

# Retailing Innovations: The Impact of Technology

<sup>1</sup>Dr. Prithvish Bose

<sup>1</sup>Associate Professor

<sup>1</sup>Amity Business School,

<sup>1</sup>Amity University Chhattisgarh, Raipur, India

**Abstract:** The paper explores the important technological innovations which are impacting modern retailing. It carries out a study of existing literature and other sources of information to identify and categorise the important innovations in technology which are changing the retail landscape. It also provides inputs on which of these are more likely to benefit Indian retailers and which are probably not well suited for our conditions.

**Index Terms – Innovation, Technology, Retail**

## I. INTRODUCTION

The retail market in India is slated to grow by 60 per cent from now, to US\$ 1.1 trillion by 2020. Such exceptional growth has been triggered by factors such as changes in lifestyles and rising incomes, especially of the Indian middle class, and the expansion of digital connectivity (India Brand Equity Foundation, 2018).

Retail management practices need to evolve to cater to this burgeoning demand. Globally, the industry is changing rapidly and the advent of new technologies (e.g. Internet of things, robots, drones), new retail formats (e.g. subscription models) and innovative practices (e.g. big data, predictive analytics) is bringing about a sea change in the way retailing is likely to be conducted in future.

Customer requirements and tastes are themselves changing constantly. Modern customers are mobile, constantly connected to the Internet, and well-informed about international trends. They are also sensitive to price, while being concerned about product quality, and less loyal to brands (Vasiliu and Cercel, 2015). In these circumstances, innovations are the main leverage to improve competitiveness. In the area of retail management, this triggered the emergence of new retail formats, new technologies, new selling techniques, and new marketing strategies (Dinu, 2015).

Pop et al. (2012) suggested the following dimensions of innovation in retail: selling format, brands, innovation process, customer's experience, information technologies, new communication channels, payment possibilities, and order fulfilment. Subsequently, Grewal et al (2017) identified five key areas where the future of retail is being impacted. The areas identified by them are: technology and tools to facilitate decision making, visual displays and merchandise offers related decisions, customer consumption and engagement, big data collection and utilisation, and analytics and profitability.

The objective of this paper is to explore the important technological innovations which have the potential to materially impact future retailing practices.

## II. RESEARCH ISSUE

With the Indian retailing sector fast coming of age, we have a golden opportunity to leapfrog many of the old technologies and embrace the ones that appear to be the most promising for our future. It is thus imperative to gaze into the future, examine the options, and use this knowledge to develop a proactive strategy.

## III. METHODOLOGY

For the purpose of the current study, the author has depended mostly on survey of the latest literature as well as discussions with domain experts and internet resources.

## IV. BACKGROUND

Technology enables consumers to make more informed decisions, receive more targeted and beneficial offers, and obtain faster service. It also assists retailers in reaching appropriate consumers at lower costs, due to technologically created efficiencies. Technological innovations can be changes in the product/service, process or system incurred as a result of implementation of new technology (Perković et al, 2015). They include changes in production processes or institutional solutions that make possible manufacturing of existing products in larger quantities or production of superior products/services from limited resources (Narayanan and O'Connor, 2010). Perković et al (2015) classified technology advancements into two categories: gradual and incremental changes of existing products/ processes, and discontinued reversal caused by completely new, radical innovations.

Benefitting from the immense progress in information and communication technologies, the retail sector has adopted many innovative technical solutions from this area (Pantano and Laria, 2012).

## V. FINDINGS

Inman and Nikolova (2017), in their analysis of customer-facing retail technologies, suggest that new technologies provide value by either increasing revenue through attracting new shoppers, increasing share of volume from existing shoppers, extracting greater consumer surplus, or by decreasing labour costs through offloading certain activities to shoppers. They identified mobile

apps, scan-and-go technologies, self-check-outs, QueVision, and smart shelf technology as some of the more critical technological innovations impacting future retailing. We examine each of these in somewhat greater details in the following paragraphs

### 5.1 Mobile applications

Any retailer worth its name boasts of a mobile app today. Their capabilities vary from relatively limited options such as a finding and providing directions and other detail of stores, ability to download coupons, view weekly or daily circulars electronically, with some even offering a Omni channel experience (Inman and Nikolova, 2017). A study in US by the mobile consulting firm Applause found that, among the mobile apps that received the highest app quality scores, the common themes were the capability to see deals, easily switch between PC and mobile, and receive in-store alerts (Gray, 2015). However, consumers were found to prefer fewer integrated apps via which they could search across retailers and buy whenever the need arises (Inman and Nikolova, 2017).

Mobile technology also allows retailers to offer relevant offers that reflect locational information (e.g., time of day, weather, location), using location-based applications (e.g. Google maps) (Grewal et al. 2016). This capability allows, for example, feel-good products to be promoted effectively to lift customers' spirits, when the weather outside is bad (Rosman, 2013).

### 5.2 Scanning

This is a technology that enables customers to carry out "self-checkout". Formally known as Self-scanning checkout, this is an automated process that enables shoppers to scan, bag, and pay for their purchases without the need for a cashier (Inman and Nikolova, 2017). This allows customers to gain control in terms of carrying out their in-store shopping. The retailers, on the other hand, save on labour costs due to the fewer number of cashiers required (Grewal et al. 2017), since the stores normally deploy a cashier supervisor for every four to six self-scanning stations. In a global study (NCR 2014) of 2,800 shoppers conducted across nine countries, 90% of respondents reported that they use self-checkout. They further report that they find self-checkout simple to use, enjoy it's convenience, and think it is faster than a cashier assisted lane.

### 5.3 Scan-and-go technologies

Smart phones have come as boon to retail organisations who are able to utilise their features to provide several customer-facing solutions. Several retailers have begun to test or introduce technology that allows shoppers to use their smart phone to scan items as they put them in their basket. Customers can use this scanned information through the retailer's app to pay without having to scan the items again at the checkout line (Inman and Nikolova, 2017).

Amazon is pushing the envelope even further, eliminating the need for scanning items (Inman and Nikolova, 2017). The Amazon Go technology allows shoppers to scan their smart phones as they enter the store, pick up the products they wish to, and leave without any formal check-out. The technology employs computer vision, sensor fusion, and deep learning technologies to automatically detect when products are taken from or returned to shelves (Inman and Nikolova, 2017). It also keeps track of items in a virtual cart and after consumers leave the store, they are charged and sent an automatic receipt. The customers require only a smart phone, an Amazon account, and the Amazon Go app (Amazon, 2016) for this convenience.

### 5.4 QueVision

Kroger, an American retailing company founded by Bernard Kroger in 1883 in Cincinnati, Ohio, has embraced the use of technology to reduce shopper waiting time at checkout. In 2010, they introduced a new system called QueVision across their 2,400 grocery stores. The system deploys infrared sensors that count shoppers using analytics based on "Little's Law" (Little, 1961) from queuing theory. This information is leveraged to quickly open more checkout lanes when shopper waiting time exceeds a preset threshold.

McLaughlin (2014) observed that QueVision has claimed reduction in the average shopper wait-time at checkout from more than four minutes to less than 30 seconds. Over 7 million shoppers visit Kroger each day, and this reduction in wait time equates to over 400,000 hours of saved time each day. McLaughlin (2014) further reports that shopper satisfaction with the speed of checkout has increased by 42%. Revenue has also gone up, and is attributed by Kroger to shoppers allocating less time to waiting in line and more time to shopping. QueVision has also helped Kroger free up parking space at urban stores where parking space is in short supply (Coolidge, 2013). Several other companies have commenced offering similar sensors to count store traffic, e.g. ShopperTrak (Chicago) and Traf-Sys (Pittsburgh), both US-based.

### 5.5 Smart Shelves

Retailers have recently been experimenting with "smart shelves" that offer the promise to reduce out-of-stocks items through weight sensors on the shelves. Sometimes the shelves also incorporate beacon-activated mobile advertising options. The objective is to enhance the shopping experience by providing the receiver only relevant information and discounts, thereby improving the retailer-shopper connect. This is done by the beacons triggering proximity-based communication and at-shelf advertising (Inman and Nikolova, 2017).

In another interesting innovation, many smart shelf systems incorporate digital price tags, which allow retailers to change prices remotely. The potential for savings in labour costs are substantial, considering that many retailers sell thousands of stock-keeping units (SKU) and changing paper price tags requires many hours of employee time. This apart, digital price tags allow retailers to change prices dynamically, responding to specific opportunities or risks at any time during the day. Inman and Nikolova (2017) point out that leveraging this capability requires analytics that enable the retailer to estimate demand on an hourly basis. This is coupled with real-time inventory information to effect dynamic price changes.

Apart from the above technologies there are a few more which merit a mention here.

### 5.6 In-Store CRM

Customer recognition is a key element of customer relationship management (CRM). Rather than rely on familiarity, retailers are beginning to experiment with facial recognition software that will help them identify shoppers unobtrusively. In fact, companies such as RetailNext are using technology capable of recognizing customers based on their smart phones. They also track key retail management metrics such as shopping path and dwell-time (Inman and Nikolova, 2017).

Pushing the envelope further, Realeyes, a London headquartered company started in 2007, which analyzes facial cues to monitor response to video advertising, can potentially track shoppers' emotions as they shop the store. The second-largest department store retailer in the United States, Target, recently acquired Powered Analytics, a start-up in Pittsburgh, USA. Powered Analytics concentrates on personalizing in-store shopping through mobile technology, location data, and predictive analytics with the objective of conveying an online shopping experience in physical stores (Inman and Nikolova, 2017). In fact, in 2013, Nordstrom, a US based chain of department stores, also operating in Canada and Puerto Rico, began testing technology that allowed it to track customers' movements by following Wi-Fi signals from their smart phones.

Thus a variety of technologies is available today to not only identify a customer but to leverage the customer database in combination with tracking applications to deliver on-time, customer-specific and contextual information and tailor-made deals to forge long-lasting and value creating relationships.

### 5.7 Gravity Feed Shelving Systems

Gravity feed shelving systems such as that introduced by Campbell Soup in 2002 has revolutionized the canned soup category. Campbell's gravity feed system is installed in over 20,000 stores. A gravity feed shelving system consists of a sloped shelf for supporting merchandise and a front wall that hold the merchandise in place until a shopper takes the front product. When the front item is removed, gravity pushes the remaining merchandise down the sloped shelf to the front. This system automatically maintains the appearance of the shelf, requires less attention from store personnel, and lowers labor costs. Shoppers find such displays easier to navigate, and more pleasant to shop. According to McCormick and Company, the gravity feed fixtures for its spices increased sales in installed retailers by over five percent and cut labor costs in half (Karolefski, 2008).

### 5.8 Personalized Promotions/Pricing

Pioneered at Tesco and Kroger, retailers are using datamining of their loyalty card data with the help of consulting firms such as EYC, Catalina, and Aimia to identify their best customers, and develop offers that increase customer retention. Taking the idea of personalized promotions one step further, many retailers are now experimenting with "proximity marketing" during the customers' shopping trip. By linking up smart phone technology and loyalty card data, retailers are attempting to identify specific customer requirements and reach shoppers with personalized offers in real-time.

### 5.9 Block chain

Block chain is a technology which links up the entire history of transactions of an item in the form of a digital ledger. Organisations are able to use this information to accurately manage and track complex digital transactions, and securely store the digital values or objects involved in those transactions. The global retail giant, WalMart is leading the innovation in this area with a plan for an international implementation of block chain. The company is targeting better tracking of its pork and produce transactions in China with this technology.

### 5.10 Internet of things (IoT)

RFID (radio frequency identification) has been extensively used in manufacturing, warehousing, consumer goods and retail. The situation has now been transformed by the emergence of new technologies and improvements in sensors, better connectivity and communication solutions and new devices, leading to what is popularly known as the 'internet of things' (IoT).

IoT is a network of physical devices, vehicles, home appliances, and other items embedded with electronics, software, sensors, actuators, and connectivity which enables these things to connect and exchange data (Brown, 2016). This has led to opportunities to improve retail operations and offer personalized and immersive experiences manifold.

The main area where the combination with IoT leads to new forms of engagement in retail, is digital signage. However, this requires personalisation, information and context. The ability to connect with data and sensors, often based on movement or gesture recognition, and the opportunities offered by diverse data-generating, allows use of IoT-enabled devices to create innovative solutions. Thus IoT can be used to link up sensors, gesture recognition, integrated video surveillance, and the customers' smart phone with data servers, and employ Big Data Analytics to deliver personalised information and offers to improve customer experience. It is one of many ways retailers use, to connect the physical with digital worlds, especially when the sense of touch is invoked.

### 5.11 Applications using Artificial Intelligence

There are several applications of artificial intelligence in retail, including use of digital assistants, robots, and drones.

### ***Virtual/Digital assistants***

While assistants from Apple, Amazon, Microsoft and IBM are already known, Amazon has gone a step further with Alexa, where refrigerators can order groceries for us. Simple online applications include chatbots which have already been adopted by Indian organisations, especially banks.

### ***Robotics***

Robotics is another technology which is being tested for retail applications, led by several retailers and brands. Amazon is leading the charge in this technology, with around 45,000 robots deployed in warehouses and other applications in supply chain and logistics. Robotic assistants are already on trial in aisles and checkout counters of brick-and-mortar stores. A Fortune 500 American organisation, Lowe's, having a chain of retail home improvement and appliance stores in the United States, Canada, and Mexico, is introducing a customer-help robot in the aisles of some of its stores in US.

### ***Drone delivery***

Amazon completed its first successful drone delivery in the U.K. in late 2016. However, regulatory hurdles and technical glitches have held this technology back. Despite such setbacks, substantial effort in this direction continues. This is exemplified by the fact that Amazon recently received a patent for airborne warehouses capable of sending out delivery drones to customer locations.

### ***AI (Artificial intelligence) Software based solutions***

Artificial intelligence (AI) technology can be used to examine past consumer behaviour to bring about improvements in retail processes. For example, data collected during past product purchase, or campaign response, can be utilised by AI software to make suggestions about the best ways to display products and the time slots in which they need to be marketed (Ahmad, 2018).

Softwares which can automate and enhance sales operations processes by identifying and conversing with internet leads have been used by many organisations. Even offline stores can use these solutions based on past consumer interactions and deploy them effectively to convert customer queries into product sales through artificial intelligence (AI) and machine learning. Even Indian companies have started developing such products and solutions. e.g. Bengaluru-based Capillary Technologies. Harnessing the power of AI, the company is building a series of products for its in-store vision to empower retailers (Ahmad, 2018).

## **VI. RECOMMENDATIONS**

It is obvious from the study that there are many technologies that are emerging at a furious pace, which have the potential to bring about far reaching changes in retail management practices. However, many of these may not be appropriate for the Indian market and there is a need to identify the ones which match with our specific requirements.

Many of the innovations gaining prominence in the advanced countries relate to reduction, and in some cases almost complete elimination, of manpower. Such an approach is not warranted in Indian conditions where staffing is not only comparatively cheaper, but providing jobs may even be considered as an area of corporate social responsibility. Thus technologies depending on robotics and scan-and-go may find few takers in India.

On the other hand, the Indian customer base is as large as it is diverse, with multiple segmentation approaches possible, and a proper understanding of the consumer psyche will go a long way to provide competitive advantage. Thus analytics based solutions such as in-store CRM, analytics employing big data and machine learning, and artificial intelligence based solutions may be more successful in the Indian context.

Some of the automation tools such as virtual digital assistants, however, are likely to ride on the increasing internet penetration and availability of smart phones and do very well in the Indian market. In fact, app based solutions are expected to penetrate rapidly. It will be interesting to see if Indian retail organisations adopt 'queuing theory' based solutions such as QueVision to handle peak loads.

The impact of certain technologies, such as smart shelves and gravity feed systems, are more difficult to predict. Although staffing by itself is not normally considered to be a problem in India, availability of adequately trained manpower is definitely a concern. Thus stores subjected to heavy footfalls such as Big Bazar, Spencer's etc. may be tempted to try out some of these options.

Overall, we appear to be on the cusp of important technological innovations making their foray into the Indian retail space within the next few years.

## **VII. CONTRIBUTIONS**

The study provides a compendium of the most important technological innovations which are likely to change future retail. It goes on to provide some inputs on which of these are more likely to benefit Indian retailers and which are probably not well suited for our conditions. This will allow Indian retailers, both large and small, to design their customer-facing approaches and take advantages of these game-changing innovations.

## **VIII. LIMITATIONS**

Due to limitations of time and space, the article is primarily aimed at presenting a bouquet of information on the various technological innovations that retail organisations can benefit for and does not attempt to provide any technical or operational details. This can be done subsequently, after zeroing on the particular solution of interest to the organisation and individual.

## REFERENCES

- [1] Ahmad, S. (2018). "How artificial intelligence is changing the retail game in Indian market". Business Standard, (2 July 2018) Retrieved 2 July 2018 [[https://www.business-standard.com/article/current-affairs/how-artificial-intelligence-is-changing-the-retail-game-in-indian-market-118070200033\\_1.html](https://www.business-standard.com/article/current-affairs/how-artificial-intelligence-is-changing-the-retail-game-in-indian-market-118070200033_1.html)]
- [2] Amazon (2016), Amazon Go: Frequently Asked Questions, (accessed December 12, 2016), [<https://www.amazon.com/b?node=16008589011>]
- [3] Brown, Eric (13 September 2016). "Who Needs the Internet of Things?" Linux.com. Retrieved 23 October 2016
- [4] Coolidge, Alexander (2013), New Technology Helps Kroger Speed Up Check-out Times, USA Today [accessed online: <http://www.usatoday.com/story/money/business/2013/06/20/new-technology-helps-kroger-speed-up-checkout-times/2443975/>]
- [5] Dinu, V. (2015), Retail innovation technologies. *Amfiteatru Economic*, 17(39): pp. 516-518.
- [6] Gray, Ben (2015), The Best- and Worst-Rated Retail Apps, Applause Analytics ARC Report, [accessed online: <http://go.applause.com/rs/539-CKP-074/images/ARC-The-Best-and-Worst-Rated-Retail-Apps-2015.pdf>]
- [7] Grewal, D., AL Roggeveen, A.L. and Nordfält, J. (2017) "The future of retailing", *Journal of Retailing*, 93 (1, 2017) pp. 1–6 – Elsevier
- [8] India Brand Equity Foundation. "Retail Industry in India". Available from <https://www.ibef.org/industry/retail-india.aspx> (Retrieved 2018-07-03)
- [9] Inman, J. and Nikolova, H. (2017), "Shopper-Facing Retail Technology: A Retailer Adoption Decision Framework Incorporating Shopper Attitudes and Privacy Concerns," *Journal of Retailing*, 93, 7–28.
- [10] Karolefski, J. (2008), McCormick Spices up Sales With Gravity-Feed Shelving, CPG Matters [accessed online: <http://www.cpgmatters.com/instoremarketing0508.html>]
- [11] Little, J.D.C. (1961), "A Proof of the Queuing Formula:  $L = \lambda W$ ," *Operations Research*, 9 (3), 383–7.
- [12] McLaughlin, L. (2014). "Kroger Solves Top Customer Issue: LongLines."
- [13] Narayanan, V.K., O'Connor, G.C. (2010), *Encyclopedia of technology and innovation management*, Chichester: Wiley.
- [14] NCR (2014), Self-Checkout: A Global Consumer Perspective, [accessed online: [https://www.ncr.com/sites/default/files/white papers/RET SCO wp.pdf](https://www.ncr.com/sites/default/files/white%20papers/RET%20SCO%20wp.pdf)]
- [15] Pantano, E., Laria, G. (2012), Innovation in Retail Process: From Consumers' experience to immersive store design. *Journal of Technology Management & Innovation*, 7(3): pp. 194-205.
- [16] Perković, F, Dužević, I, and Baković, T.( 2015), "Technological Innovation In Retail", Trade Perspectives, Innovations in Food Retailing 2015, Proceedings of The International Scientific Conference, Zagreb, Croatia, 18th and 19th November 2015, Eds Knego, N., Renko S. and Knežević, B., pp. 19-31
- [17] Pop, N., Saniuta, A., Roman, M. (2012), Perception and communication of innovation in retail trade (Case study applied to Bricolage products). *Annals of the Faculty of Economics, University of Oradea*, 1(1): pp.1200-1208.
- [18] Rosman, K. (2013), "Weather Channel Now Also Forecasts What You'll Buy," *The Wall Street Journal*, (August 14, <http://www.wsj.com/>)
- [19] Vasiliu, C., Cercel, M.O. (2015), Innovation in retail: impact on creating a positive experience when buying fashion products. *Amfiteatru Economic*, 17(39): pp. 583-599.
- [20] Wiley.com. "Internet of Things A to Z: Technologies and Applications". (Retrieved 2018-06-05)
- [21] Ali, A. 2001. Macroeconomic variables as common pervasive risk factors and the empirical content of the Arbitrage Pricing Theory. *Journal of Empirical finance*, 5(3): 221–240.