



Internet of Things in E-Commerce and Retail

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ABSTRACT: *In this paper, an attempt has been made to highlight the impact of IoT on the e-commerce and retail industry. IoT and e-commerce have until now evolved in parallel. The e-commerce trend has slipped into the retail world and most retail shops have some kind of an online presence. The IoT has already started working its way into the retail world. IoT devices such as digital signage, smart mirrors, real-time tracking, location services, smart shelves enhance the shopping experience. Through IoT enabled objects, even brick-and-mortar stores can gain similar benefits to online commerce platforms thus bringing about a positive change in the business models which is enabled by better inventory management, enhanced user experience, personalization, post-acquisition services, improved efficiency, logistics tracking and more marketing opportunities.*

Keywords: *E-commerce, retail, online, real-time tracking, personalization, post-acquisition services, logistics, marketing*

I. INTRODUCTION

The Internet of Things (IoT) is a revolutionary technology which allows physical objects to communicate with each other by connecting them to the Internet with astounding simplicity and efficiency.

The Internet of Things is defined as a worldwide information infrastructure in which physical and virtual objects were uniquely identified and connected over the internet enabling innovative, advanced services and creating a more convenient and smarter life. While many areas of impact will emerge in the near future, one of the major arenas where the Internet of Things is having a definite influence is the retail and ecommerce sector. Internet of Things would expand the scope and depth of e-commerce by linking people, smart devices, objects that are offline in the current e-commerce model, involving more communication and action, ultimately shaping the future of e-commerce. E-commerce is about to be fundamentally reshaped, as every connected object in the future becomes a potential commerce channel. IoT promotes customer engagement disrupting the traditional retail process into a more sophisticated, structured and holistic shopping experience. More and more retailers are investing in the IoT to survive and thrive in the era of digital commerce to meet the heightened demands of today's savvy, empowered consumers, who have limitless choice and price transparency online.

II. IoT applications to enhance customer experience

The primary benefit of integrating into the IoT is elimination of manual labour through automation. In addition to that, deliveries can be tracked from all over the world with high accuracy. However, there are much more opportunities apart from those:

- **Better Inventory Management**

Smart shelves^[3], is crucial for inventory management which can be an expensive and tedious process for managers. They automatically monitor inventory in stores and notify the manager when an item is running low. Mistakes through human error can be eliminated as connected devices handle all of this automatically to relieve managers' stress and improve operating efficiency, which in turn saves the retailer money.

- **Improved logistics and automatised delivery**

Installation of GPS sensors in each parcel it will enable follow-ups of the shipments closely and help estimate the time of delivery facilitating optimization of logistics. Thus, situations when a parcel on its way to a customer is taken over in the process because another customer has just paid extra to get the delivery faster. The route of the parcel is then changed, and the customer who can wait a bit longer is being sent the shipment again from the central warehouse. When combined with demand forecasting, situations can arise where pre-



stored trucks circulate in logistic loops around cities and deliver the most popular merchandise in minutes. Tracking with the help of IoT equipped detectors will have additional capabilities of managing things like the route and speed that the logistics team handle. These capabilities, when clubbed with IoT can be extended to any new technology like the concept of unmanned delivery drones by Amazon. IoT enables us to add such rules and monitor them remotely without much hassle. This is going to make customers get a much better shopping experience and increases brand loyalty.

- **Personalization and real-time promotions**
Personalization is definitely more important than ever before. With IoT we can do two things for personalizing the customer experience – customized offers and customized delivery times. The customer's feedback time is going to be near instantaneous, and you can leverage this to immediately relay customized offers to them. Mobile phones are a key for promotions. Retailers use them to send promotional offers, which depend on factors like customer's shopping history, preferences, location, as well as special events. It is important to prioritize the promotions and send only one promotion to the customer's phone to reduce confusion. Retailers use this feature through beacons to send promotions for products in the physical store that the customer has already researched online. Location-based tracking is also being used to offer assistance to customers who have been walking around the store.
- **Intelligent self-service shops**
IoT has significantly helped the vending machine industry. Vending machine companies interact in real-time to check the machines' stock levels raising an alert when the stock runs out, finding the nearest machine that has the product a consumer wants, and also charge the products based on factors like demand, weather, and available inventory. Automatic supermarket check-outs, advanced vending machines – more and more often the buying process is automated. With the development of IoT this trend will continue. Predictive systems will be able to detect that we're about to go

shopping and prepare our products to be packed into a car. Earlier, my refrigerator will send information about the missing products. Volvo has proposed a system that allows couriers to leave a parcel to a recipient by using a one-time code to open the trunk of the recipient's car. Imagine that you go to the mall and when you look for new shoes, the service packs your trunk with the shopping requested by your refrigerator.

- **Fleet Management**
Real-time position localization of moving objects is an important enabling technology for realizing the vision of the "Internet of Things". IoT radically transforms this by suggesting quicker delivery route, speed, adjusting the storage temperature automatically while transporting perishable items, raising alerts and identifying maintenance issues before the truck breaks down. Customers can also use IoT devices for real-time tracking averting the periodic updates from the shipping providers. In the retail industry, we have shopping carts equipped with shopping assistants enriched with additional location sensing means can guide customers through the store, motions and personalized discounts provide them with location-based product information, and alert them as they walk through the aisles.
- **Post-acquisition Services**
Products that require post-sale service or are covered by a warranty can be tracked using IoT by updating the information (purchase date and warranty period), we can setup system notifications and automate the sending of warranty extension offers. This results in real-time data are sent from sensors on the products back to the retailer, which help in identifying the malfunctions. Thus, this data can be used to improve the products, as retailers know how the customers use them.

III. IoT shaping the future of e-commerce and retail

- **Beacon technology**
Beacon^[4] is small location-based technology device that transmits a signal based on the Bluetooth Low Energy (BLE) Wireless Technology. This technology helps detect the presence of an Android or iOS device, as soon as it comes in the same vicinity as the



Beacon. When someone having the beacon installed passes by a beacon in a shop, the retailer can push messages to that customer promoting products or providing other useful information. Beacons could be a much better option for in-door mapping - which GPS struggles with. Various sectors like Retail, Heritage, Sports and many others have adopted this technology to redefine their customer engagement.

- **Amazon: Dash button or Dash replenishment service**

The Amazon Dash button^[5] are small, Wi-Fi enabled, battery powered, ordering buttons that allows a customer to push a physical button and reorder a toilet paper, cleaning products, detergent, juice, personal grooming products, dog food and much more. Dash buttons are branded IoT buttons. The dash button has a WiFi network adapter that connects to your existing WiFi network, and sends a “long click” or “short click” or “double click” signal in response to button activity, in addition to its serial number and battery level. That signal is received by your WiFi router and sent as internet traffic to Amazon Web Services where software interprets that “click” and executes code in response. A large number of leading brand products could be re-ordered using the Amazon dash button including Tide, Bounty, L’Oreal, Clorox making life much easier. Amazon announced that Listerine, Tylenol, Pepsi, Tropicana, and Calvin Klein are among the new brands creating Dash Buttons. Overall, Amazon now has more than 300 Dash Buttons for products.

- **HP Instant Ink**

Of late, all-in-one printers are preferred at homes and small offices over the single-function printer. One of the major reasons people don’t use their printers is running out of ink. HP has come up with a novel and cost-effective solution to the issue with their Instant Ink program^[6]. The HP Envy 5530 is quick and works reliably on WiFi. Even better though, is the HP Instant Ink monthly service we can print up to 100 pages of any type of document, including photos to A4 if necessary. This page allowance also rolls over each month. Plus, ink is automatically replenished, as HP sends cartridges to you

once the printer reports that it is running low via the internet.

- **Pinterest buttons**

Pinterest has been a place for finding products that inspire and help make a few discoveries along the way. Buyable Pins^[7] made it easier to go immediately from pin to product purchase, removing any extra steps like trying to find the item online. A pin with a blue price indicates that it is buyable. Pinterest also has “promoted pins” which are essentially advertisements for products featured on Pinterest. Many merchants using Buyable Pins have been seeing increased sales and acquiring new customers at a very low cost per acquisition. Another such benefit, is that the merchant owns the entire transaction. Unlike other ecommerce avenues such as Amazon and eBay, you are able to send follow-up emails and newsletters directly to the customers since you are able to retain this information

- **RFID tags**

RFID stands for Radio Frequency Identification, is a small electronic devices that consist of a small chip and an antenna. The chip typically is capable of carrying 2,000 bytes of data or less. Each chip contains product information such as name, price, color, material and date of manufacture. Just as bar codes or magnetic strips (on ATM cards/credit cards) must be scanned to get the information, the RFID^[8] device must be scanned to retrieve the identifying information. The chip is around the size of twice the standard mobile SIM card achieving more accuracy in locating inventory than the traditional barcode techniques. Zara, a Spanish fashion chain offering on-trend house-brand clothing, shoes & accessories, now one of the world’s largest fashion retailer was the first to implement RFID to track items across countries and run an smooth organized clothing empire.

IV. Future of E-Commerce and Retail - Internet of Things^[9]

- 70% of retail decision makers globally are ready to adopt the Internet of Things to improve customer experiences.



- By 2021, retailers are planning investments in Internet of Things(70%),machine learning/cognitive computing(68%) and automation(57%).
- By 2021, nearly 79% of retailers will be able to customize the store visit for customers as a majority of them will know when a specific customer is in the store.
- The beacon installed base to swell from 96,000 in 2015 to 3.5 million in 2018, according to business insider.
- MarketsandMarkets expects the global market value for digital signage to grow to \$23.7 billion in 2020 from \$15.8 billion in 2015.
- BI Intelligence expects 2.8 million enterprise robots to ship between 2016 and 2021.
- Nearly \$6 trillion will be spent on IoT solutions over the next five years.
- Businesses will be the top adopter of IoT solutions. They see three ways the IoT can improve their bottom line by 1) lowering operating costs; 2) increasing productivity; and 3) expanding to new markets or developing new product offerings.

V. Conclusion

Services such as Dash Replenishment Service (DRS) and Pinterest's buyable buttons are all just preliminary steps in the ambitious plans of the giant e-commerce and retail world. They show the evolution of e-commerce towards letting customers make purchasing choices based on impulse and context, instead of having to browse and select among a myriad of item thus purchasing decision with discovery and payment friction eliminated. With the advent of artificial intelligence, robots can potentially transform the retail industry enabling scenarios in the future where there is zero human intervention.

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