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Applied research on supply chain management based on internet of things

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ABSTRACT

Over the next decade the Internet of Things as a strategic emerging industry will become an important force to promote global economic development and the face of human life will thus open a new page. This paper describes the content and main technology of the internet of Things to conduct a comprehensive, systematic study, which aim to explore the new supply chains management model based on the Internet of Things, as well as the value of RFID technology in specific links of the supply chain and the practical application of the internet of Things in the enterprise．．

Key words: supply chain; internet of Things; RFID technology

INTRODUCTION

After the 2008 financial crisis, the world of networking industry and technology development is increasingly valued. In 2010 Things are first written into "Government Work Report" by Premier Wen Jiabao, and in the "Twelfth Five-Year Plan" listed as a strategic emerging industry, it also highlights the importance of a high degree of government networking industry development. Things as a new generation of information technology, experts generally agreed that the current technology can be divided into four categories such as radio frequency identification (Radio Frequency Identification, RPID), M2M, sensor network, integration of the two [1-3]. One of its core technologies is radio frequency identification technology (RFID). Articles in this network can communicate with each other without human intervention. Its essence is the use of RFID technology to interconnect the Internet through a computer networking and sharing of ideas in the automatic identification and RFID tag information items stored in a standardized and interoperable information via wireless data communication network will collect this information automatically to a central information systems to identify goods so as to realize the exchange and sharing of information to achieve the management of goods through open computer networks[4-6].

At present, China IOT industry still exist many deficiencies which is still in a fledgling stage, the relatively small scale of the industry, a wide range of application areas is not enough. In particular, the implementation of the initial investment companies when big things technology, standards and security issues and other issues outstanding, restricting the current IOT technology in our enterprise application and promotion, thus further restricting the development of China's Internet of Things industry[7]. How to build a new enterprise supply chain management model based networking technology, how things technology specific application value in this mode, how to accept or reject the adoption of enterprise networking technology, enterprise adoption of the factors which affected the behavior of networking technology, etc. topics are also increasingly subject to academic attention and attention.
In this paper, it is hoped that through the supply chain issue new management model based networking technology research, analysis IOT technology application process in supply chain management, value, to explore and find the current impact and constraints preclude the admittance of enterprise networking technology the main factors, on the one hand to provide a reference for the enterprise networking technology preclude Carolina decisions; and imperative to provide direction for the development of networking technology and future development[8-10].

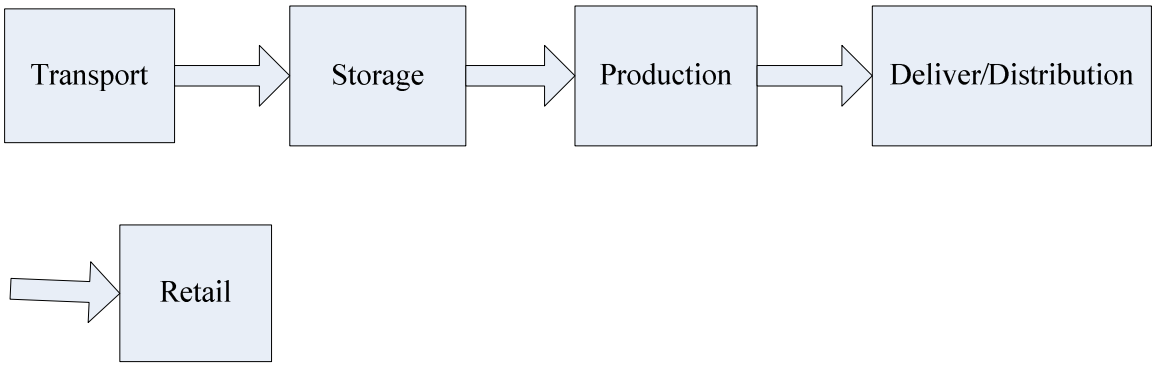

Fig. 1: Process of supply chain management

CONTENT OF INTERNET OF THINGS

Internet of Things (IOT) is also called "sensor network", which refers to the use of radio frequency identification (RFID), and other information sensing device, the information connected to the Internet in real time of all items, intelligent management and identification. Things to assign each item identification, item identification in obtaining information via radio frequency identification (RFID) devices, infrared sensors, global positioning systems, laser scanners, so as to achieve the purpose of the identification of goods and supply chain real-time tracking. This requires networking, coordination and capacity for self-awareness have become an intelligent system. Things consists of three elements, one sensing device, namely a two-dimensional codes, RFID tags and sensors to identify the "thing", the domestic low-frequency RFID-based: the second is the transmission network, that is, through the existing Internet, radio and television networks, communication networks or future NGN network, data transmission and computing, such as China mobile and actively promote the M2M business; Third processing terminal, refers to the control terminals, mobile phones, computers, communication base stations and other mobile input and output terminals..

In recent years, in response to the increasingly fierce market competition, many companies will implement supply chain management as the primary means to enhance competitiveness. Great achievements made some well-known companies in the supply chain management practice, but also make people more convinced of supply chain management is an effective way for enterprises to adapt to global competition. However, things appear and on a global scale for new ideas each item tracking and monitoring of the supply chain process and change management tools in fundamental for the development of enterprise supply chain management to bring new opportunities. Therefore, the study of how things will affect the development of enterprise supply chain management has become an important subject of discussion and research.

SUPPLY CHAIN AND SUPPLY CHAIN MANAGEMENT

Research on the theory and practice of supply chain management has always been the academic and business focus of attention. The concept of supply chain and supply chain management has been in a constant process of evolution. Fig. 1 shows the process of supply chain management. Through the analysis of existing literature, different scholars from the perspective of the supply chain were each given a different definition. The nature of the supply chain to include the plan (Plan), raw material procurement (Source), manufacturing (Make), a distribution (Deliver), such as the four basic processing operations, include the procurement of raw materials to production to product distribution eventually reach the hands of customers All activities that the supplier's supplier until all members of the ultimate customers are linked together, a chain structure composed. In broad terms, can be defined to include balance, raw materials and spare parts to obtain and supply management needs, manufacturing and assembly, warehousing and inventory tracking, order entry and management, physical distribution and logistics activities delivered to the final customer of the entire process. According to the above definition of the supply chain, the supply chain has obvious dynamic offerings, is an evolving dynamic network evolution. Around the core business of the supplier in the supply chain, as well as suppliers of suppliers and customers, and the customer's customer is a network node of the network system. Through close cooperation between nodes enterprise demand and supply of such a relationship, step by step to maximize value-added goods and interests of each member in the supply chain. With the changes in the external environment and corporate strategy, corporate link between the internal and the nodes in the supply chain members need to be dynamically updated to reflect the dynamic nature of the supply chain.

Since the 1990s, with the development of globalization, rapidly changing technology, the rapid progress of science and the market, intensified competition among enterprises. Academics and business practitioners began on how to cooperate with upstream and downstream enterprises, strategic alliance to pursue a win-win-win as well, the customers and the companies that create more value and profits for reflection, resulting in the concept of Supply

Chain Management (SCM). Supply chain management is not just concerned about the physical flow of materials in the supply chain and, more importantly, it is to the overall logistics costs and customer service level as the objective function, for only through the various functions of the organic integration of the supply chain closely, in order to maximize the power of the supply chain as a whole play, win supply chain enterprise group purpose.

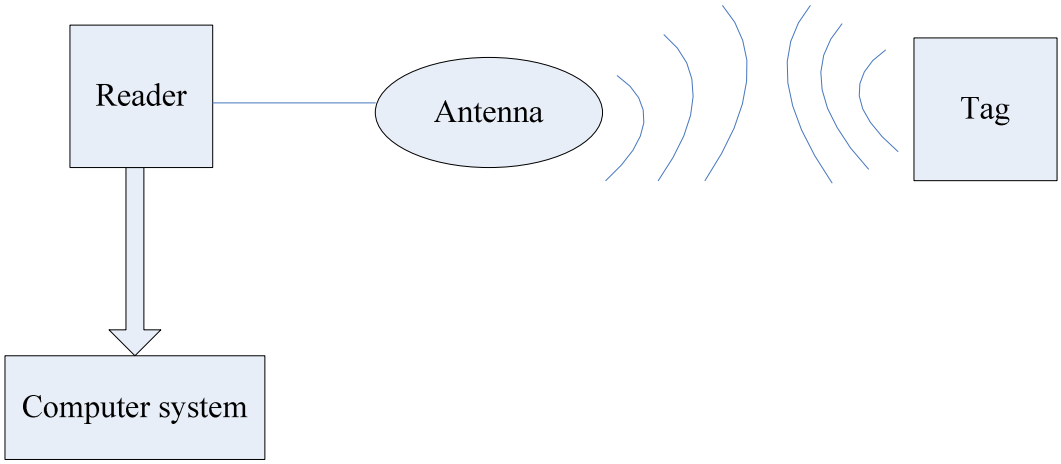

Fig. 2: The working theory of RFID system

THE MAIN TECHNOLOGIES OF IOT

First, RFID. Fig. 2 shows the working theory of RFID system. It is a non-contact identification technology using wireless two-way radio communication technology. It supports read-only mode can also support write mode, and no contact or sighting, can work freely in a variety of harsh environments, can be a high degree of data integration. In addition, because the technology is difficult to counterfeit, intrusive, so RFID is with a high security protection. It has easy data reading, identifying fast, effective distance, a wide range of characteristics to identify supply chain management. In the supply chain and the rapid development of the logistics industry today, it is its unique advantages, as the field of automatic identification shining bright spot, called the new darling of automatic identification technologies. A basic RFI D system generally consists of three parts, namely, EPC tags (Tag), reader or reader (Reader) and applications (including connecting lines) of three parts. Which, RFI D tags to identify the target of stored information or additional information such as error checking, data tag reader receives the signal, application management collected.

Second, GPS tracking technology. Establish an effective networking, there are two major difficulties that must be addressed: First, the scale of, only with a scale, in order to make intelligent articles play a role; Second, mobility, goods are usually not static, but in a state of movement, items must be kept in motion, even under high-speed motion state can be achieved at any time monitoring and tracking of goods. Then, relying on GPS is the best solution. GPS has become increasingly common in the current applications such as car navigation, water rescue, rail transport, as long as there are GPs receiver, navigation satellites will be able to determine the location of any object on the planet. And GPS with high precision, all-weather, high efficiency, suitable for real-time tracking of goods enabling technologies.

Third, enterprise application system. Application system is the key to networking technology and business connections to the Internet of Things technology into real life, companies need advanced ERP system, WMS systems, and CRM systems. Existing enterprise application system is not suitable for the application of networking technology, to the formation of automated production, transportation, marketing and other aspects of intelligent management, the development of powerful enterprise applications is one of the problems to be solved.

THINGS BASED ON EPC / RFID TECHNOLOGY AND HOW IT WORKS IN THE SUPPLY CHAIN

Things architecture can be divided into three levels: the ubiquitous perception of the end of the network, the integration of network communications infrastructure. Giving universal application service support system, they are often referred to as the perception layer, network layer and application layer, while the core is the Electronic Product Code (EPC) technology, radio frequency identification (RFI D) technology. By electronically coded for each product, combined with RFI D technology, the circulation of products, components, raw materials processing, transportation, distribution and marketing chain to track, improve transparency and control of supply chain information transmission.

EPC stands for Electronic Product Code, Chinese translated as Electronic Product Code, or electronic product code. It is to improve the logistics supply chain management, reduce costs and recently developed a new technology, is an encoding system. With the traditional bar code is different, it is based on EAN. UCC (ie Global Identification System) based on bar-coded, based on the increase in the barcode data three sections, namely, the domain manager, object classification and serial number, in order to achieve a single product logo. Electronic Product Code is the next generation of product identification code, which can be the object of the supply chain (including articles, cargo containers, pallets, location, etc.) globally unique identifier. EPC is stored on RFI D tag, which contains a silicon chip and an antenna. Read EPC tags, it can be connected with a number of dynamic data, such as the product's country of origin, date of production, the current status. By commodity circulation of such information constantly updated, one can achieve the shelves of goods, from raw materials to the full track in the world.

Things based EPC / RFID technology fully combines two technological advantages, are playing an increasingly important role in the supply chain. EPC tag stores the specification and interoperability of information, this label after production is completed, once formed, after which the entire life cycle of the product, the EPC code that uniquely identifies the product becomes, through a wireless data communication network automatically collect them to a central information system, the product of real-time query and identify the relevant information, so as to realize the exchange and sharing of information through open computer networks, various circulation in the supply chain for product positioning track to achieve transparency in the management of the product. Meanwhile, the use of RFID technology into the electronic tag when the transmitting antenna generates an induced current work area, the tag is activated for energy, then their encoding information transmitted by the transmitting antenna built pins; receiving antenna to the transmission system from the electronic tag to the carrier signal transmitted to the regulator via an antenna reader, the reader demodulates the received signal and then decoding back to the host system performs the correlation process; Analyzing the primary system based on the logical operation of the legality of the label, for different setting process and make the appropriate control, the electronic tag data stored in the identification and exchange of information. Circulation of its product supply chain optimization reasonable, rational allocation of resources, real-time monitoring of the process of circulation, improve supply chain efficiency and transparency.

IMPACT OF IOT ON SUPPLY CHAIN MANAGEMENT

The effective implementation of supply chain management from the two major carriers rely on (computer information systems and logistics and distribution centers) is not difficult to find every information industry development can give the appearance of a wave of supply chain management as opportunities. Thus, the appearance of things the supply chain management process will also appear in a series of questions to provide part of the solution, and its further effective application in the enterprise opportunities. Things were analyzed by following the part the supply chain management of several applications to demonstrate its impact on the development of supply chain.

Transport part. In transport part, through the goods and vehicles in transit EPC tags affixed to install RFID transponder device receives the checkpoint transportation line, so that suppliers and distributors can know in real time the location of the goods, status and estimated time of arrival You can also reasonable dispatch in transit vehicles to maximize vehicle utilization.

Warehousing part. In warehousing part, EPC-based real-time inventory and smart shelf technology can ensure efficient management of its corporate stock. Through the intelligent management of goods, but also can improve the utilization of storage space, so that enterprises understand the real-time inventory, thereby reducing inventory costs, improve the accuracy of inventory management. In the warehouse, EPC technology is the most widely used access to goods and inventory, it can be used to automate inventory and pick up other operations. When a label affixed to the product out of the warehouse EPC installed in the warehouse RFID reader automatically identify a range of items, automated inventory. Through access to information in the database, RFID reader can also be read out automatically product into shipping time, and out of the warehouse storage location and quantity, improve space utilization storage center, and can quickly and accurately understand their inventory levels, thus effectively reducing inventory costs, saves labor and storage space, while reducing the loss of the entire logistics due to product misplacement, sent to the wrong, theft, damage and inventory, shipping errors caused.

Production part. In the application of EPC technology manufacturing sectors, the operation can complete automated production lines, the entire production line to achieve through the identification tag of raw materials, components, semi-finished and finished products identification and tracking, and quickly find and accurately from many kinds of stock bit raw materials and parts and labor required, thereby reducing labor costs and the identification error rate and improve efficiency and effectiveness. In addition, EPC technology can help managers to issue timely replenishment information in accordance with the production schedule, making production more flexible, but also strengthened its

product quality control and tracking. Meanwhile, based on EPC / RFID technology, networking technology can also help the production managers rationalize production schedule, by identifying electronic tags to quickly inventory from many kinds of raw materials and components to accurately locate the desired station, immediate follow-up production processes and information to achieve a balanced line replenishment issued in accordance with the production schedule, steady production, but also strengthened its product quality control and tracking. Hair material production line process, the first task of the automatic system for production scheduling; AGV car loaded with materials according to certain rules put through the production line each station; installed on each workstation in real time RFID reader through the AGV car scanning, you can automatically identify the current station needs what materials, how much need, whether they have all been put in place, such as the current station employees can be equipped according to the prompt display, pick up the production of materials. Feeding in the production process, RFID reader production stations remaining on the current situation of automatic identification station materials, real material needs to send information to send material chamber sends the material preparation work in a timely manner, to ensure adequate production line materials, continuously feeding, not accumulation, etc.; provide on-site material flow rate, so that the site clean and tidy.

Distribution / distribution part. In distribution sectors, by updating the product information posted on EPC tags, so that management members can implement accurate inventory control through the computer, greatly accelerate the speed and improve the delivery and distribution process selection. The efficiency and accuracy, and can reduce labor, reduce distribution costs. By EPC technology, can automatically identify genuine and fake goods, to achieve automatic clearance and distribution part; while improving distribution chain security and visibility, easy business to track goods distribution process. Meanwhile, the application of things to improve the safety and reliability of the distribution of goods, for goods distribution sectors in the sorting, packaging, transport and stacking and other operations provide a strong technical support to improve the accuracy of these jobs and efficiency and reduce distribution costs. During distribution of goods and vehicles in transit transport EPC tags affixed to install some checkpoints on RFID transportation line to receive forwarded devices. So when the goods in transit, either suppliers or dealers can be a good understanding of the current cargo location and estimated time of arrival. Especially for high-value goods, dangerous goods easily leak requires sealing the transport of goods, etc., can be used active RFID technology, its packaging and boxes; If abnormal unpacking, central monitoring system to get items conditions, timely warning, to reduce the harm and loss.

Retail part. In retail, through the use of an embedded scanner with shelves that can effectively monitor the flow of goods, but also play a role in cargo theft. When the quantity of goods inventories dropped to a low level, but also to achieve timely replenishment, reduces inventory costs. Smart scales based on RFID technology automatically identifies the type of goods, according to the measure of goods, pricing and print receipt. At the mall exit, trademark with radio frequency identification tag reader by scanning the vehicle disposable goods, and from the customer's debit card automatically deduct the appropriate amount. These operations without human intervention, saving a lot of labor costs, improve efficiency; speed up the checkout process, while improving customer satisfaction.

Sale and recycling part. Consumers in the purchase of goods, you can use the identification label on the goods, from raw materials to product details to understand the production process, such as that ease of use. At the same stage in the service, companies can track consumer usage, problems of retrospective reason for the use of process issues, suggest improvements, enhance customer service levels, and better capture the market. For larger product accident, the case data and complete in all stages of the product, the various companies in the supply chain can work together to negotiate, to discuss a response plan, because the future of business competition is supply chain and supply chain. The entire supply chain is one of the common face of the industry crisis, opportunities for joint development of the industry, only the formation of this awareness, companies can compete in the new environment, by improving their supply chains to improve their business model by adjusting their supply chain to improve corporate value creation and value capture behavior should be the logical relationships and value networks.

Based on EPC / RFID technology networking applications is in the early stages of development, technology is still immature, supply chain strategy in the social and economic effects of the resulting application is far from apparent. However, it is foreseeable that in the near future, networking technology will inevitably change the production of human life, especially for supply chain management, and even bring about revolutionary change. Companies want to share opportunities in the future market competition, and must attach great importance to the development of networking technology, the use of existing technology to gradually achieve supply chain system under the support of things. Especially applied research in inventory, because "bullwhip effect" the most direct manifestation is dominant in inventory. There are many causes of inventory produced, but mainly from procurement, market factors, the characteristics of the bullwhip effect is a new supply chain inventory management, traditional inventory management method can not solve these problems, and only from the supply starting a whole chain, based on the application of networking technology, to build the supply chain through each node good strategic corporate

partnerships, information sharing, in order to obtain relationships throughout the supply chain inventory levels, orders, production and delivery conditions accurate information so that the production of the actual needs of customers conduct, thereby reducing demand variability in the supply chain, in order to contribute to the supply side to make more accurate forecasts and provide better services to the bullwhip effect can be effectively controlled . Therefore, the study of supply chain enterprises should spare no effort in each node, the development of networking technology, applications, and practical applications in all aspects of the supply chain, we found that the actual problem and improve technology. The near future, IOT will bring a new supply chain business model.

CONCLUSION

Although IOT from the real into the large-scale practical stage still experience a long time and it still exists many problems to be solved, including how to reduce costs, develop industry standards, research and development of core technology and so on, but based on EPC / RFID technology, things have integrated into all aspects of supply chain management, supply chain management and the development had a significant influence. With the deepening continues to mature and application-related technologies, the development of things is bound to play a positive role in promoting the development of supply chain management. IOT and RFID technology have become the third revolution in the global information industry and they are gradually widely and deeply used in various fields. Although the development of the Internet of Things is still in its infancy, but all aspects of supply chain management have been greatly affected. With the continuous development and in-depth theoretical study of Things and RFID technology, things will change the operating mode of supply chain management and realize the visual management of supply chain.

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