

# Technological Profile of Retailers in India

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## Abstract

**Background/Objectives:** Technology will play a significant role in improving the efficiencies of supply chains' of retailers and therefore the success of the organized retail stores. This study tries to identify the level of utilization of various retail technologies by retailers and the upcoming technologies which will drive business in the future in the Indian context.

**Methods/Statistical Analysis:** Questionnaire based study was conducted to ascertain the level of current technological adoption and future technological outlook for 35 retail firms. A follow up telephonic call was made to the technological heads of retailers to collect qualitative data in terms of the technologies that retailers would need to equip themselves to survive in the coming 3 years along with the upcoming technologies in the retail arena. **Findings:** The study highlights that most of the retailers are using technologies in operational areas like direct broadcast satellite technologies, communication and data sharing technologies, security and safety related technologies, on-line shopping services and enterprise resource planning related technologies. But technologies in the area of customer tracking and customer relationship management and supply chain management have not seen widespread adoption as compared to the adoption by multinational retailers. The upcoming technologies which technology heads mentioned that they would adopt in the coming years is Mobility related technologies, Queue busting technologies and Omni channel. **Applications/Improvements:** This research indicates the areas where the current usage of technologies is high and the areas where the technological investments are planned in the coming 3 years time horizon and therefore has provided a future outlook to the technological investments in Indian context. This type of study is unique in the Indian context.

**Keywords:** Indian, IT, Retail, Technologies

## 1. Introduction

The retail sector in India is estimated at USD 500 billion<sup>1</sup>. The penetration of organized modern retail formats is 8 percent, thus 92 percent of the industry is emerging retail with mom and pop stores. Several alterations are happening to the face of retail by way of government regulations, adoption of new technologies and evolving consumer needs. The allowance of Foreign Direct Investment in retail (FDI) has opened the doors to some of the world's leading brands and companies. This is bound to result in a shake-up of the landscape with the influx of new working processes, revamped distribution channels and new technologies that will redefine the way the organized retail will work in future. Shopping habits have evolved to encompass

traditional mom and pop stores as well as modern trade formats. The traditional stores are still successful as they provide an individualized experience, convenience as stores are providing home delivery as well as credit to pay at the end of the month. Whereas the modern retail formats are able to provide loads of variety and choice, discounts and offers and an enhanced shopping experience. The bigger retailers need to embrace technology because they cannot operate without the support of life blood, which is technology to manage day to day stock status, replenishment, tailored schemes for the customer, etc. The smaller mom and pop stores in contrast have also begun to use technology at the point of sale and thus to provide better service and shopping experience. As retailers grow in size and reach, they adopt differing segments of technology.

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In this study, the authors have identified technologies and grouped them into the following 11 categories: 1) Customer Tracking and Customer Relationship Management Technology, 2) Technology as Shopping Assistance and Visual Merchandising, 3) Direct Broadcast Satellite Technology, 4) Communication and Data Sharing 5) Energy Management, 6) Security and Safety, 7) On - Line Shopping Services, 8) Supply chain and Logistics Management, 9) Payment Related Technologies, 10) Enterprise Resource Planning and other add on tools.

The big retailers are able to afford to implement some of the cutting edge technologies mentioned in this paper. As prices come down over a period of time, some of the technologies will be available to our mom and pop stores as well.

### 1.1 Literature Review

The retail industry is going through a shakeout period with couple of retailers like retail closing down or selling off their business and many like Future group, Reliance Retail, Trent Hypermarket, Retail, finding it extremely difficult to earn decent profits. The industry is eyeing at technology as a means of competitive advantage and is therefore continually making decisions about whether or not to adapt new technologies available in the field<sup>2</sup>. The two important objectives of trying newest technologies is to cut costs for retailers by making supply chains efficient by enhancing product availability, reduce stock outs, reduce overall inventory levels etc. The second reason is to facilitate convenient and exciting shopping experience to the customers. Retailers who are able to achieve both these objectives should be able to boost their sales and profits. Technology will therefore play an important role in deciding the direction in which the retailer would like to take the firm in future. Those who remain behind would miss the opportunity as social media, E-commerce and other technology tools will take away a huge chunk of business from the brick and mortar stores to on-line business in the near future. A detailed review stating the various categories of technologies which are available to a retailer to enhance its performance are mentioned in the literature review.

### 1.2 Customer Tracking and Customer Relationship Management Technology:

The retail sector is envisaging a lot of growth with new players entering the market making the competition

intense. The focus has therefore shifted from merely acquiring new customers to retaining existing customers. Sophisticated analysis with the aid of Business Intelligence and Customer Relationship Management enable retailers to have unprecedented access to the mind of the customer. Retailers are using this insightful information to develop one to one relation with the customer, design marketing and promotion campaigns, optimize store layout and manage e-commerce operations<sup>3</sup>. Retailers are recording each customer's individual transactions through the Customer Relationship Management 'Loyalty cards'. Loyalty cards have given immense knowledge about customer buying patterns, which has significantly helped in augmenting customer loyalty and thereby enhanced sales and revenues<sup>4</sup>. Business Intelligence has been used by brick and mortar retailers to automate replenishment, which has resulted in inventory saving. It has enabled assortment optimization, which helps retailers to predict, which lines should be delisted, enabling them to be more responsive to changing consumer preferences. Price optimization is possible with the aid of Business Intelligence, thus gaining an edge over competitors. Consumers rely on conversations with friends, family and colleagues before buying in virtually all categories. This makes India a 'fertile' breeding ground for these programs.

### 1.3 Technology as Shopping Assistance and Visual Merchandising

A couple of new technologies have come in the market, which aids a shopper in a very smooth shopping experience. Shopping cart is one of them. It is a cart, which has a video monitor and a RFID interrogator. As the shopper moves through the aisle, the software identifies products displayed on the shelves and accordingly plays video advertisement to lure customer to buy the products. Customer can upload a shopping list and the monitor will display the products in order of aisle number and the list will erase the items kept in the cart. When the shopper adds products to the cart, the screen shows its description, detailed information, price and the total cost of cart contents making it very convenient for the shopper. The shopper can view at checkout the cart contents, total cost and select the desired payment method and pay for the purchases made<sup>5</sup>.

Digital Signage is another technology which gives the retailer the ability to play digital ads and videos across multiple retail outlets displayed via Plasma or LCD

screen<sup>6</sup>. The advantage is that dynamic content, schemes and promotions can be displayed on the screen to arouse their interest and ultimately aid in enhancing the revenue from the customer<sup>7</sup>.

Quick Response (QR) Codes have been used quite successfully by Tesco in Korea. Tesco did a market survey and ascertained that the Koreans are very hard working people and they find it difficult to manage time out of their busy schedule to shop for weekly grocery requirements. They opened the world's first virtual supermarket at a subway, where smart-phone users could photograph the QR codes of the life-size pictures, on the walls and platform screen doors, of 500 items of food, toiletries, electronics etc, for delivery within the same day. Commuters could scan the QR codes and add the items to the shopping cart, order the items and get it delivered on the same day<sup>8-10</sup>.

Computer based Kiosks have been implemented by retailers to track customer purchases, to provide list of items to complement these purchases, and to provide customers with information on product availability.

#### 1.4 Direct Broadcast Satellite Technology:

Retailers are using Direct Broadcast Satellite Technology for video conferencing. It is an extremely useful technology as corporate buyers at headquarters can talk 'over the air' with the store merchandiser and get the feel of 'what is selling' and 'what is not'. A regular discussion with the store merchandiser will ensure that the corporate office is purchasing, what the customers actually need and thereby enhance the sales of the retail outlet. The technology can be used for employee training, management updates and review meetings and transmission of store data. The technology has reduced the travel cost of some of the companies considerably and has enhanced the interaction among the various departments leading to better co-ordination and speed.

#### 1.5 Communication and Data Sharing

Information technology software's are being used by retailers to prepare budgets, develop forecasts, analyze marketing efforts and prepare automated labor scheduling. Large departmental stores and hypermarkets use radio equipment to maintain contacts with maintenance staff, security and warehouse staff so as to ensure fast action like replenishing stocks on shelves on time. Global Data Synchronization Networks helps in updating of master data to maintain consistency between the business partners<sup>11</sup>.

#### 1.6 Energy Management

Lighting control systems, motion sensors in the bathrooms, parking areas and aisles, Computerized Heating, Ventilation, Air conditioning systems (HVAC) to analyze energy load demands and peak usage periods, light fittings, which conserve energy are some of the technologies in the energy management arena. These technologies are able to conserve energy for the retailer and thereby reduce the costs<sup>12</sup>.

#### 1.7 Security and Safety

In the area of security and safety, technologies like closed circuit TVs and smoke detectors and fire systems are some of the technologies in use. These technologies are extremely important for big departmental stores and hypermarkets. With the incidents of theft increasing, it has become necessary for the big stores to have their stores under CCTV surveillance. It reduces the instances of theft and at the same time aids in ascertaining the person who has been involved with the theft after the incidence has taken place. Smoke detectors and fire systems are technologies, which help the retailer to know about a fire outburst before it reaches a level where it becomes impossible to save the remaining property. Fire could result in huge losses of property, products as well as human beings and therefore it is an important 'must have' technology especially for big departmental stores and hypermarkets<sup>12</sup>.

#### 1.8 On-line Shopping Services

Online retail is slowly becoming popular with the number of internet users expanding. It is offering personalized experiences to the on-line shoppers with rapid price and product comparisons and on the spot recommendations. Based on the selection, customer can pay by credit card and have a regional distribution center fill the order and send it directly to them within days<sup>2</sup>.

#### 1.9 Supply Chain and Logistics Management

There are many technologies which can be used in the supply chain arena. Radio frequency identification technology is one of these technologies, which can track products in real time as they move along the supply chains<sup>13</sup>. Some of the benefits that this technology offers are, automated check-out, reduced labor for stock taking,

reduced out-of-stock and improved theft prevention<sup>14</sup>. This particular technology has not penetrated the Indian markets as the cost of deployment of the technology is very high.

Point of Sale technologies like bar coding and scanning machines used at the checkout counter enable a retailer to facilitate the process of checkout by preparing the bill and receiving the payment for the items purchased. Most of the organized retailers in India use some form of point of sale technologies to capture product sale data as well as customer profile information, which can enable the retailer to offer schemes, discounts and offerings. Electronic shelf labels and self checkout are technologies which have still not received acceptance in the Indian retail sector. Electronic data interchange (EDI) is an inter-organizational exchange of information between the retailer and its suppliers. This technology is widely used by retailers in India.

### 1.10 Payment Related Technologies

Biometric payment is method of recognizing a person based on the physiological characteristics like face, fingerprints, iris, retina, etc and allow them to pay for the purchase made by linking it to their financial statements. Eliminating the need to carry a wallet in the store, the new system provides customers with greater convenience, security and speed at checkout<sup>15,16</sup>. Biometric payments can link captured transactions to Loyalty reward programs, gift cards and discount coupons<sup>17</sup>.

Mobile payments are payments made using mobile devices such as cell phones or PDA<sup>18</sup>. Advances in various technologies have made this possible, which include Short Messaging Service, Wireless Application Protocol, SIM toolkit, Radio Frequency Identification SIM and Near Field Communication<sup>19</sup>.

Biometric payments or Mobile payments will eliminate the need to carry bulky wallets with paper bills, coins, currency and loads of cards. Through fast transactions, retailers can greatly increase footfall through their stores.

### 1.11 Enterprise Resource Planning and other add on Tools:

An Enterprise Resource Planning (ERP) system facilitates internal and external management of information across an entire organization. Typically, ERP systems comprise of all enterprise functionalities such as finance and accounting, manufacturing, sales and service, cus-

tomers relationship management, human resources, etc. ERP systems automate these functions with an integrated software application, thus helping the management to take right decisions. It also manages connections with the external stakeholders of the organization. An ERP System is a sophisticated software solution that provides accurate and timely information and helps management take appropriate and timely business decisions. For example, in an ERP environment, the moment a material is moved from warehouse, the manager is automatically aware without being specifically informed about it. The procurement team gets an alert about the possible next procurement time; the production planning team gets the notification about the available stock, so on and so forth.

The on-premise ERP software's available in the market are very expensive. In contrast, there are on-demand solutions available in the market called as Cloud computing. It is an on-demand solution built on web based standards and protocols through a shared physical infrastructure. It promises lower cost and rapid deployment and therefore is ideal for small and medium scale enterprises.

Apart from the core ERP, many add on modules are available in the market for example Collaborative, Planning, Forecasting and Replenishment (CPFR). It is a collaborative method to jointly forecast sales of goods to the consumers to enable the manufacturer to be able to plan production and distribution better and the retailer to ensure availability of a product with the minimum stock<sup>20</sup>.

### 1.11 Research Objective and Methodology

Technological advances offer new opportunities to retailers to better manage their stores and also enhance the shopping experience of the consumers thereby aid in developing brand loyalty, which in turn leads to enhanced sales and profit. The objective of this research is to deepen the readers understanding of various technologies available to the retailers in the Indian context. It will also ascertain the current level of usage of these technologies and the technologies which retailers are planning to implement in the coming three years. The study will also highlight the technologies of future and the upcoming technologies, which have hardly made a presence in the Indian context but are quite promising.

A questionnaire based survey was administered. For designing the questionnaire a thorough review of previous literature was conducted. Technological firms were contacted to gather information about the latest retail technologies offered by them. Inputs from some of the

technology heads of multinational retailers were also captured. Retailers association of India was also contacted for their inputs on the topic. Finally, a pilot study was conducted where 8 technology heads of retail firms were asked to fill up the questionnaire. The participants of the pilot study were asked to offer their comments and suggestions, in terms of whether all the technologies were included in the study and whether they were classified under the correct category. They were also asked to comment on the clarity of the survey question. These comments were incorporated into the final questionnaire.

The final questionnaire was sent to technology heads of retail firms in India through mail. Reminders were sent and calls were made to follow up with the retailers. 103 technology head and managers were contacted and out of them 39 responded. 4 responses were not complete and therefore discarded. Therefore the sample size is 35 representing 35 different retail firms. After administering the questionnaire, qualitative data was collected by making a follow up telephonic call with the technology heads of retail firms. The purpose was to understand, the technologies which the retailers would need to equip themselves in the coming 3 to 5 years time horizon. They were also asked to elaborate on the upcoming technologies with

reference to the retail sector. The telephonic conversation with the technology heads helped the authors to clearly visualize the direction in which technological adoption will shape up in the coming days.

## 2. Data Analysis and Findings

The findings of the study are based on the tabulation of all returned surveys through mail as well as telephonic conversation with the technology heads of retail firms.

### 2.1 Customer Tracking and Customer Relationship Management Technology

The use of technology as customer tracking and customer relationship management falls into several categories. These include 1) Customer Loyalty Card, 2) Data Mining, 3) Business Intelligence and Data Warehousing, 4) Infrared transmitters or other devices, 5) Electronic devices at entrances/exits to record number of customers and 6) Web technologies like Mashups, Ajax, Blogs, Social networking, etc. The percentage of retailers currently utilizing each of these technologies and the likelihood of future use are presented in Table 1.

**Table 1.** Customer Tracking and Customer Relationship Management Technology

Technology	Current Use		Future Use								
	Percent Utilizing	Number of Firms <sup>1</sup>	Likelihood that technology will be implemented in at least half of malls in next three years <sup>2</sup>								
			Not At All Likely	Likely	Very Likely	1	2	3	4	5	
<b>Customer Loyalty card</b>											
a. to track customer loyalty /shopping frequency	73	26	12	8	43	22	15				
b. to develop customer profiles	73	26	12	8	43	22	15				
<b>Data Mining</b>											
a. Market Basket Analysis	67	23	15	12	45	20	8				
b. ABC analysis	67	23	15	12	45	20	8				
c. Clustering	67	23	15	12	45	20	8				
<b>Business Intelligence and Data Warehousing</b>	67	23	18	9	50	22	1				
<b>Infrared transmitters</b> or other devices to track customer movement in the retail outlet	16	6	60	20	5	10	5				
<b>Web Technologies</b> like Mashups, Ajax, Blogs, Social Networking, etc	49	17	7	15	40	17	21				

<sup>1</sup>Number of firms reporting having this technology in fewer than 50% of their malls.  
<sup>2</sup>Responses from firms having this technology in fewer than 50% of their malls.

45 percent of the retailers are using Customer Loyalty cards for tracking loyalty and to develop profiles so that promotions can be offered based on the profiles of the consumers. 80 percent of the retailers were of the opinion that they are “Likely” to “Very Likely” to implement customer loyalty cards in the next three years. 29 percent of the retailers are using different data mining tools for decision making and promotions. Business Intelligence and Data warehousing has been adapted by 30 percent retailers. Number of customers and customer movement technologies are hardly being used by Indian retailers. 49 percent retailers have started using Web technologies to promote their offerings.

### 2.2 Technology as Shopping Assistance and Visual Merchandising

The use of technology as shopping assistance and visual merchandising falls into several categories. These include 1) Shopping cart, 2) Digital Signage, 3) Quick response codes and 4) Computer based kiosks. The percentage of retailers utilizing each of these technologies and the likelihood of future use are presented in Table 2.

Research findings indicate that none of the retailers who participated in this survey seem to be using these technologies. Only 34 percent are of the opinion that they are “Likely” to “Very Likely” to use Digital Signage to display promotions, schemes and offers in the coming 3 years timeframe. None of the firms indicated that they would use Shopping cart, Quick response codes and computer based kiosk in the next 3 years, which indicates that the infusion of these technologies will take considerable time in India. Unless the Indian retailers foresee substantial benefits from these technologies, they would not be interested in investing in them.

### 2.3 Direct Broadcast Satellite Technology

The use of technology as Direct Broadcast Satellite Technology falls into several categories. These include Satellite communication by retailer for 1) Employee training, 2) Video conferencing, 3) Management updates and 4) transmission of store data. The percentage of retailers currently utilizing each of these technologies and the likelihood of future use are presented in Table 3.

**Table 2.** Technology as Shopping Assistance and Visual merchandising

Technology	Current Use		Future Use				
	Percent Utilizing	Number of Firms <sup>1</sup>	Likelihood that technology will be implemented in at least half of malls in next three years <sup>2</sup>				
			Not At All Likely	Likely	Very Likely		
			1	2	3	4	5
<b>Shopping cart</b>	0	0	93	7	0	0	0
<b>Digital Signage</b>	0	0	42	24	15	7	12
<b>Quick Response Code</b>	0	0	89	3	8	0	0
<b>Computer based Kiosks:</b>							
a. to track customer purchases to provide list of items to complement these purchases	0	0	84	16	0	0	0
b. to provide gift list of ideas based on previous purchases of customers	0	0	84	16	0	0	0
c. used by customers to make purchases	0	0	84	16	0	0	0
d. to provide information to customers	0	0	84	16	0	0	0
e. which provide customers with information on product availability	0	0	84	16	0	0	0

<sup>1</sup> Number of firms reporting having this technology in fewer than 50% of their malls.

<sup>2</sup> Responses from firms having this technology in fewer than 50% of their malls.

**Table 3.** Communication and Data Sharing

Technology	Current Use		Future Use				
	Percent Utilizing	Number of Firms <sup>1</sup>	Likelihood that technology will be implemented in at least half of malls in next three years <sup>2</sup>				
			Not At All Likely	Likely	Very Likely		
			1	2	3	4	5
<b>Information Technology Software</b>							
a. to prepare budgets	85	30	0	3	13	24	60
b. to develop forecasts	85	30	0	3	13	24	60
c. to analyze marketing efforts	71	25	20	24	14	15	37
d. to perform automated labor scheduling	43	15	30	25	6	21	18
<b>Use of desktops/laptops</b>							
a. to prepare reports for communication	100	35	0	0	15	15	70
b. to develop promotional materials	86	30	0	0	18	17	65
Use of <b>radio equipment</b> to maintain contact with maintenance staff, security, warehouse staff, etc.	29	10	60	27	10	2	1
<b>Global Data Synchronization Networks</b>	26	9	40	11	30	12	7

<sup>1</sup>No. of firms having this technology in less than 50% of their malls.

<sup>2</sup>Responses from firms having this technology in less than 50% of their malls.

Research findings indicate that none of the retailers are using satellite communication for employee training and video conferencing and they are not likely to use these technologies in the near future as the cost is quite prohibitive. Almost all retailers are using satellite communication technologies, for activities like management updates, and transmission of store data.

## 2.4 Communication and Data Sharing

The use of technology as Communication and Data Sharing falls into several categories. These include Satellite communication by retailer for 1) Information technology software to prepare budgets, to develop forecasts, to analyze marketing efforts and to perform automated labor scheduling, 2) Use of Desktops/Laptops to prepare reports for communication and to develop promotional materials, 3) Radio equipment to maintain contact with maintenance staff, security, warehouse staff, etc. and 4) Global data synchronization networks. The percentage of retailers currently utilizing each of these technologies and the likelihood of future use are presented in Table 4.

Research findings indicate that 85 percent and above retailers are using information technology software to prepare budgets and develop forecast. 71 percent are using

information technology software for analyzing marketing efforts and only 43 percent are using information technology software to perform automated labor scheduling as many retailers have stores which are small in size (less than 1,000 square foot) and employ people between 2 to 7 per store and therefore do not require information technology software for scheduling. All retailers in the given sample prepare reports for communication using desktop or laptops, 86 percent retailers use desktop/laptops to develop promotional materials. 29 percent retailers in the given sample use radio equipments to maintain contacts with maintenance staff, security, warehouse staff, etc. 50 percent retailers use global data synchronization networks.

## 2.5 Energy Management

The use of technology as Energy Management falls into several categories. These include 1) Computerized Heating, Ventilation and Air conditioning to analyze energy load demands and peak usage periods 2) Motion sensors based lighting especially in the parking area, toilets, lobbies, etc. The percentage of retailers currently utilizing each of these technologies and the likelihood of future use are presented in Table 5.

**Table 4.** Energy Management

Technology	Current Use		Future Use				
	Percent Utilizing	Number of Firms <sup>1</sup>	Likelihood that technology will be implemented in at least half of malls in next three years <sup>2</sup>				
			Not At All Likely		Likely	Very Likely	
			1	2	3	4	5
Computerized Heating, Ventilation and Air conditioning (HVAC) to analyze energy load demands & peak usage periods	29	10	24	45	7	9	15
Motion sensors based lighting especially in the parking area, toilets, lobbies, etc	14	5	79	9	4	5	3

<sup>1</sup>Number of firms reporting having this technology in fewer than 50% of their malls.  
<sup>2</sup>Responses from firms having this technology in fewer than 50% of their malls.

**Table 5.** Security and Safety

Technology	Current Use		Future Use				
	Percent Utilizing	Number of Firms <sup>1</sup>	Likelihood that technology will be implemented in at least half of malls in next three years <sup>2</sup>				
			Not At All Likely		Likely	Very Likely	
			1	2	3	4	5
Closed circuit CCTV in the retail outlet	90	32	0	13	5	12	70
New technologies for exit signs (e.g., incandescents and light - emitting diodes)	17	6	38	24	15	13	20

<sup>1</sup>Number of firms reporting having this technology in fewer than 50% of their malls.  
<sup>2</sup>Responses from firms having this technology in fewer than 50% of their malls.

Research findings indicate that only 29 percent of the retailers use HVAC to analyze energy load demands and peak usage periods. 14 percent of retailers use motion sensors based lighting especially in the parking area, toilets, lobbies, etc. This clearly depicts that energy management is not a focus area for most of the retailers. Retailers who have stores less than 1,000 square feet area are reluctant to invest in energy management technologies as these technologies are expensive for them and the benefits do not sufficiently justify the investment. 35 percent of the retailers are of the opinion that they are “likely” to “Very Likely” to implement energy management technologies like HVAC and 10 percent of the retailers are of the opinion that they are “Likely” to “Very Likely” to implement Motion sensors based lighting.

## 2.6 Security and Safety

The use of technology as Security and Safety falls into several categories. These include 1) Closed circuit CCTV in the

retail outlets, 2) New technologies for exit signs for example incandescent and light—emitting diodes, 3) Smoke detectors and fire system. The percentage of retailers currently utilizing each of these technologies and the likelihood of future use are presented in Table 6.

Research findings indicate that 90 percent of the retailers use closed circuit CCTV in the retail outlet, 32 percent use incandescent and light-emitting diodes for exit signs, 65 percent use smoke detectors and fire system. Almost all the retailers are likely to install CCTVs in the coming 3 years time horizon. Many retailers who have not installed smoke detector and fire system are likely to do so in the coming 3 years time horizon. Technologies for exit signs are applicable to retail stores which have huge parking space. Most of the retailers in this study do not have huge parking area with security guards using technologies for exit signs.



**Table 6.** On- line Shopping Services

Technology	Current Use		Future Use				
	Percent Utilizing	Number of Firms <sup>1</sup>	Likelihood that technology will be implemented in at least half of malls in next three years <sup>2</sup>				
			Not At All Likely	Likely	Very Likely		
			1	2	3	4	5
On - line <b>home page</b> to provide information to customers (e.g. types of store, hours, etc.)	95	33	0	0	0	11	89
E-commerce / On - Line Shopping for customers	51	18	8	22	34	27	9
<b>Virtual shopping mall</b>	0	0	89	6	3	1	1
<b>M-commerce</b> / Mobile commerce	51	18	40	30	17	7	6
b. Electronic Shelf Labels	0	0	100	0	0	0	0
c. Self Checkout	0	0	100	0	0	0	0

<sup>1</sup>Number of firms reporting having this technology in fewer than 50% of their malls.  
<sup>2</sup>Responses from firms having this technology in fewer than 50% of their malls.

## 2.7 On—Line Shopping Services

The use of technology as On – Line Shopping services falls into several categories. These include 1) On line home page to provide information to customers (e.g. type of store, hours, etc), 2) E-commerce/On-line shopping for customers 3) Virtual shopping malls and 4) M-commerce/ Mobile commerce. The percentage of retailers currently utilizing each of these technologies and the likelihood of future use are presented in Table 7.

Research findings indicate that 95 percent of retailers have on-line home page to provide information to customers about type of stores, location of stores, product

details, working hours, etc. 45 percent of the retailers have an E-commerce presence and there are no retailers who provide virtual shopping mall experience or are active on Mobile commerce. 70 percent of the retailers are of the opinion that they are “likely” to “Very Likely” to implement E-commerce or on-line presence. On-line shopping is becoming quite common especially with the city youngsters, who do not have the time to visit stores and are looking out for convenience. Lot of on-line retailers are providing option to the customers to pay on delivery, which is slowly removing the threat of losing money on on-line shopping from the minds of the consumers and

**Table 7.** Supply chain and Logistics Management

Technology	Current Use		Future Use				
	Percent Utilizing	Number of Firms <sup>1</sup>	Likelihood that technology will be implemented in at least half of malls in next three years <sup>2</sup>				
			Not At All Likely	Likely	Very Likely		
			1	2	3	4	5
<b>Personal handheld multi modal Shopping Assistant</b>	0	0	100	0	0	0	0
<b>Electronic Data Interchange (EDI)</b>	61	21	3	28	42	15	12
<b>Warehouse Management system (WMS)</b>	85	30	7	10	63	12	8
<b>Voice based order filling</b>	0	0	73	27	0	0	0
<b>E-procurement</b>	46	16	2	3	70	15	10

<sup>1</sup>Number of firms reporting having this technology in fewer than 50% of their malls.  
<sup>2</sup>Responses from firms having this technology in fewer than 50% of their malls.

Technology	Current Use		Future Use				
	Percent Utilizing	Number of Firms <sup>1</sup>	Likelihood that technology will be implemented in at least half of malls in next three years <sup>2</sup>				
			Not At All Likely	Likely	Very Likely		
			1	2	3	4	5
<b>Biometric Payment</b>	0	0	100	0	0	0	0
<b>Mobile Payment</b>	0	0	84	0	9	7	0
<b>Debit card / Credit card</b>	100	35	0	0	0	0	100

<sup>1</sup>Number of firms reporting having this technology in fewer than 50% of their malls.  
<sup>2</sup>Responses from firms having this technology in fewer than 50% of their malls.

thus promoting on-line shopping. Virtual shopping mall concept is new in the Indian context and therefore only 5% retailers are of the opinion that they would come out with a virtual shopping mall in the coming 3 years time horizon, whereas 30% were of the opinion that it is “Likely” to “Very Likely” that their stores will provide Mobile commerce.

## 2.8 Supply Chain and Logistics Management

The use of technology as Supply chain and Logistics Management falls into several categories. These include 1) Radio frequency identification technology (RFID), 2) Point of sale technologies, 3) Personal hand held multi modal shopping assistant, 4) Electronic data interchange (EDI), 5) Warehouse Management System (WMS), 6) Voice based order filling and 7) E-procurement. The percentage of retailers currently utilizing each of these technologies and the likelihood of future use are presented in Table 8.

Research findings indicate that not a single retailer has implemented RFID in fewer than 50 percent of the stores. Though the technology has been implemented by global retailers like Wal-Mart, it has not been found cost effective in the Indian scenario. The cost of the technology is a deterrent to its implementation. The big Indian retailers like Shoppers Stop, Pantaloons, Trent, etc., are trying to ascertain the feasibility of its implementation but are unable to find the proposition viable at this point in time. As the prices will slash, retailers will try to implement this technology, which claims a lot of advantage in terms of managing the supply chain effectively right from the supplier to the store. All the retailers had implemented point

of sale technologies like bar coding and scanning but not a single retailer had implemented electronic shelf label and self checkout. Electronic shelf label is a technology which enables the retailer to display current prices on an ongoing basis and thus helps in offering sales promotions and discounts quickly and with utmost ease. Again this technology is expensive and Indian retailers do not still find it cost effective and therefore have not adopted this technology. Self checkout as a concept would take a little longer to implement as a major chunk of the population is still below poverty line. There is a threat of theft in self checkout. A lot of population of India does not have debit or credit card and so self checkout would not be possible. Personal handheld multi modal shopping assistant has also not penetrated the Indian market.

Electronic data Interchange is implemented in around 57 percent of the retailers. 75 percent of the retailers are of the opinion that they are “likely” to “Very Likely” to implement the technology within the forthcoming 3 years timeframe. Warehouse management system has been implemented in around 85 percent of the retailers. Voice based order filling is a technology which does not have its presence in India. E-procurement has got wide spread adoption. 79 percent of the retailers have adopted E-procurement. 95 percent of the retailers are of the opinion that they are “likely” to “Very Likely” to implement E-procurement in the coming 3 years.

## 2.9 Payment Related Technologies

The use of technology as Payment Related Technologies falls into several categories. These include 1) Biometric payment 2) Mobile payment 3) Debit card/Credit card. The percentage of retailers currently utilizing each of

**Table 9.** Enterprise Resource Planning and other add on tools

Technology	Current Use		Future Use				
	Percent Utilizing	Number of Firms <sup>1</sup>	Likelihood that technology will be implemented in at least half of malls in next three years <sup>2</sup>				
			Not At All Likely		Likely	Very Likely	
			1	2	3	4	5
Retail Enterprise Resource Planning (ERP)	100	35	0	0	0	0	100
Cloud computing for add on tools like analytics, etc	12	4	22	30	33	12	7
Collaborative Planning, Forecasting and Replenishment (CPRF)	81	28	2	3	14	24	57

<sup>1</sup>Number of firms reporting having this technology in fewer than 50% of their malls.  
<sup>2</sup>Responses from firms having this technology in fewer than 50% of their malls.

these technologies and the likelihood of future use are presented in Table 9.

Research findings indicate that Biometric payment and Mobile payment are technologies which have not been adopted by the sampled retailers in India. Debit Card/Credit cards are used by all the retailers. None of the retailers were of the opinion that Biometric payment and Mobile payment will be implemented in their stores in the coming 3 years timeframe.

## 2.10 Enterprise Resource Planning and Other add on Tools

The use of technology as Enterprise Resource Planning and other add on tools falls into several categories. These include 1) Retail enterprise resource planning, 2) Cloud computing 3) Collaborative planning, forecasting and replenishment. The percentage of retailers currently utilizing each of these technologies and the likelihood of future use are presented in Table 10.

Research findings indicate that all the retailers have adopted enterprise resource planning software for capturing day to day transactions of the firm. Very few retailers (12 percent) have adopted cloud computing for add on tools like analytics, etc. Collaborative, planning, forecasting and replenishment has been adopted by more than 75 percent of the retailers and 95 percent of the retailers are “likely” to “Very Likely” to implement this technology within the next 3 years.

## 3. Discussion

### 3.1 Current Use

Based on the responses of the participating firms, technologies with low current usage and technologies with high current usage were identified. Technologies related to customer tracking and customer relationship management have seen low adoption. The multi-brand retailers have adopted this technology faster as compared to the single brand retailers. The reason that was stated by the respondents was that customer tracking and customer relationship management related technologies are expensive to implement. Unless the retailer has substantial sales the cost does get justified as compared to the investment made. Secondly, the technology adds value when the shopper shops on a frequent basis and therefore it becomes difficult for single brand retailers to invest in this technology as they are unable to attract the shoppers at a regular interval. Shoppers Stop is one of the pioneer retailers, who initiated loyalty program. They claim to have the highest number of people under the loyalty program in the country. More than 75 percent of the sales happen through the loyalty program. Technologies in the category of shopping assistance and visual merchandising have also seen almost no adoption. Shopping cart is an expensive technology which requires integration with RFID and other technologies. Indian retailers are not able to see these technologies as viable alternatives, because the cost of adoption is extremely high. Quick response code

requires that people possess smart phones. The number of people who have a smart phone is expanding as far as the Indian market is concerned, but still not enough to justify the investment in Quick response codes. This technology again requires integration with other technologies like mobile commerce and mobile payments which are new to the Indian market. Direct broadcast satellite technologies are used by all the retailers for management updates and transmission of store data but not used for employee training and video conferencing. Video conferencing is an expensive technology and retailers do not find this investment worth the cost and therefore has seen hardly any adoption.

Technologies in the category of communication and data sharing have seen widespread adoption by most of the retailers except technologies like radio equipment to maintain contact with staff and global data synchronization networks. The size of most of the Indian stores is quite small as compared to foreign stores and therefore the need for radio equipment was not felt by the Indian retailers. Most of the retailers are struggling to survive and make decent profits and therefore energy management related technologies are not focus area for retailers in India unless it makes economic sense. The penetration of computerized heating, ventilation and air conditioning system is high in case of air-conditioned departmental stores and hypermarkets. This technology is expensive for the single brand retailers who have stores less than 1,500 square feet. Motion sensors based lighting has also not penetrated enough in the Indian retail sector. Technologies in the category of on-line shopping services have seen considerable adoption. Almost all the retailers had an online home page. Around 45 percent of the retailers had an e-commerce site. Mobile-commerce is a technology that technology companies are working on, but has not penetrated as yet in the retail arena. Supply chain and Logistics management is a category of technologies that retailers are banging on for improving their operational efficiency by ensuring that the overall stocks in the supply chain are at the rock bottom level while maintaining adequate stocks at the stores level. This requires technologies, which can capture data at the point of sale level and provide updated stock status levels. Points of sale technologies like bar coding and scanning have been widely adopted and almost all the retailers in the study have adopted this technology. Some of the retailers have adopted technologies like electronic data interchange and warehouse management system but other technologies

like electronic shelf label, self-checkout, personal hand-held multi modal shopping assistant, voice based order filling and e-procurement have not been able to enter the Indian retail sector. Technologies in the category of payments have not penetrated in the Indian retail sector except the use of debit card or credit card for payment. Biometric payment and mobile payment are technologies which will take a while to enter the retail sector in India. Technologies in the area of enterprise resource planning and other add on tools have seen wide-spread adoption in India. All the retailers surveyed in the study have implemented retail enterprise resource planning software. A lot of retailers have also implemented collaborative planning, forecasting and replenishment for faster and better management of inventory. Some of the retailers are experimenting with cloud computing for add on tools like data mining and business analytics.

Overall, the focus of retailers has shifted from capturing operational data towards analytics and customer tracking and customer relationship management related technologies. Most of the retailers have stabilized on capturing data through the point of sale technologies and sending it to the ERP so that inventory management can be implemented right from the supplier to the store. Now they are looking at grabbing technologies, which help in understanding the customers better so that a higher share of the customer wallet can be achieved and thus building brand loyalty in the process.

## 4. Future Use

Based on the responses of the participating firms, technologies that will be implemented in at least half of the malls in next 3 years were identified to provide future outlook. Most of the retailers were optimistic about their use of customer tracking and customer relationship management based technologies. Almost 80 percent of the firms reported that they are “likely” to “Very Likely” to use these technologies to grab a higher share of customer wallet by understanding the customer requirements and providing offers, schemes to lure the customer. Technologies in the category of shopping assistance and visual merchandising are technologies which have hardly been adopted by retailers in India and the future also does not look promising as most of the retailers have mentioned that they are unlikely to adopt these technologies in the forthcoming three years. The technologies in the category of direct broadcast satel-

lite have been adopted successfully for management updates and transmission of store data and will be used in future three years as well but most of the retailers said that they are unlikely to use satellite communication for employee training and video conferencing in the coming three years. Video conferencing is an expensive technology and will take a couple of years for adoption. Technologies in the category of communication and data sharing have seen widespread adoption and almost 80 percent of the retailers said that they are “likely” to “Very Likely” to use these technologies in the coming three years. Radio equipment to maintain contact with maintenance staff, security, warehouse staff, etc. is used by some of the mall management administrative people to manage the facility. Individual retailers are unlikely to use it in the coming three years. Around 50 percent of the retailers were of the opinion that they are “Likely” to “Very Likely” to use Global data synchronization networks in the coming three years time horizon.

Technologies in the category of energy management like HVAC and motion sensors based lighting are not the top priority technologies for adoption for most of the retailers and therefore around 10 to 30 percent of the retailers mentioned that they are “Likely” to “Very Likely” to adopt this technology in the coming future. Technologies in the category of security and safety like CCTV and smoke detector and fire system have seen widespread adoption and 80 to 90 percent of the retailers mentioned that they are “likely” to “Very Likely” to use this technology in the coming three years. Technologies for exit signs have seen moderate adoption and retailers are 50 percent “likely” to “Very Likely” to adopt this technology in the coming three years. Technologies in the category of On-line shopping services is picking up very fast and a lot of retailers are feeling a dip in their brick and mortar sales especially in the category of books stores, Music and accessories. On-line apparel sales are picking up quite well. People are initially experimenting with apparel purchases of small value to get a feel and would probably make purchases of higher values as well in the coming days. 70 percent and more retailers have mentioned that they are “Likely” to “Very Likely” to implement on-line shopping for customers. Almost all the retailers have a home page. Virtual shopping mall and M-commerce are technologies which have hardly seen any adoption in the country and 70 percent and more retailers mentioned that they are “Unlikely” to implement this technology in the coming three years.

Some of the technologies in the category of supply chain and logistics management have seen widespread adoption like point of sale technologies like bar coding and scanning. Electronic data interchange is a technology which 50 percent and more retailers confirmed that they are “Likely” to “Very Likely” to implement this technology in the coming three years. Warehouse management system is another technology which around 80 percent retailers mentioned that they are “Likely” to “Very Likely” to implement in the coming three years. E-procurement is another technology in this category which around 95 percent of retailers mentioned that they are “Likely” to “Very Likely” to implement in the coming three years. Electronic shelf labels, self checkout, personal handheld multi modal shopping assistant and voice based order filling are technologies which are “unlikely” to be adopted in the coming three years. Payment related technologies are technologies which most of the retailers are unlike to implement in the coming three years except debit card and credit card facility which is available with all the retailers in the study. Finally enterprise resource planning and other add on tools have been implemented in most of the retail firms in India. Cloud computing is a technology which more than 50 percent retailers mentioned that they are “Likely” to “Very Likely” to implement this technology in the coming three years.

## 5. Upcoming Technologies

The technology heads of retail firms were asked to mention the upcoming technologies in the next 3 to 5 years as far as the Indian markets are concerned. These are technologies which some of the multinational retailers have tried but are still expensive and new to the Indian markets.

### 5.1 Mobility

Mobile usage in India is considerably higher than the global average, and it is arguably this channel that brings the biggest opportunity for retailers looking to sell to Indian consumers. Prices of smart-phones have come down from an average of Rs. 15000 in 2012 to entry level models which cost Rs. 4000 in 2013. While the customer adoption of mobility has been very high, the retailers in India have failed to show the same speed to market. Some of the features that the Indian consumers are looking at from a mobility solution are gift registry, loyalty program

access, store locator, deals and promos, price comparator, customer support and social integration. Entertainment and joyfulness of doing business through cell phone can influence the overall adoption of the technology<sup>21</sup>.

## 5.2 Omni-Channel

The retailers are using more than one channel to sell their products. The channel lineup for retailers can include brick-and-mortar stores, e-commerce sites, social and mobile commerce, catalogs and other seasonal or single-use channels such as pop-up stores and flash sales. The availability of these channels has, boosted shoppers' expectations within each channel. A consumer expects cross-channel services such as 'click-and-collect' and 'order-to-deliver', wider online SKU offerings, in-store kiosks, free delivery, free returns through any channel and a mobile retail site. Retailers also expect a consistent brand experience in terms of products, promotions, prices, product descriptions, delivery charges and return policies, regardless of which channel they are shopping which is called as Omni-channel.

Today's Consumers are much more, well informed about brands than most of the employees of the retail stores. They research a brand on facebook or any other social media before purchase. They go the website of various brands to check the product, price, feature, color, etc. They are demanding an omni-channel, whereby they could book a product on the internet and go and buy in the brick and mortar store or select and book a product in the physical store and ask for a home delivery. This would require the existing stand alone silos like physical store business and e-commerce business to talk to each other in an integrative way. Omni channel provides a seamless, consistent and integrated shopping experience, which is unique to the consumer.

## 5.3 Queue Busting Technology

Queue busting refers to operations intended to reduce the amount of time customers have to wait to receive service. Automated queue-busting systems use mobile computers and printers to add speed, security and professionalism to transaction processing operations. The benefit of this technology could be a reduction in customer waiting time, improved customer conversion and an overall increase in revenue at the locations where queue busting is deployed. The queue busting technology can be either automated or mobile. In automated queue busting applications, items

in basket are scanned, so that only the payment part of the check out process is at-counter. This can reduce billing time and works best when the cash memo size is less than 20 items. Another alternative is mobile queue busting, where associates use mobile systems to complete the entire transaction on the spot, so the customer can bypass the counter completely. The advantage of mobile queue busting systems is that queue buster staff has "one-to-one" interaction with each customer, which leads to a feeling of added customer care and individual service, which improves the customer experience and loyalty. Another version of queue busting technology is based on quick response codes (QR). Tesco has pioneered the concept in South Korea and Woolworths have introduced this concept in Melbourne and Sydney.

## 6. Discussion of Managerial Implications

The technology heads of retailers were asked to provide an outlook in terms of the technological areas in which retail firms will make investments in the coming 3 to 5 years time frame especially with reference to the Indian market.

- Retailers would need to have an on-line presence and therefore would need to be active on the e-commerce platform.
- If offline stores are available, retailers would need to integrate the store network into the online e-commerce platform to provide services such as buy online pickup in-store, etc.
- Retailers would need to invest in analytical tools that capture, collect and analyze online and offline customer behavior so as to understand the consumer and accordingly offer schemes, discounts and sales promotions.
- They would need to develop ability to act on customer insights on a real-time basis on the web and other channels.
- Digital marketing solutions that provide customer segmentation and personalized marketing campaign execution and measurement capabilities can provide an edge to retailers in terms of lowering customer acquisition costs and developing brand loyalty.
- Retailers would need to develop ability to do both qualitative and quantitative web and digital analytics.
- Retailers would need to place the customer at the centre and then build on the technology lifecycle.

Build a balanced approach for the online and offline experiences and map the technology based on those customer experiences.

- Build a Customer Interactive Platform, which provides a personalized and interactive experience to customers based on their profile and shopping history and should be able to select and compare products.
- Integrate the store with other supply chain elements. Agile supply chains integrates merchandising, sourcing, logistics, order management and order fulfillment, thus enabling flexible demand response no matter where customers are.
- They would need to undertake Customer Relationship Management initiatives through targeted promotions, personalized messages and in-store loyalty management programs.
- Store managers would be required to be empowered with real-time enterprise data, which helps the store manager to react to exceptions in store like shelf is out of stock and assigning the re-stock task to the store associate. Analyzing key trends such as shrink patterns enables store managers to target their activities better. This empowers store managers to be more effective by being on the floor, helping customers and driving revenue.
- Retailers would be required to tap social media to engage their customers and to address their queries, anxieties, apprehensions and concerns. Based on the feedback on the social media appropriate changes need to be undertaken so as to ensure that the customers are delighted and similar concerns do not come up again and again.
- Omni-channel is what all retailers would need to move towards by offering similar experience across channels and the possibility for a customer to order online and pick up from store or order in store and delivery at home, thus integrating all the channels of distribution.

## 7. Conclusion

Information technology has become an important department for a retailer. No relevant business decisions are taken without the technology team involvement. The technology department leads or is a part of all schemes, offers, promotions, campaigns, customer loyalty programs, etc. launched by the retailer. Once a business

process is set, IT department will put it in action with the aid of technology. The retailer has to transform itself, to a process and technology driven organization from a people driven organization. This transformation will ensure that technology gets adopted faster and with much more success.

There are so many suppliers coming up with new retail technologies. It is becoming more and more difficult for technology heads to decide, which IT tools to embrace. It is important to select the technology which is right for the organization but equally important to make sure, that first, all the users know how to use the technology. Second, all users use the technology. Third, different ways in which the same tool can be used should be ascertained. Finally, low cost start-up and long term use could be an option for success. End-user adoption of new technology is frequently a key roadblock to an implementation's success and also the most critical factor for generating return on investment.

The current study has divided the technologies in ten different categories. Retailers were asked to indicate the current use of the technology in less than 50 percent of the stores which depicts current usage as well as future outlook of the retail firms in terms of how likely are they planning to adopt a particular technology. Mobility, omni-channel and queue bursting technologies are the upcoming technologies which will very soon penetrate the Indian market.

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