority to decide individually the way of their operation. The need for connectivity imposed changes in the way of supply chain operation for companies. The strategy of supply chain imposes effective collaborations between suppliers, manufacturers, wholesalers and retailers with customers. Thus, the smart manufacturing changed the way of processes and deals between companies. Now, utilizing one piece of flow for production effectively produce better results.

B. Technology in warehouses

The digitalization of warehouses using automated flows and combining different types of technology as automated vehicles and robots achieved to improve logistics processing in relations with previous years. Furthermore, using Data companies can have repositories of transactions and financial loose ends which have provoked with customers. For instance, the return of a product or a wrong order from manufacturing warehouse. On this way, an autonomous B2C logistics is created between businesses and consumers.

C. The opportunities of technology into SCM

Internet of Things (IoT) has changed the way of operation in supply chain procedures of companies. Opportunities as imagery, optimization, dashboard and social messaging has improved all the procedures of product. Now, employees can communicate more quickly and via images can immediately understand what is happening to other networks. On this way, they are informed constantly for changes which probably will affect the successful operation of supply chain. Facebook, Twitter, LinkedIn and Instagram constitute the most famous way to promote products and services. Now all companies can have an online store or page and Facebook users can order directly from the company's products that they desire.

D. The role of Data via IoT in SCM

Moreover, Data Foundation (DF) offers a lot of advantages for supply chain. The usage of data science in machine learning can produce predictions for future supply chain operations. Thus, infusing cognitive intelligence in supply chain via machines, things, programs and applications helps ensure product reliability.

E. The contribution of IoT in logistics

Most logistics Companies have private inventory visibility of their products or services as well as fleet monitoring of supply chain. Customer can be informed

constantly in which processing level is his order and the time of delivery.

Machines permit to manufacturers to operate with smart equipment. In fact, automating vehicles or machines produce work ten times more quickly and efficiency than human hands. On this way, via improved test methods retailers have an accurate information of time delivery in order to inform their customers. Furthermore, accidents are avoided because machines are programmed in order to work with standard movements into factories offering guarantee success on their work.

VIII. RESULTS

A. Impact in supply chain procedures

The biggest benefit of IoT is that saves money and energy. Applications are communicating each other exchanging data directly to all connected systems without be necessary to go somewhere to make a business meeting or check the current inventory into retailer warehouse.

IoT promotes Machine-to-Machine (M2M) communication. The result of M2M opportunity provides better transparency with lesser deficiencies. Due to objects that physical environment of IoT promotes, central wireless infrastructures have designed constituting by automating machines and things which communicate between them and produce faster and timer output.

B. The disadvantages of IoT technology in transactions of SCM.

Although the chances of IoT are plenty, all this automated and connected world of supply chain can be dangerous. A wrong record of information as delivery address or name of customer can provoke unpredictable problems. A lot of issues are created every day because of complexity of systems. Think a machine which construct plastic bags, one day present one technical problem on robot-machines and start destroy the products into warehouse. Thinking that the economic damage which company will be suffered is vast. In addition to that a big number of IoT data is transferring via machines and online programs as networks every minute. Despite the fact that all these high security systems which companies have probably equipped there is possibility of hacking. A lot of strict information is transferring via Internet. For example, number of accounts at banks, big amount of money between companies and even more codes for weapons between countries.

Compatibility of connected devices between different networks constitutes a global problem for IoT technology. Manufacturers should be operated with global standards and the persist them. For example, today all devices are equipped by Bluetooth technology.

This connectivity sometimes can provoke problems with Data. A failure in software or hardware can have as a

result the loss of many important files for supply chain procedures.

IX. CONCLUSION

Proposal to companies which use IoT for the procedures of Supply chain cycle

Departments of companies which are responsible for the effectiveness of transactions into SCM cycle should be careful with the transferring data which exchange. It is suggested that they should have always repositories of data in case of technical problem which cause loss of data. Because of the big amount of daily transferring data, they should have with a high level of online security in order to be maintained the safety and security of transactions with customers. Moreover, it's a good idea for companies start using validating keys for each action into ERP programs as well as a frequent update of personal information of customers as address and name in order to be avoided accidents as wrong delivery of product it is crucial. Last but not least, the timeliness of deliveries and reliability in terms of deliveries are the first priorities for the satisfaction of customers which the departments of companies should be accommodated.

To sum up, the management departments of companies should make efforts constantly in order to improve not only the services to their customers but to always satisfy them having a long-term collaboration and not short-term.

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