Impact of Internet of Things in the Retail Industry

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Abstract. The rise of Internet of Things has led to many game changing efforts to create new business models and opportunities in various domains of industry. In this paper, we look into the impact that the concept of IoT will bring in Retail Industry in coming years with the point of view of new business outlook based upon parameters of security, reliability, integration, discoverability, and interoperability. The paper also presents new concepts that can be implemented for business profitability using various IoT Technologies with prime focus on the areas of embedded systems, cyber physical systems, generic sensors and security. In relation to the Retail Industry, the focus areas of development and support of IoT technology will shift from a mere data collection to knowledge creation which can enable value chain development using a framework concentrating more from a legal point of view. Not only has the technology paradigm shifted from a certain POV but businesses also changes in terms of scalability, dynamicity, heterogeneity and interconnectivity. The paper discusses about newer ideas and their business and social impact on the industry in terms of profitability and adaptability.

Keywords: IoT · Retail · Use cases · POV

1 Introduction

The current era of interconnected physical objects which are often referred to as "Things" are the building block of future trend of everything accessible anywhere realizing the concept of ubiquitous computing [1][2]. The innovation potential of IoT extending to new products, services and domains is endless and the range of domains it will affect will not only limited to smart cars, e-health, retail and smart logistics [3][4]. The innovation in this field is the results of the value add support and collaborative efforts from industry experts, academia and informatics.

This has also triggered software advancements in terms of storage and analytic aspects which can adhere to the data hierarchy related to the IoT. The retail industry has been evolving over time due to the impact of the Information Technology and this has led to adoption of various new business value propositions in terms of processes involved. The technology impact in Retail industry started with the introduction of E-Business proposition and this moved the overall model to look beyond adoption

I. Ciuciu et al. (Eds.): OTM 2015 Workshops, LNCS 9416, pp. 61–65, 2015.
DOI: 10.1007/978-3-319-26138-6_9

parameter to the deeper insights of actual discrepancies in scenarios involving business loss. Then the notion of the radio frequency identification (RFID) technology and the electronic product code (EPC) network arrived to the scene of mobile B2B e-Commerce and its integration into supply chain [5].

Evidence of impact of IT involving information quality, new organization processes, organizational scalability and flexibility have been positive with the performance optimization that it has brought to the domain leading to competition with new players and more choices for the consumer. The field of IoT has been developing rapidly and has consumed the concept of Ubiquitous computing leading to a new vision in terms of architecture and development layer model for IoT [6][7].

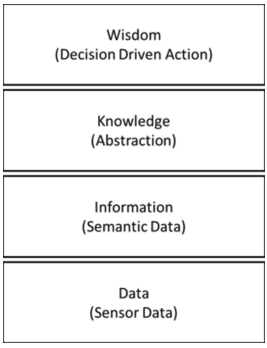

Fig. 1. IoT Knowledge Hierarchy

2 IoT and Retail Industry

There are various new innovations that were introduced in the area of embedded systems leading to a new paradigm adoption in the vast array of the heterogeneous devices leading to computing and networking optimizations. This led to the formation of the concept of smart grid and the feature of integration became the most important focus in the area of new technology innovation.

The innovations has bred web based service economy as the present focus of Internet of Things and platform enabling the service as a part of "Software As A Service" model enabling to bridge the gap between the representation of physical world in information systems and the physical world itself [6][8]. The overall challenge in any IoT project will be the following: a) Real-time information retrieval, b) Process Optimization, c) Responsiveness, d) Scalability, e) Network dependency.

3 Architecture

The innovation from the architecture surrounding any manufacturing domain in respect to the IoT has been very intensive and from the inclusion of various parameters like security and real time tracking the research outcomes in the areas of hybrid computation, network conditioning and heterogeneous interfacing has been quite

formidable. The notion of a three dimensional aspect of communication, service and computation has to merge with the parameters like adoption, environment and field integration. The key parameters for success of IoT lie in the intelligent integration of Application Service, Information Integration, Data Exchange, and Field Sensing with control over the following key ROI [9][10][11]: a) Non-uniformity, b) Inconsistency, c) Inaccuracy, d) Verification.

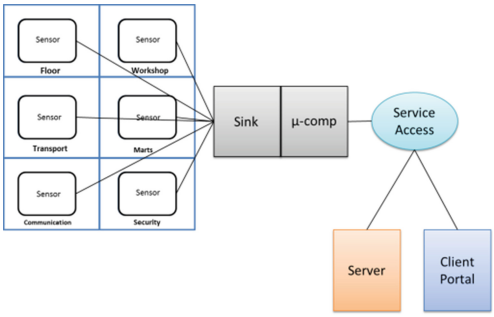

Fig. 2. General Architecture

The issue of content management in terms of sensitive information and secure sharing of such information will form the basis of design for architecture in case of Retail industry as it directly impacts the consumer.

4 Value Proposition for Business Process in IoT – Case Study

a) **Beacon Assisted Shopping Experience**.

With the innovation in Bluetooth technology, the introduction of beacons to enable interaction with mobile devices in a shop floor based on proximity detection will define a unique experience for consumers who will be provided with information related to the particular section of items like offers, gifts and value added services. The cost-effectiveness and reliability of the overall architecture makes it more feasible and adaptable for retail stores and shopping malls. The methodology can also be applied to not only improve shopper experience and but also the detection of shoplifting [12].

b) **Kinect Enabled Shopping Apparel Trials.**

Shopping experience and real time information regarding a particular garment is critical from sales point of view. We have seen the introduction of Virtual Fitting Rooms (VFRs) which have made it possible to be able to try out apparel without being physically present in the showroom or in case of physical presence simply stand in front of the garment and a 3D model of you with the garment will be displayed creating a physical interaction which is possible using full body maps and gesture recognition using Kinect and similar technology [13].

c) **Fresh Meat and Fruit Tracking and Smart Delivery**

The complex network of farm product delivery to the consumer table is one of the major research areas where IoT will impact with the advanced RFID technology enabling fresh farm products to reach consumers in time and in a hygienic manner with the use of smart data exchange platform and dynamic reporting, alert mechanisms to enable crisis management. The platform should enable exchange of supply chain and sensor data autonomously and report evidences in case of anomalies found and also to enable identification and prediction of precise trend for out of stock situations and also improving operational efficiencies, and reducing operational cost [14][15][16].

Finally we can deduce that the IoT domain, however, is not only limited to sensors and sensor networks but the related feature of interests, attributes and the autonomous integration of sensor raw data and resources to the overall business process and execution requirements. This innovation process will not only impact the domain of retail but it can be reused to renew the innovations in health and other critical domains.

Acknowledgement. The Authors would like to thank their colleagues and friends for their immense support. They would also like to thank their university connects and professors for supporting them in this theoretical research work.

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