# Chapter 18
# Role of Technologies in Revamping the Supply Chain Management of Kirana Stores

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## 18.1 Kirana Stores and Indian Retail Sector

Indian retail is one of the most vibrant and fast-growing sectors which is experiencing exponential growth and has been termed as the fifth largest preferred retail destination globally now [1]. According to a recent report by RedSeer, the sector is set to grow to $1.3 trillion by the fiscal year 2025 from $1 trillion now. It accounts for over 10% of the gross domestic product (GDP) of India. The retail segment in India is supported by both organized and unorganized players with the later one ruling the market at 84% share. In the FMCG and grocery category though, their contribution will continue to be almost 90%, the report said. Organized retail, both online and offline, is poised to grow from 16% to 22% in the next 5 years. The unorganized segment is largely driven by neighborhood corner stores or grocery stores which in general parlance are called kirana stores.

These kirana stores are the lifeline of Indian consumers and an integral part of the distribution network of food and grocery products. More than 15 M stores are operating in every nook and corner of India serving millions of Indians both from higher-income groups and to lower-income groups. Despite the deeper penetration of organized retail and e-commerce platforms, these stores have not lost their consumer base and their relevance in the life of the consumers. There are millions of Indians from lower-income groups, for whom getting into an organized retail outlet is still a dream but for them, kirana stores have been their saviors. These stores

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serve the immediate neighborhood and build and keep a close connect with their consumers. They know their consumers by name, their buying pattern, and their shopping preferences and offer credit also to help them maintain their livelihood. There are huge numbers of daily wagers in India who earn their livelihood by doing temporary jobs and paid daily. For these consumers, kirana stores are not only a necessity but a source of credit also. Their families buy essential food items on credit from these stores during the daytime, and they pay back to these stores in the evening when they return home after days' work.

Most of these stores are run by a single individual, from the premise of their home and with limited capital and space. They store and stock a range of products – grains, cereals, packaged goods, beverages, nonfood items from a category of personal care and homecare, fruits, vegetables, and dairy items. These stores score very high on parameters of customer acquaintance, connect and knowing the buying patterns. Without spending any advertising or marketing budgets on branding, these stores develop a strong emotional connect with their consumers which lasts for years. The entry barrier in this business is very low and thus the competition is very high so every store tries to do their best to maintain their committed consumer base.

While these stores have proved themselves the true companion of Indian consumers for a long time, many of the high-end consumers understood their importance during the recent lockdown post-outbreak of Covid-19. When all the established organized players both from brick-and-mortar format to e-commerce and hyper-local format were struggling to operate due to lack of manpower and restriction for movements, these stores served their consumers even while risking their own life. The resilience shown by these stores during that critical time helped them expanding their consumer base to new territories and with a new consumer segment also. During that time when most of the other business was unable to operate, these stores earned laurels and praise from many brands which started wooing them to place their set of brands on these stores. Many hyper-local businesses and established e-commerce companies which were trying to collaborate with these stores to ensure their last-mile deliveries even before lockdown stepped up their efforts to build a partnership with these stores. These partnerships have blurred the gaps between online and offline channels and have provided opportunities for both the players to co-opt with each other rather than compete. While organized players have ensured last-mile deliveries using the vast network of kirana stores, owners of these stores have in return are eying for additional business from these partnerships.

Almost all the leading online and e-commerce players are trying to partner with these kirana stores to expand their reach and ensure last-mile deliveries. Jio Mart, which is promoted by Reliance, is also eying on kirana stores with WhatsApp-based order placement and home deliveries. The objective of these firms is to capitalize on the locational advantage of kirana stores to ensure faster deliveries of their goods while offering additional revenue to these stores.

While this newfound partnership is there to stay as it benefits both the players, at least the time being, it has allowed kirana stores to relook into their business models. While at the front-end operation where consumer experience matters the most, these stores have started working upon by using tech-based solutions. Cashless

payment, order taking through messaging apps, listing with local online directories, and partnership with local logistics partners for home deliveries are a few of the initiatives taken by these stores in recent months. But the larger issue is still open for these stores in terms of managing the supply chain. Due to capital issues, they were already struggling to maintain the inventories and range of SKUs, but now with going beyond their traditional consumer base, they have another challenge in terms of managing a wider range and product assortment. This has led to a situation where they need to revamp their entire supply chain.

## 18.2 Kirana Store's Supply Chain and Its Key Components

A supply chain is termed as the process of making and selling commercial goods, including the procurement of raw material, conversion into finished goods, and its transportation and distribution, for sale to end user. In a more simple term, supply chain can be further defined as an integration of three components buy, make, and move. Here buy refers to sourcing of raw materials, make is to convert this raw material into finished goods, and move is about the transportation of these finished goods to point of sales.

Supply chain management is the management of every step in to supply chain to make it cost-efficient and time-bound to help businesses generate more sales and create more happy customers.

In the context of kirana stores, supply chain starts at the procurement of finished goods from wholesalers or open mandis and ends at a sale to customers at their store. This can be depicted as shown below (Fig. 18.1).

Under newly found convergence between offline and online channels and the emergence of hyper-local channels, there is another leg being operated in the supply chain where logistics partners of hyper-local platforms and e-commerce companies collect the delivery from these stores and deliver to customers directly without the customer making a physical visit to the store. This additional leg in the supply chain can impact inventories and storage part of the supply chain of kirana stores.


**Fig. 18.1** Traditional supply chain of kirana stores. (Source author)

## 18.3 Key Components of SCM and Scope of Technology

The traditional distribution network of kirana stores is highly fragmented, leading to various challenges to operate the stores. Limited storage space and working capital are the given constraint, whereas due to overdependence on wholesalers and company distributors for procurement, their supply chain becomes larger leading to wastages in the system. Various research studies suggest that up to 15% wastage in cereals and 30% in fruits and vegetables are due to storage-related issues and age-old handling methods alone.

Due to the challenge of overdependence on wholesalers and constraints of storage and working capital, supply chain management becomes more critical for kirana stores. Out of the different components of the supply chain, three can be taken as the most prominent one to study further from the perspective of technological intervention. These components are procurement or sourcing, inventory management, and storage and logistics. The component of logistics has been slightly downplayed here as most of the supplies to these stores are inbound and delivered at their stores by suppliers except the loose grains they buy from open mandis. But with the emergence of hyper-local channels and convergence of online and kirana stores, some outbound deliveries are also happening with the help of third-party logistics partners. The key components of SCM have been discussed below with the scope technology can have in their operations.

## 18.4 Procurement or Sourcing

Sourcing of goods is one of the key components of the supply chain which requires time, money, and understanding of demand projection. Since kirana stores sell both the packaged and loose items, getting estimates on what to buy and from where to buy to meet the financial constraint is a task and where the technologies can help these stores.

## 18.5 Inventory Management

Inventory management is a critical component for kirana store SCM. For them, it is highly critical to keep the right size of inventory seeing the constraints they have. Inventory management is a concern area that requires attention due to different expiry times of various SKUs in the food and grocery segment. Even to maintain the freshness of dairy items, chocolates, soft drinks, and vegetables for a longer time, these stores would be in need of cold storage with which most of them don't have until and unless provided by suppliers. To get an optimum inventory level under operating condition, these stores need the technological solutions which

can suggest them average sales through rate, demand projection basis trends, and accurate estimates of stock lying with them.

## 18.6 Storage and Logistics

These stores buy mostly on a weekly basis, and quantities depend on credit amount extended by the distributors and suppliers for FMCG products. Due to constraints of capital and no data on how much to buy, frequent stock-outs, especially during the second half of the month, are a common phenomenon for these stores. The reason is that they buy more during the first week of the month seeing the purchase cycle of consumers, especially the salaried one. In the case of loose grains, the buying cycle most of the time happens on a harvest cycle basis, and thus the issue of warehousing is very common. The challenges of storage are directly linked with the inventory planning and procurement cycle and thus also require solutions based on technology to improve the efficiency and operating process.

## 18.7 Types of Technologies and Their Application in SCM of Kirana Stores

With the growth in the retail sector and the emergence of e-commerce, and the concept of omnichannel presence, supply chain management has become the most critical and talked about function of the retail sector across the globe. E-commerce companies are operating with a global supply chain where some of the goods are procured from the outside country and then shipped and stored in the local country for further distribution. The Amazon effect, a term which was coined after same-day delivery option to its customers, announced by Amazon has further pushed the retail sector to experiment with newer technologies. Digital, RFID, and of late blockchain technologies are some of the most popular technologies being used in supply chain management across the globe. Robotics and the IoT are getting used for supply chain management but are still in a nascent stage from the supply chain perspective. The identified three technologies have immense potential to drive not only cost efficiencies but scores high on parameters of acceptance, usability, and affordability also.

## 18.8 Blockchain

Blockchain is an Internet-based technology that is prized for its ability to publicly validate, record, and distribute transactions in immutable, encrypted ledgers. It came

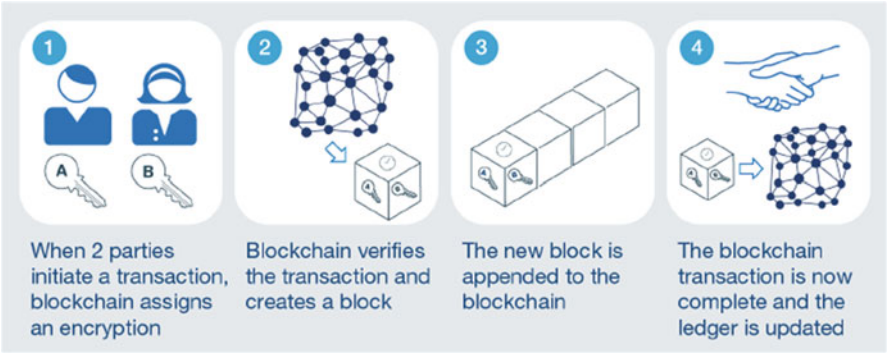


**Fig. 18.2** How to create a blockchain transaction. (Source Mckinsey & Company)

into light in 2008 as a tool for securely tracking cryptocurrency transactions. It is a record-keeping technology that is nearly impossible to tamper with.

Blockchain uses mutually distributed ledgers that are built on a series of innovations and used to organize and share data in a digital form. As defined by Seebacher and Schüritz [6] "A Blockchain is a distributed database, which is shared among and agreed upon a peer-to-peer network". It consists of two key elements:

1. Blocks which are a storage unit of transaction
2. Time-stamped transactions that are secured by public-key cryptography (i.e., "hash") and verified by the network community

Once an element is appended to the blockchain, it cannot be altered and it becomes an archive of all the past transactions and activities (Fig. 18.2).

Blockchain as a technology has got immense potential, but its usage is still limited in supply chain management. In today's business set up, most of the firms operate their supply chain operations without using Block Chain Technology. But block chain has immense potential to excite the SCM professionals and they have already started building the initial cases and projects to check the usability and feasibility of this technology in supply chain operations. Walmart is already using it to trace the origin of the products, e.g., mangoes which are shipped from Mexico to the USA. It says that the use of blockchain has shortened the time to track produce from 6 days to 2 seconds, which helped them solve several issues related to food safety, customs and regulatory filings, and automated payments. China-based retailer JD.com has also been using blockchain to track supplies of beef from Australia to China to address the problems of food contamination, misrepresentation, brand erosion, and product theft.

Out of various properties and comfort in which blockchain offers, there are two characteristics – transparency and traceability – which are critical for supply chain management in the context of local market conditions of India.

**Transparency** Transparency is referred to as the information available to each of the players involved in a supply network. Awaysheh and Klassen [2] define transparency as the extent to which information is readily and easily available to both the counterparties in exchange and also to outside observers who are involved. Transparency is critical as it ensures visibility to all concerned parties about the movement of goods and stages it passes through from procurement till final sale to consumers. It provides a bird's-eye view in the value chain with a guarantee of the proper handover of third-party goods and final product labeling also.

**Traceability** Skilton and Robinson [7] define traceability as the ability to recognize and substantiate the components and chronology of events in all steps of a process chain. Traceability is related with information to trace the origin of the product in which consumer is buying as most of the consumers now demand information on the source of the product they buy. Blockchain technology can enhance product traceability by reducing counterfeiting and by streamlining product recall.

Besides the above two key properties, blockchain offers other benefits also which can be used in building a more efficient supply chain.

- Reduced errors
- No product delays
- Prevention of fraudulent activities
- Increased consumer/supplier trust

Blockchain can help stores in providing verified information to customers regarding where products are, how it got there, and when it arrived at the shop.

## 18.9 Role of Blockchain in Supply Chain Management of Kirana Stores

Procurement is the key function of kirana stores. Blockchain can help them manage their procurement as it provides two valuable benefits to them. End-to-end visibility of blockchain promotes fair and complaint practices that can prevent any malfunctioning during the procurement process. With almost no intermediaries in between, the procurement process would become a less costly affair for these stores. Besides that, it would reduce the chances of human errors. For kirana stores, procuring grains is a big challenge as they buy it straight from mandis or farmers, and without any visibility, once the order has been placed, chances of mixing of low-quality grains are very high. The usage of blockchain technology in this procurement process would ensure transparent information at all levels of the supply chain and reducing the possibilities of quality degradation at any level.

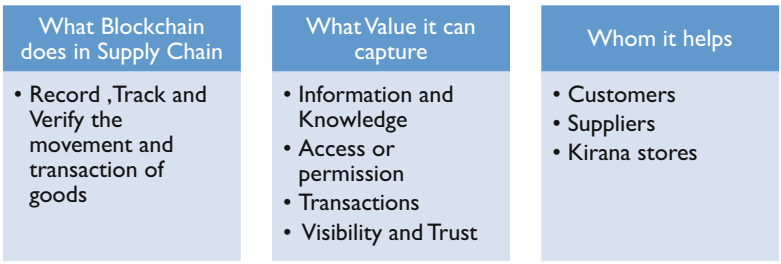


**Fig. 18.3** How blockchain can help kirana stores managing supply chain. (Source author)

The benefits of blockchain can be transferred in the delivery cycle of the supply chain also which directly impacts the consumers. With the increased partnership between these kirana stores and hyper-local and e-commerce platforms, the delivery part of goods to consumers has been outsourced to third-party logistics partners in most of the cases. These logistics partners deploy their own vehicles to deliver the goods to the end user. Since three parties are involved in the process from order taking to order delivery (online platform to kirana stores to logistics partners), issues at any level can impact the customer experience. Blockchain can come handy in these situations where delivery vehicles can be integrated with technologies such as GPS, which in turn works as an input source of information for the blockchain. Once this mechanism gets in place, it almost removes all the possibilities of data forging and would track any hampering or mishandling of the goods dispatched for delivery to customers.

The third area where blockchain can be used by kirana stores is to track their goods especially food items where freshness and hygiene are most sought after attributes from a consumer perspective. Blockchain can track food items throughout supply chains to help reduce inefficiencies and give speed to the flow of goods. It can provide visibility to everyone involved in the process of sourcing, storing, distribution, and sale of food items to help them work together. It can solve two purposes – customers would have clear visibility about the place from where their food comes from and would reduce the chances of waste of food items due to spoilage and delay in delivery timing. For example, if a plum is plucked from a plant and transferred into a storage space, the blockchain records the status of the plum. In the absence of a proper record, a supplier might think that the plum is still on the tree.

Diagram given below is showing how blockchain can help kirana stores in managing their supply chain with the help of blockchain (Fig. 18.3).

## 18.10 RFID

RFID stands for "radio-frequency identification" where digital data is encoded in RFID tags or small labels and captured by a reader via radio waves. Rouse [5] defines RFID as a technology that incorporates the use of electromagnetic or electrostatic coupling in the radio-frequency (RF) portion of the electromagnetic spectrum to uniquely identify an object, animal, or person.

In basic characteristics, RFID is quite similar to barcodes when data from tag or label is taken by a device that stores it in a database. While comparing RFID and barcode, RFID data tags have the functionality to be read beyond the line of sight where the barcode needs to be in the range of optical scanner for retrieval of stored data. RFID systems consist of three components – RFID tag or label, RFID reader, and an antenna. RFID tag contains an integrated circuit, and antenna is used to communicate data to the reader which in turn converts the radio waves into different data formats and transfers this to the host computer via a communication interface.

The criticality of RFID technology lies in its capability to help store owners to trace the location and quantity of inventory without doing manual search and counting [8, 9]. It enables store owners to meet the consumer demand by inventories at the right place, at the right time, and in the right quantity (Fisher et al. 2000). RFID improves the traceability of goods to help retailers track the flow of goods in the physical distribution channel at any given point which leads to reduced inventory levels [4].

Walmart experimented with RFID and successfully placed RFID tags on individual garments that can be read by a handheld scanner [10]. This helped in ensuring optimal stock at shelves and maintaining the required inventory level. In an organized retail scenario, there is no need to scan products with RFID tags separately but can be accounted while being remained in the shopping basket when the customer passes through a doorway equipped with appropriate readers. This leads to faster checkouts, saves labor cost, and adds to enhanced customer experience.

RFID helps in creating delighted customers as it can provide them information about the origin of the product especially in the case of perishable and organic food items. Retailers can use the RFID technology to create differentiation from their competitors by adding and communicating the values hidden in the products itself to the customers.

Like any other technology, RFID also has positives and negatives. While on the positive side, it can revolutionize the supply chain management for both big and small stores, on the negative side it can be misused to track the locations of customers also. Privacy advocates argue that retailers could misuse the technology to track the location of the customers beyond the store also using RFID tags as these tags are traceable even after being removed from the products bought by the customers. Although no such issue has been reported in the recent past, companies have been working on this problem to reduce the privacy concern of the consumers.

## 18.11 Role of RFID in Supply Chain Management of Kirana Stores

For kirana stores, RFID has its potential to help them in two key areas of supply chain management – storage and inventory management. Managing inventories is a big challenge for kirana stores due to two reasons – space constraints and low working capital. Normally a kirana store stocks and sells 3500–4000 SKUs in limited space, thus making it difficult to locate the low selling SKUs at the right time. Another challenge is in the absence of a proper record of the stock count, and frequent stock-out position is witnessed at stores. RFID helps kirana store not only to locate the products but also to keep a proper track on stock availability of different SKUs so orders can be placed in time to avoid stock-out situations. Proper tracking also helps in saving products from being damaged and dented and thus incurring possibilities of losses for these store owners. Less stock-out situations lead to high customer satisfaction, thus leading to higher sales for these stores.

A core capability of RFID is the ability to have a piece of complete information from the date item is received and data at which it is sold. It helps retailers to know their sale through rate and in turn support them in inventory design and replenishment cycle. It leads to lower wastages and reduces the losses due to spoilage.

With the help of RFID technology, store owners can track the food items all the way from the original location to the consumers it is sold, thus bringing transparency in the entire value chain. Most of the kirana stores sell items that are famous for being produced at one particular location. Like mangoes from Malihabad, Lucknow, in northern India. RFID can help track the origin of these mangoes and would come as handy for consumers to know the source of the product that they are buying.

RFID helps in keeping a complete track of products in the store as retailers want to know the status and condition of goods. RFID tags can update on a real-time basis the information like the temperature of products during transportation. It offers them the opportunity to do the correction and take actions if required to maintain the specific temperature or conditions for the critical products during any stage of the supply chain process.

## 18.12 Digital Technologies

Deloitte [3] defined digital technology as an as technology-enabled combination of resources (can include instruments, devices, bots, tools, processes, networks, methodologies) which enable the availability of content (can be data, information, expert/social reviews, reports, analysis) for the user to make more productive decisions and satisfying choices. Digital technologies are electronic tools, systems, devices, and resources that generate, store, or process data. Well-known examples include social media, online games, multimedia, and mobile phones.

In the traditional supply chain, information is used to travel in linear order with each step dependent on the one before it leading to cascade the inefficiency at one step in subsequent steps. Digital technologies help in building a coherent supply chain, which is more dynamic and integrated. The digital supply chain employs real-time data and provides greater transparency to help make more informed decisions. It also provides more avenues to collaborate across the entire supply chain network.

Digital technologies are in the process of reshaping the supply chains and are poised to give a complete makeover to the existing process of procurement. Application based on cloud computing and IoT has disrupted the fundamentals of the old-fashioned supply chain. These technologies are helping retailers in strategic sourcing by using predictive analytics and improved transactional relationships between retailers and suppliers. Digital procurement solutions are helping retailers by giving them access to data that was hidden from them to make them use it to drive complex analysis and building more efficient business operations. With the presence of this data, retailers are now ready to partner with brands directly which are already experimented with virtual showrooms and virtual reality.

A digital supply chain (DSC) is a technology-supported smart and value-driven process to produce revenue and business value for the organizations by leveraging new approaches and methods. DSC is not about whether goods and services are digital or physical; it is about how supply chain processes are managed with a wide variety of innovative technologies and solutions.

Digital technologies provide the capabilities that can completely re-engineer the existing supply chain process by collaborating with each player involved in the process and thus focusing more on shoppers alone with the objective of improving sales and shopping experience. The digitally connected supply chain can ascertain the right inventory required to support demand from the market in conjugation with cost to serve the demand.

## 18.13 Role of Digital Technologies in SCM of Kirana Stores

Since kirana stores operate on low capital and small space to store goods, a digital- based inventory model will help them store the economic quantities and faster replenishment of stock as and when required. Today's consumer is digitally connected and migrates frequently between online platforms and offline channels to ensure the best deal for him. With more retailers getting connected with digital technologies, these consumers place their orders before arriving at the store, thus making it easier for store owners to check their inventories in time. If store owners have clear visibility of collective orders, regardless of their origin especially in the case of the active hyper-local model, stores would have a much better chance to eliminate two things that are the key challenges – out of stock and improper inventories. Another area of application of digital technology at kirana stores is the tracking of food items. Freshness (meat, seafood, deli, bakery, produce) has become the battleground in food. Retailers are focusing on the quality and freshness of the

food items to serve their customers and reduce their objection levels. With the help of technology, retailers can weight products randomly, track code dates, enforce safety requirements, and thus ensure food safety as a part of the culture of the store operation.

Kirana stores operate with a space of 200–500 sq ft and always complain about space as in the absence of proper planning the available space even falls short of placing goods in order and sequence, leading to a situation where some of the items get lost in haphazard storing and finally lead to damaged or OOD which again cause loss of cost. Digital technologies deal with macro- and micro-space analysis to improve store layout and store planning as well as optimization of shelf space to assure the most optimal utilization of space and arrangement of goods. Digital displays are now used very frequently for merchandising at kirana stores which have improved store layout and store planning as well as optimization of shelf space to assure the most optimal utilization of space and arrangement of goods.

For FMCG products, procurement is largely dependent on the visit of suppliers at kirana stores. A sensor-based POS terminal keeps track of sales and stock position for various SKUs for packaged goods with barcode if entered properly in the system. This functionality helps small kirana stores managing their replenishment and further procurement.

## 18.14 Conclusion

Technology has been instrumental in revamping supply chain management across the globe in recent years. Most of these initiatives have been taken largely by organized retailers but later being replicated by unorganized sector also depending upon factors of affordability and ease of usability. In the last few years, kirana stores in India also started experimenting with technological solutions in the supply chain. Eroding market share, changing consumer demographics, increased digitalization, and the onslaught of organized retail and e-commerce were key factors that not only posed challenges before these stores but also provided an opportunity to revamp the existing process both at front-end operations as well back-end operation. Increased affordability of smartphones, mobile data, and availability of the Internet in vernacular languages worked as an enabler in this transformation of kirana stores. In terms of the application of blockchain technology at kirana stores, it looks quite premature seeing the cost and absence of proven examples in the Indian context. While scope for digital technologies and RFID look promising, it would require more sincere efforts to help retailers understand the benefits and operational efficiency these technologies can brought for them. The role of suppliers and distributors would be critical for helping, motivating, and handholding kirana stores to start using these technologies. It can be concluded that technologies like blockchain, RFID, and digital have enough scope to address the issues of traditional

supply chain and restructure it according to the needs of today's time. These technologies can help in not only reducing the cost of operation but to improve the operational efficiencies to increase consumer footfall and finally growth in business.

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