

Relevance of Internet of Things in Animal Stocks Chain Management in Pakistan's Perspectives

Mir Sajjad Hussain Talpur, Murtaza Hussain Shaikh, and Hira Sajjad Talpur

Abstract—With the blossoming rise of the Internet of Things (IoT) in recent year's internet of things play a significant role for the development of effective traceable supply chain management of animal products; traceability in animal products supply chain management is essential. But due to the special requirements of some applications, the existing technology cannot meet them effectively. The traceability in Animal products supply chain management is a hot issue for the researchers of IoT. Animal product traceability system must be constructed and give an assurance with the enhancement of internet of things. In this article we would discuss the significant role of IoT in animal product supply chain management, benefits of Internet of things in animal product supply chain management. Physical aspect of the use of the IoT is different between different animal products and lastly the involvement of IoT among the applied research and current practical applications. In Pakistan IoT based other emerging technologies are still in early foundation stage; especially in the animal products application of supply chain management. This paper also tries to highlight a new agricultural product supply chain management not only to achieve the visual quality and traceability of agricultural products and ensure people's food quality and safety but also effectively control the food diseases.

Index Terms—Traceability, chain management, quality, safety, logistic, components, technology.

I. INTRODUCTION

Pakistan is an agriculture country, and through the technologically & economic development in the country, peoples are mainly concerned about the atmospheric conditions, and protection of their animal stocks and products. "High quality & Harmless animal products" demanded in all over the world markets, the universal expectation of all customers of animal products wants good quality animal products; which on the animal products supply chain management (APSCM), has put promote superior requirements [1],[2]. In order to enrich the quality and protection of Pakistan's animal products, improve the market and make them competitiveness of animal products, must develop an effective, efficient and secure animal product traceability system, traceability system of animal product should have dynamic and efficient management of the

products [3]. Therefore, it has big challenge for researcher or developer how to use advance information and communication technology. So the implementation of animal product supply chain management has become one of the key areas, IoT as the modern and new emerging information and communication technology has become one of the major factors in the animal product supply chain traceability system of animal products [3],[4]. The IoT is a key technology that is quickly gaining ground in the development of modern secure wireless telecommunications and also somehow visible in other computer related terminologies as determine in figure 1. There is no standard identification of "*Internet of Things*". Considering the functionality and identity as central it is reasonable to define the IoT as "*Things have identities and virtual personalities operating in smart spaces using intelligent interfaces to connect and communicate within social, environment, and user contexts*" [4].

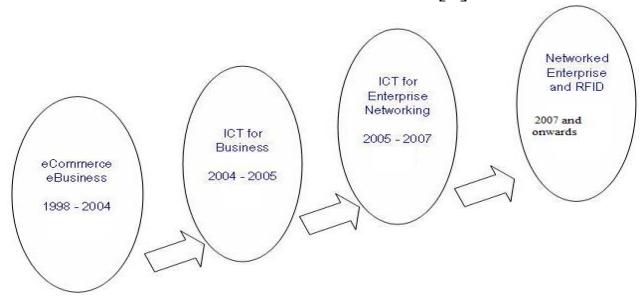


Fig 1. Continuation of improvements in ICT era

We are entering a new era of ubiquity, we are entering the Internet of Things era in which new forms of communication between human and things, and between things themselves will be realized. A new dimension has been added to the world of information and communication technologies: from anytime, anywhere connectivity for anyone, we will have connectivity for anything [5]. Therefore the main idea of this thought is the pervasive existence around us of a mixture of stuff or substance; such as Radio-Frequency Identification (RFID) tags, EPC technology, tiny sensors, actuators, cellular phones, and so on. These things are capable to interact with each and collaborate with their neighbors through the unique addressing schemes, in order to achieve their goals [6].

II. STRUCTURING AND COMPONENTS OF IoT

Through the Internet of things, anything in the world can be identified tracked and monitored on demand anywhere at any time. Internet of things is considered as another revolution following the Internet after information and technology industry. On the bases of IoT Structure; internet

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of things has three basic components, namely RFID systems, middleware systems and Internet systems Savant. RFID system is the backbone of IoT and it enables data to be transmitted by a portable device, called “*a tag*”, which is read by an RFID reader and processed according to the needs of a particular application. The data transmitted by the tag may provide identification or location information, or specifics about the product tagged, such as product name, size, color and weight. RFID systems can be used to monitor objects in real-time, without the need of being in line-of-sight. This allows for mapping the real world into the virtual world. Middleware savant system is software that bridges RFID hardware and enterprise applications [6], [7]. It is the primary means of data gathering for any RFID deployment and it consists of Savant server, ONS (object naming service) servers, PML (physical markup language) server and the corresponding data server software [7]. Internet system consists of computer systems and network servers as shown figure2.

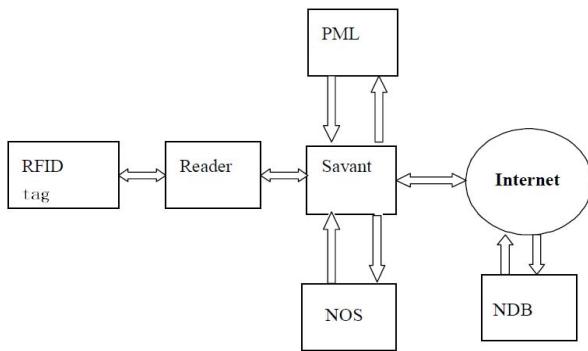


Fig. 2. Fundamental composition diagram of IoT

IoT has vision to boast the communication technologies in order to connect the things into objects anywhere, anytime, and any media. In this reason, wireless communication technologies played a significant role and now-a-days the ratio among the radios and peoples is almost near to same.

III. OPERATIONAL PRINCIPLES OF IOT

The Internet of Things is a technological revolution that represents the future of computing and communications, and its development depends on dynamic technical innovation in a number of important fields, from wireless sensors to nanotechnology. The essential working principles of Internet of Things based on Radio Frequency Identification which is known as the heart of IoT, EPC technology used global unified products coding and wireless communications technology in order to tracing of animal products, boast the integrity of animal product supply chain management, decrease logistics expenses, as the innovative new technology [8]. Products completed in the production, labeled with EPC code stored electronic tags. Furthermore, in the whole life cycle of the product, the EPC code easily recognizes a product, as EPC codes for the index in real time query and modify objects information from the product network, but also use it as signs, all movement in the supply chain to find the product tracking. In the use, transport, recycling, sale, any links, when a RFID reader read range in its tags to monitor the existence, the label contained in the

EPC and its linked data transfer to the Savant middleware [8],[9]. Savant initially the Electronic product code data is key, in the local ONS server contains the information of product for EPC information server's network address, and Savant query according to the EPC information server address, access to commodity specific information, the essential cure, to transmit the information back-end enterprise applications to do a deeper level of computing ,at the same time, local EPC information server and the source of this information server to record the reader to read and modify the corresponding information [2] as shown in figure 3.

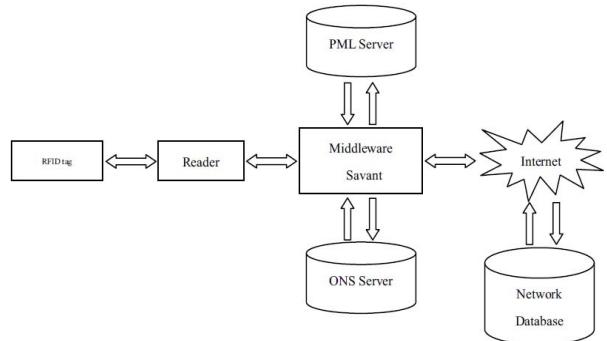


Fig. 3. IoT Framework

IV. THE NETWORK STRUCTURE OF ANIMAL PRODUCT SUPPLY CHAIN MANAGEMENT

A. The Functional Analysis of APSCM based on IoT

Supply chain management is the systematic, strategic coordination of the traditional business functions and the tactics across these business functions within a particular company and across businesses within the supply chain, for the purposes of improving the long-term performance of the individual companies and the supply chain as a whole [9]. The animal product supply chain is a network structure model, which is determined by logistics, information flow and capital flow through it. Supply chain organization's goal is to information flow should be in sequence, logistics, capital flow and so on, and integrate to consumer demand, maximize customer satisfaction and supply chain to minimize the overall cost of production balance in the supply chain. Finally, internal organizational mechanisms must be organized in effective form in order to protect the overall function of supply chain organization. Because of the characteristics of animal product supply chain, logistics, information flow is necessary to pass a higher, in time, need to be quicker, in space, and requires more severe storage conditions. Therefore, it made animal products traceability a higher technical requirements, while the development and stability of the supply chain made a greater requirement [10]. All nodes in the supply chain enterprise should be a unified, harmonious division of labor and cooperation, and layout of the traditional supply chain is comparatively complex, members of the relatively unstable and so the delay caused by the market and asymmetric information, destroy the supply chain between node enterprises unity and harmony [11]. On the other hand, the existence of the bullwhip effect, causing the information in the long transmission path distortion and distortion of information is not conducive to the retrospective.

It can be seen that the traditional animal products in all aspects of supply chain management are often in motion or loose state of the information, timeliness, accuracy, and sharing, based on EPC technology, the application of things, a good solution to the above problem. In IoT, the EPC have tag read and write data function, easy smallness and diversification of the shape, reusable, good penetration and data capacity and other characteristics, can adapt to frequent changes in the supply chain data, communicate data, acquisition in a timely manner and system commands, widely used in supply chain warehouse management, transportation management, production management, material tracking and identification and so on, and significantly reduce the bullwhip effect in supply chain [11]. Therefore, IoT application for animal products supply chain, the use of RFID and network database technology, will integrate all types of production, movement and the effective information quality and protection. Information collection, storage, transmission, the animal product supply chain and safety of animal products combined through the entire supply chain, and established animal product trace system based on IoT [11]. Which archive a summary of the data and information in the entire supply chain to make regulatory and consumer information track in the platform, and guarantee transparency throughout the supply chain process [11],[12].

B. Influence of IoT on Product Supply Chain

The impact of production processes as of animal products like (e.g. meat, poultry and dairy products including milk, butter, cheese and eggs etc) is difficult to do things through phases of things together, so, in production processes, the main objects for IoT is managed for poultry and livestock [12]. Poultry and Livestock from birth to wear for containing its unique ID number of the RFID tag, which process and record all relevant information collected in the breeding, at the same time, applied animal RF chip management system handle poultry and livestock breeding information on a single individual.

V. IMPROVEMENT IN MONITORING OF SAFETY AND QUALITY CONTROL MANAGEMENT OF FOOD AT SOURCE

How to track and trace foods has become a very urgent global task. To ensure the quality safety of agricultural products, we need to do a good job from the source. We should establish a set of quality perjuring, tracing, mechanisms and systems to ensure quality and safety of agricultural products. If agricultural problems appear, particularly the emergence of threatening life and health of consumers on major issues, we can inquire the direct responsible persons and regulatory non-compliance responsibilities [12]. Improving & developing web-based logistics technology is the key to realize a smooth logistics of agricultural products a, track their quality level and the subsequent trail. There are a number of enterprises have developed food supply chain, high-tech tracking system based on the quality and safety of foods. Currently in Pakistan farmers use electronic ear identification and related data collection cards to track food's or agricultural products immunization records, health records and raising records.

Besides this, the development of electronic signature picking tickets technology, GIS technology, automatic identification technology and GPS technology play an important role in tracking and protecting quality and safety of agricultural products and foods. This can effectively improve the information supply chain situation of low level, and gradually build the agricultural supply chain information network management system. Indeed Pakistan is the largest country that produces the dairy and food products and for its export growth, the major stakeholders must establish an efficient supply chain integration system in the supply chain to ensure that agricultural products will continue to flow from the supplier of end-users and raise the whole management level of the entire agricultural supply chain [12].

VI. REASONED ARGUMENT

Internet of Things is coming which brings us into a new era in which everything from tires to toothbrushes can be identified and connected and things can exchange information and make decisions by themselves. The communication forms will be human-human, human-thing, and thing-thing. Things will be the main traffic makers. People's life can benefit from the Internet of Things. So, the analysis based on IoT in the agricultural supply chain applications and this paper has tried to draw the following conclusions. Firstly, the IoT has been gradually manifest advantage in the supply chain management of agricultural products, and represents the future direction of agricultural information. Secondly, the current of the IoT between applied research and practical applications there is a gap in the agricultural supply chain management. IoT in Pakistan has some of the key technology is still in training stage in the agricultural application of supply chain management. Finally, the physical aspect of the use of the IoT is different between different products. We hope that the given interest shown by industries in the IoT applications, in the coming years the internet of thing will be a powerful driving factor for the development of agricultural product supply chain.

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