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Internet of Things in Retail Sector

Pratiksha R. Shetgaonakar
Asst. Professor, S.R.E.I.T.,
Shiroda, Goa
Pratiksha.gawas@gmail.com

Abstract:**The Internet of Things (IoT) is viewed as a major driver of the third Industrial Revolution. There is noquestion that the conne ctivity of "things" will only continue to affect how businesses run in the future.Like in all other areas such as auomobile, home automation, t ransport etc, the opportunity for IoT in retail industry ishuge.**

IoT is more than just "Things" of connected devices, products or sensors. IoT can connect systems, providing unifiedvisibility, r ealtime decisions, and deeper insights customers, competition, product portfolio and performance.This paper describes about the various sub areas in the retail sector that can be benefited for better customer andretailer experience using IoT.

Index Terms**—Internet of things, retail, sensors, customer.**

I. INTRODUCTION

The Internet of Things (IoT) can be a game changer for the retail industry, giving retailers the tools and insights to transform their businesses. And yet, with the prospect of billions of devices and things connecting to systems and the cloud, getting started on IoT may seem overwhelming and complicated. In this paper ,we discuss about a proven IoT strategy that retailers can launch into today. By focusing on the devices, infrastructure, services and data they already have, retailers can merge digital and physical environments to make immediate and impactful improvements in store.

II. APPLICATIONS OF IoT IN DIFFERENT AREAS

The figure below specifies in a well structured manner , the various areas where the IoT is being and can be used at present and in future [1].

Fig 1: Applications of IoT

III. IOT IN RETAIL SECTOR

A. Models proposed

The Business Maturity model described below is used to implement various functions of Retail can be divided into three categories [2]:

- *Model for operational efficiency*
- *Model for Business Intelligence*
- *model for Business Transformation*

I. *Model for Operational efficiency*

Fig2: IoT Business Maturity model for operational efficiency

In the first stage of fig 1, the retailers can deploy sensors to monitor telemetry around the following scenarios:

- Monitoring in-store traffic to determine which days of the month or week are busiest, and what time of day is the busiest. It could certainly trigger alerts when in-store traffic exceeds pre-configured thresholds. A great example of monitoring in-store traffic is can be the key to building customer loyalty.

- When refrigeration units fail in stores, it can mean significant losses in food that needs to be thrown away. Monitoring and reporting temperatures in the refrigeration units across all stores enables retailers to monitor and respond in time to issues.

- Tracking on-shelf availability of products could be another scenario that is critical to retail. Using shelf sensors, RFID and other sensor devices, retailers could get real-time information about product availability on every shelf in every store.

- It could also mean engaging with the devices that customers in stores already have, like mobile phones. Through an opt-in mechanism, retailers could potentially engage with customers using personalized messaging and offers.

Fig3: Tracking Shelf Inventory in real time

II. *Model for operational efficiency*

Fig2: Business Maturity model for Business Intelligence

In the examples that I mention above, it would really be about applying advanced analytics methods to the data for some of these possible scenarios:

- The in-store monitoring data could be used in combination with several diverse data sets like weather data, information about events within a pecific radius of the store, holidays and so on to more accurately predict in-store traffic over time. This prediction could help with workforce optimization, inventory and campaigns.

- In addition to monitoring refrigeration units, the detailed telemetric data collected from them could be used for predictive maintenance of the equipment to ensure that downtimes are either eliminated or minimized. This has major implications to store performance, especially for grocery and QSR's.

III. *Model for Business Transformation*

Fig4: Business Maturity model for Business Transformation

The companies that use the data and analytics to power new services and revenue streams are the ones in that third stage of the IoT Business Transformation Model. Using in-store traffic data to make decisions on workforce optimization could an example of that. Some examples:

- Using in-store traffic information to plan and optimize workforce;
- Combining weather, social and other public data with in-store traffic data to better predict demand;
- Sharing the telemetric data from refrigeration units with the manufacturers/service companies to enable increased uptime;
- Use behavioral data to design store and shelf layout.

IV. STRATEGIES PROPOSED

Here are five strategies retailers can employ to take advantage of IoT [3].

- Smart Shelf
- Traceability
- Loss Prevention
- JIT Promotion
- Customer Flow

V. CONNECT THE STORE SHELF AND THE BACK ROOM

One of the long existing problems in retail is to have a true picture of inventory on the store shelf. It is not simply the inventory that systems show is available at the store. Too often, there is a disconnect between what is found on store shelves compared to the inventory sitting in the back room.

This lack of visibility creates a host of issues and associated costs for retailers. Among the negative outcomes are lost worker productivity, mishandled stocking, potentially empty shelves (when there is actual inventory available within the store) and suboptimal inventory order management. Retailers can tackle these problems with greater usage of technology to bring more visibility into the actual location of inventory. They can employ solutions that take advantage of existing infrastructure - such as cameras within the store – as well as new technologies such as sensors, beacons, and RFID chips.

The Retailers can make use of both the hardware and software that can make the store shelf "smarter" and tie it to the back storage room. The combination of store shelf sensors, smart displays, digital price tags and high resolution cameras makes it possible for retailers to see what is on the store shelf and in the back stock room and link these two sets of data.

Retailers who have issues with being out of stock, rapidly moving inventory and massive swings due to seasonality need to look at IoT to help manage the inventory process. With greater visibility within the four walls of the store, retailers can start seeing improved results within their stores

VI. IMPROVE TRACEABILITY OF INVENTORY BEFORE AND AFTER THE POINT OF SALE

Retailer supply chains, like most supply chains, have become longer, more complex and require greater control than before. Having visibility into inventory does not start at the receiving dock of the store. On the contrary, the ability to track and trace product movements starts from the point of manufacturing. It is simply not about tracking where the inventory is either - certain retailers need to be able to trace the inventory and its treatment and condition throughout the supply chain.

This is no more apparent than wi th perishable and temperature-sensitive inventory. For example Confectioners have to ensure that their products are transported at the right temperature throughout their journeys to retail outlets. These companies use a greater number of sensors to guarantee that their products are handled properly, measuring a host of variables from temperature and humidity to vibrations and altitude. It is not simply about bringing product to market, but what happens once the product has been sold. Major disruptors to retail supply chains are product recalls, which have struck everything from vegetables and dog food to baby products and appliances. Retai lers need to invest igate how to leverage IoT technologies such as RFID to better track and trace products throughout the extended supply chain. This level of IoT investment focuses more on transportation and warehousing assets to provide a more complete picture of the retail supplychain.

VII. REDUCE FRAUD AND SHRINKAGE

One challenge all retailers face is shrinkage and fraud. Whether this is from store employees stealing, shoplifters or even organized crime, there is a constant need for trying to curb items being taken out of circulation nefariously. How can IoT help curb this? By adding an additional layer of visibility to the process. Rather than solely relying on point -of-sale systems to indicate when a piece of merchandise has been sold, retailers can look to smart shelves, source-tagged SKUs and more sophisticated camera technology to track the flow of inventory in and out of the front door of the store. More powerful cameras can be used that can enhance the ability of stores to track and manage their inventory. Rather than relying on receipts or lack thereof, retailers can lean on these smarter in-store technologies to paint a much clearer picture of what transpires. If a patron claims to have purchased items but misplaced the receipt, having rapid and detailed access to what occurred in the store could quell some of the fraud that is occurring. Of course, it will not eradicate fraud, but give the retailer an additional layer of protection it currently does not enjoy.

VIII. DELIVER JUST-IN-TIME PROMOTIONS AND COUPONS

Traditional brick and mortar retailers are at a disadvantage against online channels. One area where brick and mortar has struggled to keep pace with online players is in the ability to hone in on demand, quickly identify customer desire, and seamlessly cross-sell and upsell products. Everyone is familiar with banner ads that are based on online search history and with receiving suggestions of other things to purchase based on what's in the online shopping cart. Brick and mortar retailers do not have the digital intelligence their online competitors have. Better sensors and beacons are starting to give brick and mortar players a glimpse into what is possible. Leveraging the cellular network as well as beacons in specific stores, provides the retail channel with online flexibility. Using IoT can allow brick and mortar stores to tie in customer experience data via beacons to push more tailored content onto smart displays within the stores or even onto customers' mobile devices. Via this more targeted content,

users of the technology hope to drive greater retail sales. IoT will offer brick and mortar retailers the opportunity to provide their customers demand-shaping deliverables - promotional materials. But this is only the first step. Retailers must realize that customers will expect, if not demand, more sophisticated interactions if they are to truly develop a deeper relationship via mobile and IoT.

IX. MAXIMIZE IN-STORE FLOW MANAGEMENT

Focusing on and trying to maximize how consumers navigate the store aisles is not a new concept. With IoT, there is an opportunity to add more sophisticated digital tools to the process. Rather than relying on someone with a clipboard measuring the traffic patterns or reorganizing displays and then trying to correlate with sales, leveraging smart cameras, beacons and even microphones can give brick and mortar retailers more detailed and accurate data.

Moving forward, this information could be used to push data and messages to patrons to better manage traffic patterns as well. If the line is too long at a certain restroom, push a message to patrons in a section that they should go to a restroom a few sections away with a much shorter line. Or offer value-added services such as when the line at the concession stand is too long, send a message that you can have your hot dogs and beers delivered to your seats for an additional cost.

Entertainment and sports venues can leverage IoT to act more like retailers. Meanwhile, retailers can take these tactics and create digital, connected and customized experiences in their brick and mortar stores. These use cases address business needs whose results are visible in the near term. IoT is not a panacea, but a tool that can be coupled with traditional approaches to provide retailers with another step forward. These use cases can also bring immediate results for retailers, making the investment more palatable for executive teams. As retailers work through early implementations of IoT, they will also lay the groundwork for more ambitious use cases.

X. CONCLUSION

Internet of Things (IoT) has become a powerful force for business transformation, and its disruptive impact will be felt across all industries and all areas of society. IoT is transforming the retail sector in a big way and the data generated by the connected “things” are enabling retailers to have far more insights about customers and operations than ever before. The insights in turn enable retailers to streamline operations & personalize customer experiences. The IoT devices in stores can not only capture relevant data for retailers but can also be the points of personalized engagement with customers [5]. The ability to gather data from various points of customer contact enables retailers to get real time insights about the customer, make more relevant, timely, personalized and contextual offers. It also drives a more streamlined and impactful engagement with customers. This paper surveys and suggests various methodologies, models and strategies that can be used and implemented in the retail sector for achieving the better customer and retailer experience.

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