IoT & Agricultural Marketing: A Case Study

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Abstract

The age-old tradition of farming in Indian society is the sources of food supply in the country. But the food producers due to illiteracy and lack of proper knowledge are deprived from their fair earnings. Poor productivity or price discrimination practiced by the powerful dealers, traders and middleman being the major reason depriving the farmers from their remunerative price on the agricultural produce. The paper aims to identify the problems in agricultural marketing and introduces IoT (Internet of Things) to sense objects, situation and surroundings pertaining to agricultural system through smart technology in the smart network to address the problems and necessary course of action can be taken to benefit both producers and consumers and such improvement in infrastructure may lead to socio-economic development of the country.

Introduction

India is basically an agrarian society since time immemorial, and the farmers have been producing agricultural crops for their livelihood and sourcing food supply in India. Due to illiteracy and lack of proper knowledge they are deprived to earn their legitimate income. The causes may be either loss incurred due poor productivity or selling their produce at a price below the minimum fair price due to price discrimination exercised by the powerful dealers or middleman in distribution chain. To ensure higher productivity and even distribution of agricultural output in creating mutual benefit to the producers as well as consumers, agricultural marketing has evolved as a new discipline of business in modern India. The National Commission on Agriculture (XII Report, 1976) has explained that agricultural marketing is a total process which start with marketing the products from different farms, involving all the market structures, taking care of operations before harvesting and after harvesting, grading the product, storing them in the proper warehouses, looking after the distribution and transportation.

The series of operations involved in this entire system are supported through ICT (information and communication technologies) but miles are left behind for its full deployment in our country. IoT (Internet of Things), an emerging phenomenon is a network through which interconnectivity between all tangible and intangible objects is possible to be established. The network infrastructures are controlling and sensing the objects from remote areas and direct integration from the world has been created with the help of computerized systems. The virtual realization which has been happened due to the various network infrastructures can help to improve the accuracy, efficiency and economic benefits. In recent future the researchers are predicting that IoT will offer varieties advance connectivity including devices, systems, and services that goes beyond machine to machine communications and this communication will cover a huge number of protocols, different domains, and innovative applications. The automation in every field has been brought by smart objects and these are mainly applying in the field named agriculture which may bring the economic development in any country.

Related Literature Survey

Stankovic (2014) summarized that, the future vision of IoT lies in the fact that it would become a utility with increased sophistication in sensing, actuation, communications, control and knowledge creation from huge amount of data. Due to the large scale of devices, new research problems regarding connectivity of the physical and cyber worlds, openness between the systems, and privacy and security will arise. But these myriad of problems are expected to be solved by the researchers as soon as possible.

Castillejo *et al.,* (2013) proposed that WSN (Wireless Sensor Network) can effectively integrate the new emerging series of wearable devices in the IoT and can bring new experiences to the daily life activities. After using various integration on different variety of physiological parameters, it has been measured effectively & with the help of wearable devices it has been ultimately sent to the WSN. In the IoT based systems, a service-oriented semantic middleware solution has been introduced and a single application based platform is needed. The user can access the data through a wide variety of devices (smartphones, tablets, and computers) and operating systems (Android, iOS, Windows, Linux, etc.).

Mattern *et al.,* (2010) have discussed about the vision of the real world embracing everyday objects, the challenges involving scalability, interoperability, software complexity, security and personal privacy etc., possible usage scenarios and technological building blocks of the IoT. IP stacks, web servers along with RFID are most important technologies for daily mart objects. It has been also discussed that social and governance issues such as security versus freedom, comfort versus data privacy, and notorious altercations concerning store cards, video surveillance and electronic passports may likely arise with the vision of the Internet of Things in becoming a reality.

Farooq *et al.,* (2015) presented a comprehensive overview of IoT scenario which promises a great future for the Internet where the type of communication is machine-machine (M2M). This will influence every part of our lives ranging from the automated houses to smart health and environment monitoring by embedding intelligence into the objects around us. The enabling technologies and the sensor networks of IoT have been reviewed in the paper with description of a six-layered architecture. The key challenges related to IoT such as security and privacy threats.

IoT and Agricultural Marketing:

Although several improvements were made in the field of Agriculture by the policies undertaken by the Government and the strategies adopted by the private organizations; ICT (Information and Communication Technologies) played an eminent role for making Agricultural Marketing more effective and efficient. IoT is an extension of ICT and has far reaching influence in making substantial enhancement in Agricultural Marketing in addressing the above challenges.

1) Environmental Monitoring: Applications of the IoT typically use sensors to assist in environmental protection by monitoring air or water quality, atmospheric or soil conditions, and can even include areas like monitoring the movements of wildlife and aquatic living organisms as well as their habitats. Development of devices connected in IoT can monitor resource depletion and chalk out effective measures of controlling the same; this may also lead to more effective support through emergency services using other applications like early-warning systems concerned with earthquake or tsunami. IoT devices in this application typically span a large geographic area and can also be mobile.

2) Crop Production: The uncertainty in crop production can be reduced through proper information conveyed to the farmers via common information centre 'e-choupal' or through local cable channels or via smartphone apps. The farmers are able to know the farming parameters with high precision favorable for farming and can be triggered to take optimum decision. The inputs required to maximize the productivity can be communicated through these above

media. Apart from these the farmers will be triggered for critical time of harvesting to prevent their crops from damage due to flood, fire, storm, or due to disease, pests etc.

3) Quality of Input and Output: To achieve better quality of produce the farmers will be informed regarding the use of definite type of fertilizers, pesticides. The seed quality can be ensured through the presence of RFID tags and nano-sensors embedded in the sealed bags which can be detected through smartphone apps by scanning the QR code assigned to the RFID tag in real time domain. On the other hand the price charged by the farmers must be justified in accordance to the quality of the produce determined by electronic gadgets at the trade centers, mandies etc. that are tightly coupled with the IoT to match with the predefined criteria for quality measurement fixed by the government. For example price per litre of milk determined from the percentage of water in milk when sold to dairy farms.

4) Controlling of Tools and Implements: Through application of robotics different tools and implements such as tractors, harvesters, threshers, power tillers, pump motors can be automated or can be controlled from remote location. The user can monitor and control the process and its outcomes from the virtual reality of the farming land with status of different tools and implements presented in the mobile or computer screen. This will lead to smart farming.

5) Distribution: The distribution of Agricultural produce involves large number of middle man in the distribution channel; the farmers are forced by the powerful dealers and traders to sell at a price less than the minimum support price fixed by the government each year as per recommendations of the Agricultural Price Commission. Since the government cannot exercise effective control due lack of proper monitoring system to justify the prevailing malpractices, the poor farmers are exploited from their legitimate income. Since each of the middlemen adds profit which is not definite the consumers purchase these agricultural produce at higher market prices. IoT has the capability to convey information about the minimum support price to the farmers via local TV channels, mobile phones or through e-choupal which can be tallied with the priced fixed at the mandies, dealers, or trade centers. The transaction can be monitored and controlled electronically through IoT by the competent authority to ensure minimum fair price to be obtained by the farmers. The number of middleman will be curtailed in the distribution chain and as a result the consumers will be charged fair prices for the commodities sold in the market.

6) Quantity Measurement System: Although digital weighing and volumetric machines are used in measuring the quantity of agricultural produce generally in SI unit; some other form of measuring system using analogue instruments with prevailing standards such as, Tola, Pav, Seer, Maund, Hundredweight (CWT) etc. are also used by the traders in measuring agricultural produce in India. Since these customary standards are not always authentic, easy manipulation can be made by the unscrupulous dealers, traders, or middleman in the measuring system. Although it is easy to tamper the calibration of analogue instruments but it is difficult for the digital instruments. There is possibility to monitor the calibration standards and operating status of digital instruments used by the traders if connected online to the IoT.

7) Designing Effective Advertising Campaigns: The target group of customers on the basis of their demographic information stored in the cloud can be identified for agricultural marketing. Marketing of agricultural inputs - both capital and consumable as well as marketing of raw agricultural produce as inputs to the industries related to food processing, textile and beverages can be made through smart advertisements, online demonstrations facilitated with two way communication for negotiation and better purchase decision. The targeted customer can virtually interact through the smartphone or smart television platforms connected to the IoT. Many products such as bakery products, puffed-rice, stamped-rice, popped-rice, cheese, butter, curd, ghee, honey, bidies, country liquor, bamboo-craft, wooden-craft, jute-craft, etc. from different cottage industries can also be marketed by different companies through their brand names. To channelize the relevant operations and information exchange through an automated process there need intervention of smart devices with a smart network under the purview of IoT.

Conclusion

The overall challenge is to extend the current IoT into a dynamically configured web of platforms for connected devices, objects, smart environments, services and persons. IoT embedded in smart environments and platforms forming a smart wave of everything as one of the next big concepts to support societal changes and economic growth which will support the farmers in their profession and improve their standard of living. The overall task is creating and master innovative ecosystems beyond smartphones and device markets through integrated environment and platforms supporting multiple applications in the field of agriculture bringing contextual knowledge of the surrounding world and events into complex business and social process. With the incessant flourishing of the emerging technologies, the concept of IoT will soon be developed in an inexorable manner on a substantial scale. This emerging paradigm of networking will influence every part of our lives and environment monitoring by embedding intelligence into the objects around us. But miles are left to go ahead for the deployment of IoT.

References

Atzori, L., Antonio, I., Giacomo, M. 2010. The internet of things: A survey. *Computer networks,* 54(15), 2787-2805.

Castillejo, P. Martínez, J.F., López, L., Rubio, G. 2013. An internet of things approach for managing smart services provided by wearable devices. *International Journal of Distributed Sensor Networks,* 9(2), 190813.

Catarinucci, L., de Donno, D. Mainetti, L., Palano, L., Patrono, L., Stefanizzi, M.L., Tarricone, L. 2015. An IoT-aware architecture for smart healthcare systems. *IEEE Internet of Things Journal,* 2(6), 515-526.

Chaouchi, Hakima, ed. *The internet of things: connecting objects*. John Wiley & Sons, 2013.

Emary, E., Ibrahiem M.M., Ramakrishnan S. 2013. eds. *Wireless sensor networks: from theory to applications*. CRC Press.

Farooq, M. U. Waseem, M., Mazhar, S., Khairi, A., Kamal, T. 2015. A review on internet of things (IoT). *International Journal of Computer Applications,* 113(1),1-7.

Gubbi, J. Buyya, R., Marusic, S., Palaniswami, M. 2013. Internet of Things (IoT): A vision, architectural elements, and future directions. *Future generation computer systems,* 29(7), 1645-1660.

Hersent, O., David B., Omar E. 2011. *The internet of things: Key applications and protocols*. John Wiley & Sons.

Howard, Philip N. 2015 *Pax Technica: How the Internet of things may set us free or lock us up*. Yale University Press.

Ishaq, I. Carels, D., Teklemariam, G.K., Hoebeke, J., Abeele, F.V., Poorter, E.D., Moerman, I., Demeester, P. 2013. IETF standardization in the field of the internet of things (IoT): a survey. *Journal of Sensor and Actuator Networks,* 2(2), 235-287.

Ling-yuan, Z. 2012. A Security Framework for Internet of Things Based on 4G Communication, in *Computer Science and Network Technology, (ICCSNT),* pp. 1715-1718.

Mattern, F., Christian, F. 2010. Vom internet der computer zum internet der dinge. *Informatik-Spektrum,* 33(2), 107-121.

Miorandi, D., Sicari, S., De Pellegrini, F., Chlamtac, I. 2012. Internet of things: Vision, applications and research challenges. *Ad hoc networks,* 10(7), 1497-1516.

Razzaque, M.A., Milojevic-Jevric, M., Palade, A., Clarke, S., 2015. Middleware for internet of things: A survey. *IEEE Internet of Things Journal,* 3(1): 70-95.

Shen, G., Bingwu, L. 2011. The visions, technologies, applications and security issues of Internet of Things. *E-Business and E-Government (ICEE), 2011 International Conference on*. IEEE, 2011.

Singh, J., Pasquier, T., Bacon, J., Ko, H., Eyers, D. 2016. Twenty security considerations for cloud-supported Internet of Things. *IEEE Internet of Things Journal,* 3(3), 269-284.

Stankovic, J. A. 2014. Research directions for the internet of things. *IEEE Internet of Things Journal,* 1(1), 3-9.

Uckelmann, D., Mark, H., and Florian, M. 2011. An architectural approach towards the future internet of things. *Architecting the internet of things*, 1-24.

Vermesan, O., Peter F. 2014. eds. *Internet of things-from research and innovation to market deployment*. Vol. 29. Aalborg: River Publishers.

Whitmore, A., Anurag A., Li, D. X. 2015. The Internet of Things-A survey of topics and trends. *Information Systems Frontiers,* 17(2), 261-274.

Zanella, A., Bui, N., Castellani, A., Vangelista, L., Zorzi, M. 2014. Internet of Things for Smart Cities. *IEEE Internet of Things Journal,* 1(1), 22-32.

Zeinab, K., Aldein, M., Sayed, A., Ahmed, E. 2017. Internet of Things applications, challenges and related future technologies. *World Scientific News,* 2(67), 126-148.