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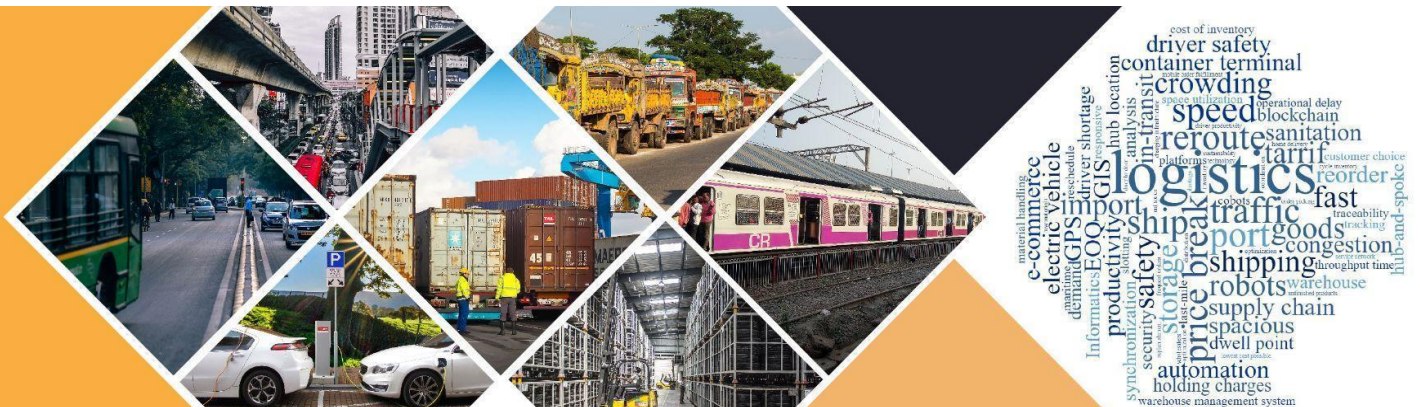विद्याविनियोगाद्विकास:
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Rise of Quick Commerce in India: Business Models and Infrastructure Requirements

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Rise of Quick Commerce in India: Business Models and Infrastructure Requirements

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Acknowledgement

Introduction

The democratisation of mobile internet, increase in e-commerce penetration and omnichannel distribution has led to an expansion of the e-commerce industry. The COVID19 pandemic and the subsequent control measures like lockdowns and social distancing led to disruptions in the e-commerce industry (Mandloi et al., 2021). This has also influenced consumer behaviour and led to an increase in the online purchase of perishables and groceries by customers. A part of the shift can be attributed to the diversion of spending from clothing and lifestyle to household essentials (Nahata, 2022). Further, COVID19 led to an expansion in online grocery purchases by 80% in 2020 to USD 2.66 billion[1](Patil et al., 2021, p2). The demand was accompanied by instant delivery expectations, leading to the emergence of the quick commerce business. It is estimated that the industry will grow at a CAGR of 27.9% between FY 2022 and FY 2027 (Pratik and Arora, 2022). Today, many players operate in the quick commerce business. Some are new players like Zepto and Pickily while others are an extension of established players like Swiggy Instamart, Blinkit, Dunzo Daily, Country Delight, and Big Basket Daily among others. These players use different business models based on business dynamics and customer requirements to process orders instantly with efficiency and accuracy. Warehouses are a key element of the quick commerce supply chain.

The rapid growth of the quick commerce industry necessitates a detailed review of the established and emerging trends in the industry and an exploration of the various business models adopted by these firms. Through a comprehensive literature review, this paper aims to throw light on the operating model of quick commerce businesses and assess their fundamental infrastructure requirements. The paper covers the following aspects -

- A brief overview of the Indian e-commerce market and the emergence of quick commerce
- Different quick commerce business models, especially in the grocery market

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[1] Exchange rate on May 24, 2021, is USD 1 = INR 72.8366. Source: Yahoo Finance.

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- The centrality of warehousing in optimising the quick commerce supply chain
- The need to automate warehousing operations in dark stores[2]
- The challenges that affect the sustainability of quick commerce in an ever-changing market environment.

It is important to first understand the dynamics of the e-commerce industry in India before reviewing the quick commerce industry. Platform markets were established in India at the beginning of the 21st century with the onset of advanced technology and internet services. These platform markets revolutionised Indian commerce. One such platform was e-commerce, which has seen rapid growth and popularity among India's urban population. E-commerce has brought significant changes in consumer behaviour, transforming Indian business processes. It has reduced the need for customers to visit physical stores by bringing all kinds of products for sale on apps and websites. The Indian e-commerce market is estimated to reach USD 200 billion by 2026 and USD 350 billion by 2030 (*E-commerce Industry Report*, 2022), from the current value of USD 52.57 billion recorded in 2020. This growth can be attributed to multiple factors. Some of them are -

- Increase in smartphone and internet users - Data from the World Bank showed that almost 43% of the Indian population uses the internet. As per the IAMAI and Kantar Research report, this number will touch 900 million by 2025. Notably, nearly 50% of the transactions were done over a mobile application.
- Relaxed FDI (foreign direct investment) norms – The current FDI norms of the government allowed 100% FDI via the automatic route in B2B e-commerce. Also, for the marketplace model, B2C e-commerce, 100% FDI is allowed under the automatic route.

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[2] Dark stores are micro warehouses scattered in dense neighbourhoods that aid the efficient delivery of products.

- Favourable government policies - The promotion of digital payment methods through UPI and Rupay by the government is a key driver of e-commerce. Further, the FY22 budget contained proposals to incentivise digital payment gateways. Similarly, the Bharatnet initiative which aims to improve broadband penetration is helping bring e-commerce to rural areas. The government has also launched the Open Network for Digital Commerce (ONDC) to bring smaller vendors onto the internet and provide them with a level playing field in the e-commerce industry.

- Promotion and visibility - Social media platforms like YouTube, Facebook, WhatsApp, and Instagram, showcase advertisements that encourage users to make online purchases.

All these factors have contributed to an increase in online shopping, which is expected to grow in the future. A by-product of this boom in e-commerce is the rise of the online grocery market as well.

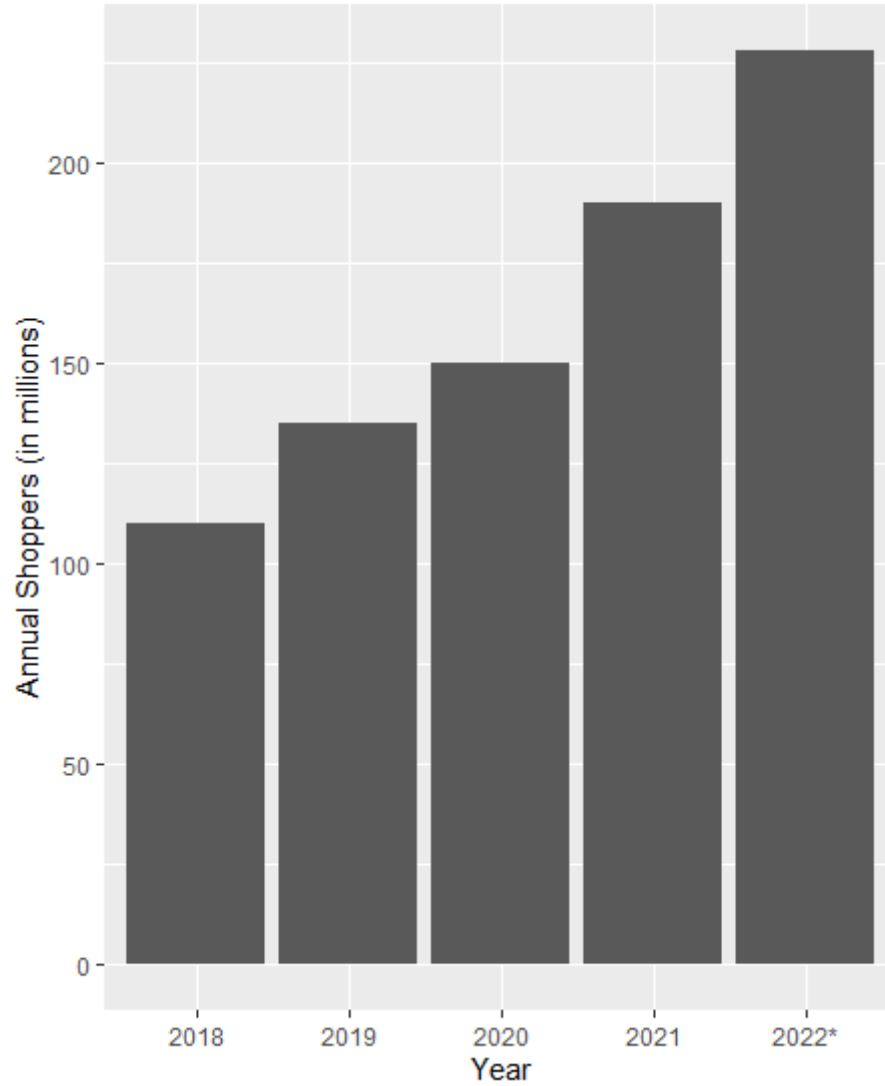Figure 1 shows the growth of annual online shoppers in India.

Figure 1: Number of annual shoppers in India from 2018-2022 (in millions) (Source: Statistica E-commerce report, page no. 18 (internet usage in India, 2021))[3]

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[3] *2022 number is forecasted

Consumer behaviour in grocery shopping depends on the mode of purchase and the value proposition of the modes. Consumer purchase strategies for grocery purchases can be of three types. These three types affect the choice of mode of purchase for consumers. The following are the three strategies -

1. Stock up: This is a bulk purchase for long-term consumption. The purchase happens mainly through supermarkets and local *kirana*[4] stores.

2. Top-up: These are daily consumables, such as eggs, milk, vegetables, and fruits, among others. Their purchase happens through local *kirana* stores and online e-commerce platforms.

3. Unplanned purchases: Emergency purchases and daily consumables. The purchase happens through local *kirana* stores and quick commerce platforms.

The consumer purchase behaviour or pattern further depends on the value the consumer seeks while purchasing. The traditional modes of purchasing groceries have been from supermarkets or local *kirana* stores. However, the emergence of online market platforms has become a key driver behind changing consumer purchase patterns, especially for those who seek convenience and time as a more significant value proposition. Table 1 summarises the types of consumers and their choices of stores based on their value proposition.

Table 1: Various purchasing patterns of consumers and their value propositions

	OFFLINE STORES		ONLINE STORES	
	LOCAL KIRANA	RETAIL SUPERMARKET	TRADITIONAL E-COMMERCE	QUICK-COMMERCE

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[4] *Kirana* stores refer to small-scale convenience stores situated in neighbourhoods to cater to the local population. They are also called mom-and-pop stores.

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			Convenience of ordering	On-demand ordering
MAJOR VALUE PROPOSITION	Trust, Familiarity	Discounts		
	Local relevant products	Wide variety	Doorstep delivery	Doorstep delivery
	Network	Convenience	Discounts	Instant delivery
			Variety of products across regions	
TARGET CONSUMER	Old loyal customers	Those preferring an in-store shopping experience	Those seeking Convenience	Young generation
	Housewives		Internet using customers	Internet users
				Time savers
				Those seeking Convenience

Source: Author's analysis

Changes in consumer lifestyle, hectic work schedules, the convenience of app-based shopping, and lucrative discounts have led to a remarkable shift in the shopping habits of consumers, especially in urban areas. While they prefer the convenience of buying items from home, COVID19 and the subsequent pandemic-related concerns have changed their

preference from delayed deliveries to instant deliveries since groceries are items of daily, and in many cases, of immediate use.

Emergence of quick commerce

In the last couple of years, a new buzzword, 'Quick commerce', has disrupted the e-commerce market, due to the COVID19 pandemic (Patil et. al, 2021). Catering to the consumer demand for daily goods, groceries, vegetables and fruits, quick commerce has the potential to revolutionise the grocery market. (Stojanov, 2022) described quick commerce as a class of e-commerce where products are delivered to the doorstep of customers quickly. The idea of instant deliveries has expanded from traditional ready-made meals to various items like groceries, medicines, cosmetics, electronics, etc. It offers the speed of instant market purchases with the convenience of purchases made from home. Convenience, urbanisation, and busy lifestyles are the key parameters influencing consumer behaviour, pushing companies to focus on reducing delivery times. Additionally, the COVID19 pandemic has aggravated these needs since social distancing and work-from-home discouraged people from visiting stores. Now, firms are incentivised to shorten the delivery time and give as much flexibility to the consumer as possible. Figure 2 shows the types of grocery products purchased through quick delivery apps.
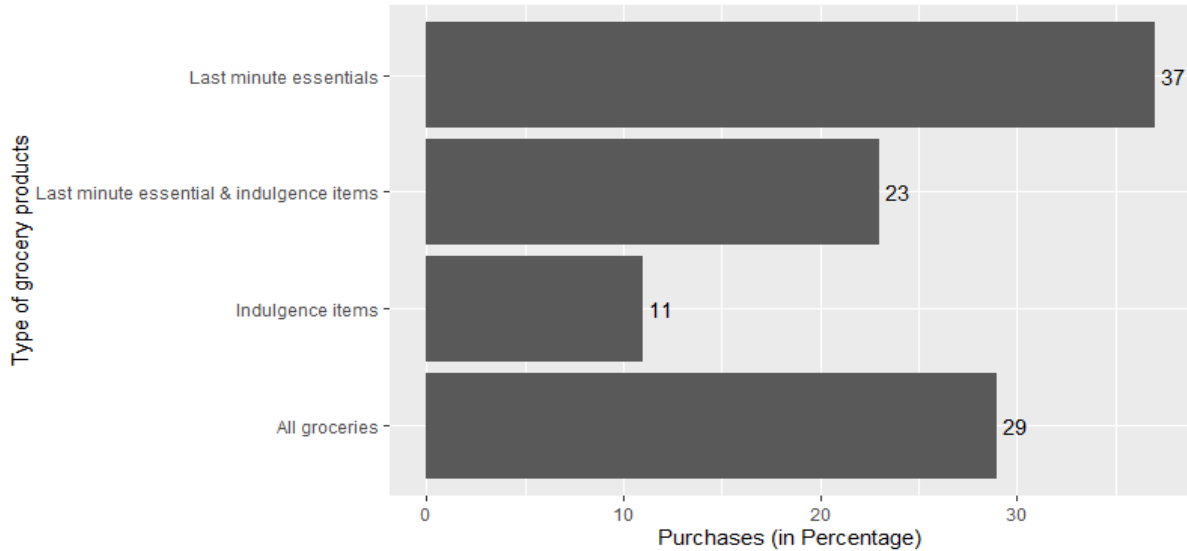
Figure 2: Purchase mix of grocery via quick commerce in India as of February 2022 (Source: Statistica 2022 report on quick commerce. (*survey results of 10070 respondents, across 272 districts of India))

India's quick commerce or Q-commerce industry grew rapidly during the COVID lockdowns. It is estimated that the sector is expected to grow 10-15 times from the current USD 0.3 billion to USD 5 billion by 2025 (*15X Growth in Just 3 Years! We're Talking About India's Quick Commerce Market,* 2022). The contribution of quick commerce to the online grocery market is around 10%, which is expected to rise to 40-50% in the coming years (Dey, 2022).

The market has also adapted to the evolving industry. The supply chain of e-commerce and the newly formed quick commerce industry has seen a transformation from a singular central warehouse to an advanced web of strategically located dark stores. The following table (Table 2) summarises the evolution of patterns in grocery shopping and inventory storage mechanisms.

Table 2: Changing purchasing pattern and inventory storage mechanism

Timeline	Till 2012	2012-2019	2019 onwards
Type of grocery shopping	Traditional ways of grocery purchase- Local *Kirana* stores, supermarkets	E-commerce, online platforms, doorstep delivery apps	Quick commerce- Instant deliveries
Customer Behaviour	Convenience, in-person shopping, discount seeking	Convenience, website, and smartphone purchases	Instant demands, time-sensitive, smartphone apps purchases
Type of inventory storage	Self-owned stores (~2500- 4000 square feet)	Large warehouse (~40,000 sqr feet)	Dark stores (~1500-2500 sqr feet)
SKUs	~3000-15000	~50000- 100000	~1500- 2500
Fulfilment time	Self-paced	1 to 3 days	20-45 minutes

Source: Author's analysis

Quick commerce is not just convenient and beneficial for consumers but is also advantageous to retailers (Roycroft et al., 2022). The following points highlight some of the benefits of quick commerce to retailers -

1. Value proposition and enhanced brand awareness among consumers: As the online market is growing rapidly, consumers expect better service levels, making the market more competitive for e-commerce firms. Therefore, offering a better value proposition

to customers through faster delivery gives an edge to e-commerce firms in the retail market.

2. Customer stickiness and loyalty: Customers tend to be loyal to the quick commerce platform of their choice if they consistently have positive experiences with product choices, quality, and delivery. At the same time, happy customers tend to pull new customers, thereby increasing customer footfall through new customer acquisition.

3. Advanced customer data: As more and more consumers join the platform, retailers can better understand customer behaviour. The better the understanding of consumer behaviour, the easier it becomes to manage inventory. Customer buying patterns regarding seasonality, regional influencers, and certain other demographics can also be predicted in advance.

The rise of quick commerce has provided a new business opportunity to budding entrepreneurs, startups, and various established e-commerce players. Instant deliveries, which were primarily used for food deliveries till a few years ago, are now being used to deliver vegetables, groceries, pharmaceuticals, and even consumer electronics. The sector has also attracted considerable attention from industry and researchers. The following section conducts a literature review of the academic work done on quick commerce.

Literature Review

Though it is an emerging field, there exists significant literature on quick commerce. Various factors have led to the emergence of quick commerce in present times. The COVID19 pandemic led to widespread lockdowns that severely restricted public movement. This led to a surge in the online purchase of goods by consumers, both for planned and unplanned consumption (Potdukhe et al., 2022). Densely populated urban areas with apartments of limited size meant that residents had limited space to stock up, and preferred to buy when necessary. Also, the rise in single-member households in urban areas has led to a rise in

demand for products in small quantities with repeat orders (Gai, 2022). (Villa and Monzon, 2021) reasoned that the ability to choose among different options, live tracking of delivery status, and convenience of shopping with a click complemented by speedy deliveries drive consumer behaviour towards quick commerce. Quick commerce is thus, the e-commerce of the next generation, that plays with the customer's need for convenience and instant delivery (Chandhok, 2021).

A key reason for its rise is the deployment of technology to digitise business models. The way a firm interacts with its stakeholders has been transformed by new digital technology. (Hanelt et al., 2021) and (Verhoef et al., 2021) defined digital transformation as "organisational change that is triggered and shaped by the widespread diffusion of digital technologies" to "develop a new digital business model that helps to create and appropriate more value for the firm." Through vertical integration, customers, rivals, and suppliers may all become partners in the development of new goods and services. (Cappa et al., 2021) examined the effects of big data analytics on companies' performance, including using mobile applications to acquire personal data from consumers. They believe big data should be dependable and rich, to deliver useful information. Data collection, storage, usage costs, and the danger of data leaks are some of the challenges that a company should minimise while implementing digital transformation.

(Huang and Yen, 2021) differentiated e-commerce from quick commerce based on delivery time and delivery mode, target customers, customer preferences, and presence of stores. While the delivery time in e-commerce spans between a day to a week, it is less than an hour for quick commerce. Delivery trucks of e-commerce also differ from the two-wheelers being used as the mode of delivery in quick commerce. Households with three people or more and single-person households are the target segment for e-commerce and quick commerce respectively. While price sensitivity and discounts influence customer behaviour in the case of e-commerce, it is delivery time sensitivity that influences quick

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commerce. Quick commerce utilises small and scattered dark stores to process orders which contrast with the employment of mega warehouses in e-commerce. Dark stores are the micro warehouses scattered in dense neighbourhoods that aid the efficient delivery of products (*What's Next For Q-Commerce: The Golden Child of E-Commerce, 2022*).

Potdukhe et al. (2022) listed three key aspects of the instant delivery model - technology, dark stores, and delivery partners. Technology-backed processes in the form of websites and mobile applications represent the starting point of customer experience. Dark stores are notified about the order and prepare the order for dispatch within 2-2.5 minutes. Delivery partners collect the orders and deliver them to the customers, thereby closing the cycle of an order. Delivery partners are the enablers for last-mile delivery.

As a direct consequence of the pandemic, there has been an unprecedented increase in the number of customers demanding rapid delivery of supermarket supplies. According to the findings of a study that McKinsey (*How European shoppers will buy groceries in the next normal, 2020)* carried out with customers in Germany, France, Spain, Italy, and the United Kingdom throughout the pandemic, there has been a continual rise in the desire from customers to purchase online. Researchers found that nearly 15% of people have purchased groceries from a previously unused website. Of those people, a majority say they plan to keep buying groceries online to fulfil some of their requirements, and 12% have shifted to grocery stores that offer home delivery or takeaway services.

(Eriksson and Stenius, 2020) observed that the demand for online grocery shopping was immense, and clients faced problems getting suitable time for self-pickup and home delivery. (Elnahla and Neilson, 2021) found that COVID-19 has produced a previously unheard-of mismatch between the supply and demand of retail workers, since certain stores, such as online food merchants, have been forced to close their doors due to abnormal demand. Because of this, the strain on quick commerce ventures and the delivery partners

working for them has increased significantly in terms of cost and workload. Extant literature discusses hiring strategies for delivery partners.

(Das and Yadav, 2020) used simple integer linear programming to propose a model to determine the optimal requirement of delivery partners based on dynamic delivery demand data. They also presented a four-quadrant framework strategy (Figure 3) for recruiting delivery partners across the three categories of full-time, part-time, and weekend-only delivery partners. The framework considers the demand for home delivery of goods and the cost that the company is willing to incur on servicing that delivery. The framework recommends hiring more full-time workers in case a company cannot compromise with the quality of the delivery service or demand arrives from loyal customers (Quadrant IV and II), while part-time workers should be hired more when cost-cutting is paramount (Quadrant I and III).
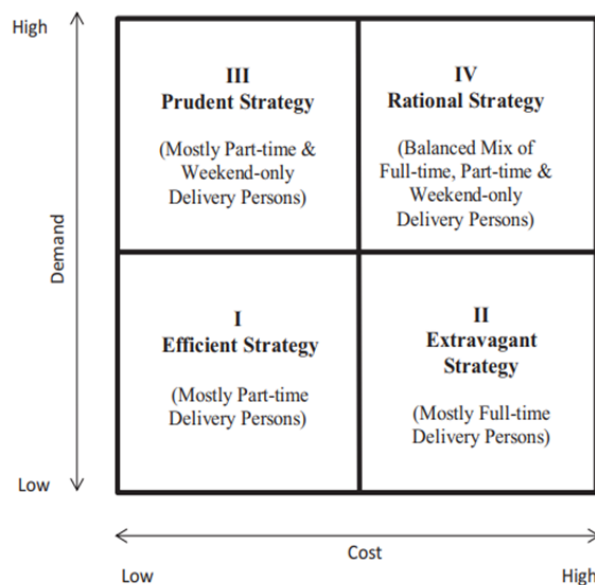

Figure 3: Hiring strategy for delivery partners (Source: Das and Yadav, 2020)

As mentioned before, the COVID19 pandemic has led to a surge in online shopping wherein delivery partners have played an important part in servicing orders. However, there were concerns about the impact of increased workload on the health and safety of these delivery partners. (Ariker, 2021) suggested that information about the working conditions of the delivery partners impacts consumer behaviour and the response towards quick commerce ventures. The researcher used Mehrabian and Russell's Stimulus-Organism-Response (SOR) Model to assess consumers' responses in terms of brand reputation and retail patronage intention towards ventures with good and poor working conditions. Two studies were conducted wherein the first study hypothesised two ventures with good and bad working conditions (in terms of working hours load amidst the setting of the pandemic) keeping the prices of the products the same, while in the second study, the venture with the good working conditions also charged higher prices to the tune of 15% compared to the other venture. Using paired sample t-tests, the researcher concludes that consumers attach more goodwill and trust to the venture with better working conditions in both studies. Thus, better working conditions can help quick commerce ventures build loyalty and expand their market share.

Even before the pandemic, a slew of new quick commerce food merchants had sprung up due to digitisation. (Purcarea, 2021) expected a noticeable shift in e-commerce. The findings of the research showed that the quick-commerce retail space is expanding at a rapid pace and that there is higher competition among instant delivery companies that are vertically integrated and use third-party delivery platforms. Getir introduced fast grocery delivery in Turkey in 2015 and was among the first quick commerce grocery firms. Another quick commerce start-up, Spanish Glovo, was founded in 2015 and is active in 21 countries. Delivery Hero, a worldwide retailer, began using quick commerce in 2019 and has invested extensively in expanding its platform to include local stores as well as constructing Delivery Hero-owned local warehouses, dubbed Dmarts, around the United States.

Certain challenges have been highlighted for quick commerce as well. Villa and Monzon (2021) pointed to the small volumes, multiple delivery addresses, instant deliveries, more frequent resupplies, and diminished vehicle load optimization as some of the challenges for quick commerce because these elements lead to increased reliance on already clogged urban roads. Mobile warehouses, collection points, and lockers are provided as possible solutions for these problems. Stojanov (2022) predicted that the usage of drones, artificial intelligence, and robotics would accelerate the development of quick commerce.

(Leng, 2021) anticipated that the worldwide market for quick commerce would reach around EUR 448 billion by the year 2030. Thus, quick commerce presents a substantial opportunity for future expansion. Consequently, there is a need for greater research into quick commerce business models and how automation can make such models more efficient.

Operating model of the Quick Commerce industry

This section discusses the operating model of the quick commerce industry. The model is dependent on the availability of the internet to consumers. The company's app serves as the first point of contact between the customers and the sellers. Once the customer places an order, it is received by the order execution system and is routed to the distribution centre nearest to the consumer location. The picker (or the delivery partner) picks the parts as per the orders, packs them, and hands them over to the delivery agent, who thereafter delivers the order (Figure 4).

Figure 4: Process flow of grocery products ordered online using the instant delivery app

It is important to note that coordination between upstream dark stores, distribution centres, and downstream delivery partners is crucial for the quick fulfilment of orders (for example, within 15 minutes). Data-driven demand estimation models improve warehouse management efficiency when the order fulfilment process gets delayed and becomes costly. Through historical customer data analysis and real-time data capturing, various parameters such as high-demand parts, order volumes, and order seasonality can be predicted in advance. Also, strategic locations for distribution centres can be planned by leveraging advanced data management technology. Various parameters such as population density, road networks, and busy zones are considered while selecting the locations to ensure that delivery times are minimised.

Quick Commerce business models

As mentioned before, many players are entering quick commerce by launching various innovative business models on online grocery platforms. Zepto, Bigbasket, Flipkart, Amazon Fresh, Grofers-Blinkit, and Swiggy-Instamart are a few of the key players. The following

table shows the list of market players and their target delivery time in quick commerce (Table 3).

Table 3: Quick commerce firms with their promised delivery time

E-Commerce firm	Quick delivery time
Swiggy Instamart	15-30 min
Big Basket	15-30 min
Blinkit	10-30 min
Zepto	10 min
Dunzo	20 min
Ola	30 min
Flipkart Quick	90 min
Amazon Fresh	120 min

Source: Joseph & Sil, 2022

Companies can adopt existing business models or innovate new business models for quick and efficient delivery. However, most of them use micro fulfilment centres called dark stores. These are small warehouses of around 400-2000 square metres with around 1000 SKUs (stock-keeping units) or unique products. They are located strategically close to customer locations for fulfilling orders quickly. The nomenclature indicates that these stores are only used for fulfilling orders with no regular walk-ins for consumers.

On a broader level, five major business models can operate in the online grocery market as discussed.

1. Inventory model
2. Hyper-local model
3. Multi-vendor platform model
4. Revenue channels in the online grocery model
5. Omnichannel model

I. Inventory model

In this model, the products are purchased from authorised vendors and are stored in either company-owned or leased warehouses (Figure 5). The warehouse is notified upon the placement of an order by the customer. Subsequently, it prepares the order for the delivery partner to fulfil. The inventory levels are decided as per the consumption/ordering pattern and the delivery lead times from suppliers. The order delivery website or the app is integrated with the inventory levels to reflect the real-time availability of products on the online platform.
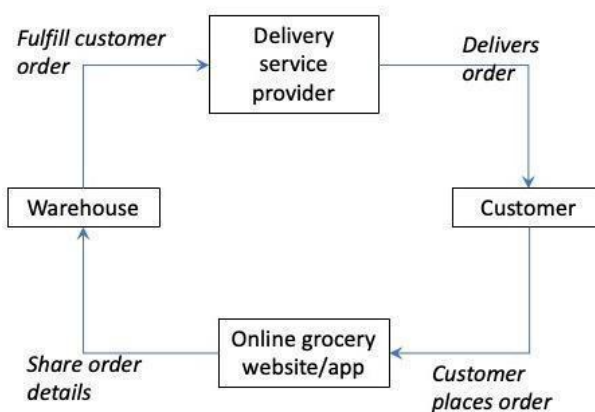
Figure 5: Inventory model

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There are three parts that quick commerce firms need to consider while managing order fulfilment in the shortest possible time effectively. The first is the mother warehouse or collection centre for the supplied goods (from retailers, farmers, and wholesalers). Second is the network of distribution centres and dark stores to improve customer proximity. Quick deliveries are usually supported by dark stores. These are mini warehouses located closer to the customers. The third one is the last-mile delivery or logistics.

Integrating processes and technology in all these verticals and aligning them together is essential for an efficient order fulfilment process. The inventory replenishment occurs as per the order patterns and required inventory levels. The mother warehouse feeds material to the distribution centres and dark stores. At times even the distribution centres replenish material at the dark stores. Such an omnichannel model ensures that a high fill rate is achieved, and the required inventory levels are maintained all the time.
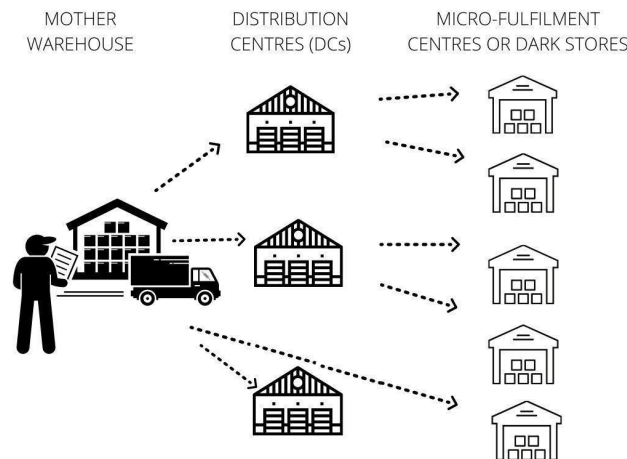

Figure 6: Inventory replenishment in the omnichannel model

The inventory model is used when the demand is fluctuating, or when there is high seasonality in the order patterns, or the products belong to a niche category. Also, this model is adopted by businesses forecasting good business growth since it involves huge initial investment in leasing space, hiring manpower, and setting up transportation systems. Big Basket uses this model to fulfil its last-mile delivery.

II. Hyper-local model

The hyper-local delivery model is built upon the idea of using local and nearest vendors to service the customer's order. As the last mile is critical in the e-commerce domain, reaching out to customers in the remotest areas is essential. This can be achieved by having retail grocery partners who are local store owners. These store owners sell their products through the online platform of the e-commerce firm. These firms create a marketplace website or app where customers can order groceries. After that, the firms deliver these orders in the shortest possible time by using the network of local sellers by routing the orders through the nearest offline shop or stores.

Meanwhile, store owners can also sell their goods via offline channels. Here, the e-commerce firms collaborate with the local stores to achieve last-mile delivery. Therefore, this becomes a win-win business strategy.

This model is used for multiple reasons, such as delivering services at the fastest rate and increasing the reach of the business to compete in the e-commerce grocery market (Figure 7). It eliminates the need for quick-commerce companies to own warehouses and manage inventory operations. Dunzo uses the hyperlocal delivery model. Also, startups like Blowhorn, Shadowfax, Wefast, Grab, and Pidge use the hyperlocal delivery model.
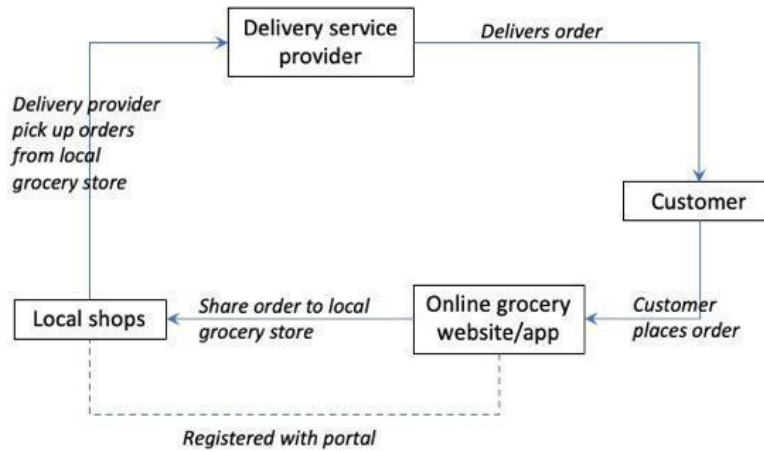
Figure 7: Hyper-local model

III. Multi-vendor platform Model

There are multiple vendors operating a digital storefront in this model. The inventory in the multi-vendor platform model is not stored in a single warehouse but is handled by multiple vendors. Once the customer puts an order on the firm's website or app, the order gets diverted to the respective vendor (Figure 8). The transportation is planned, and the parts are picked and delivered by the e-commerce firm in the shortest time.

In this model, the e-commerce firms get full control over vendors and can earn a certain percentage of commission through these vendors without investing in inventory. Also, the product range that the firms can offer through this model is higher than the self-controlled inventory model.

Swiggy Instamart and Amazon Fresh leverage this model to fulfil their orders. They have partnered with third-party sellers and restaurants to deliver products and services quickly.
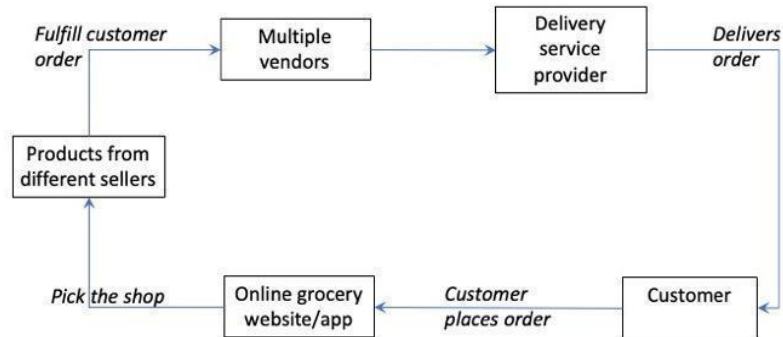
Figure 8: Multi-vendor platform model

IV. Multi-revenue channel model

The multi-revenue channel model differs from the models discussed above. The company following this model provides a platform where sellers can list their products after payment of a predetermined commission to the platform owners. Also, the platform owners can charge a fee per order from the subscribers or vendors.

The other revenue streams in this platform are commissions, membership fees, subscriptions, service charges, promotions, third-party advertisements, or using the buyer and seller data for other applications (Figure 9). Udaan is a platform in the e-commerce market where manufacturers, retailers, wholesalers, and buyers are connected. Various social sites such as Instagram and Facebook promote quick commerce purchases through advertisements.
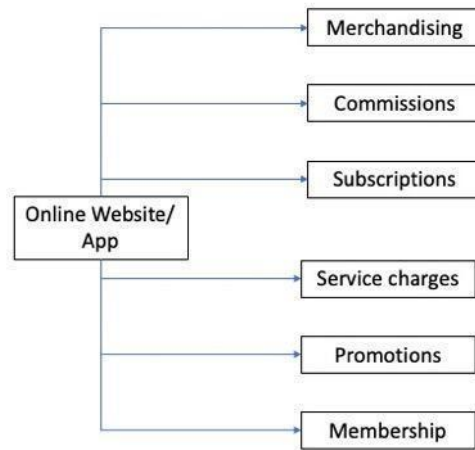
Figure 9: Multi-revenue channel model

V. Omni-channel model

This model consists of brick-and-mortar stores, online platforms, distribution and storage centres, the sales team in stores, websites, and mobile applications. The customer can use any of the modes to make a purchase. It allows the customer to either purchase online or visit the store and make a purchase after a physical inspection.

Customers are served seamlessly through digital as well as physical (in-store) means. This model caters to both types of customers, those who purchase online as well as those who prefer to see products before making a purchase. Thus, brand loyalty is maintained by providing choice and flexibility to consumers.

Bigbasket has recently started the omnichannel model. It has started small local grocery shops for daily needs in selected metro cities. Also, it is installing vending machines for essential grocery items under the brand name of BBinstant at various localities to increase its reach and accessibility.

Other Models

In the last decade, many innovative business models have risen in the e-commerce domain. Certain models like the *multi-store marketplace*, where one single platform manages multiple e-commerce websites under one domain, or *B2B2C hybrid marketplace,* in which products are sold to retail customers as well as wholesale and buyers also exist. Depending on the target customer segment and market requirements, e-commerce firms design and develop their operating business model.

Infrastructure requirements of Quick Commerce business

While a firm can adopt any of the business models discussed above, or innovate its business model, it should strategically focus on a few basic infrastructural requirements for an effective and efficient quick commerce business. This section lays out the basic infrastructure requirements for a quick commerce business to become operational. Notably, warehousing plays a significant role in making supply chains efficient. High-level activities in a conventional warehouse involve the correct placement of items, timely stock replenishment, collecting and packing of the items in the order, and their final delivery. On the contrary, the time to process the order in the dark store should not exceed five minutes so that delivery agents can deliver the order quickly. Therefore, it becomes necessary to design a lean system that avoids procedural time loss in operator movements for efficient and quick deliveries. The following are the crucial elements that help create efficient infrastructure for quick commerce order handling.

A. Order Management System (OMS): This is the backend system used for managing and processing consumer orders and includes processes such as order routing, order processing, tracking, and inventory management. OMS assists firms in managing orders coming in from multiple locations and going out to various fulfilment centres.

It also aggregates and processes real-time data across multi-echelons of the business model, the vendors, and service providers and consumers on a single interface.

OMS aims to ensure the speediest order fulfilment with the highest efficiency. Therefore, by integrating all the backend operations in the order management system, firms can achieve lower levels of human errors and eliminate time delays when searching for the required parts. Motion delays can be reduced by optimising the picking route in the warehouse. Waiting delays can be controlled by synchronising and balancing the interconnected operations.

An effective order management system offers a few key advantages. It -

1. eliminates manual intervention and errors,
2. helps in scaling up business operations,
3. aids in the effective management of inventory and eliminates losses due to inventory mismanagement, and
4. integrates various departments and organisations under one system.

B. Throughput of the fulfilment centres: The activities in a warehouse involve storing, replenishing, picking, and packing the order items and the final dispatch. All these activities should not take more than five minutes since sufficient time should be left for the delivery partners to deliver the goods. Therefore, it becomes necessary to design warehouse operations and an order fulfilment flow for the dark stores to reduce time delays caused by the excessive movement of operators in search of items.

C. Layout of fulfilment centres: The layout of the dark stores plays a critical role in efficient order fulfilment. Placement of the material storage racks, packing station, incoming material staging areas, and incoming and dispatch docks are all interconnected.

Micro fulfilment centres or dark stores, although similar in area to that of regular supermarkets differ in their design parameters. Aisles are built longer in supermarkets to induce customers to spend more time in the store, whereas dark store lanes need to

be smaller to ensure swift movement of the picker between shelves and the packaging station. Also, excess picker movement can be reduced by grouping high-frequency products near the dispatch counters.

The layout needs to be designed based on the business model. Various software and simulation tools can assist in designing the warehouse.

D. Smart racking systems for parts storage: Intelligent racking systems help pickers by increasing the accessibility of order items. Storage racks should be designed considering the following basic level parameters.

1. SKUs: The stock-keeping units or SKUs can be categorised based on the frequency of order or movement, size, weight, or shape. Once categorised, SKUs can be placed in the warehouse or the dark store in various zones for efficient picking. Also, special racks can be designed to avoid parts damage for various shapes and sizes of SKUs.

2. Storage density and utilisation: It is always essential to ensure effective utilisation of the storage space to manage the maximum number of SKUs in the most optimised space. Therefore, racks can be designed to maximise the density and utilisation of the storage space in the fulfilment centres.

3. Storage and retrieval systems: Depending on the business requirements, the system to store and retrieve parts and/or pallets is designed, and racks are designed accordingly.

E. Packaging and last mile delivery: Concise and easy-to-carry packages are designed for quick last-mile delivery. Elimination of packaging can help optimise the operation time of dark stores. Innovative packing bags and reusable containers can be used instead of traditional packing to reduce time.

Last-mile delivery is one of the crucial steps in quick commerce as there are various externalities involved, such as road and traffic conditions, weather conditions, etc. Transportation through heavy vehicles is not advisable for quick commerce. Instead,

firms are opting for bicycles, electric scooters, and other two-wheeler options because of their agility in densely populated areas.

F. The safety and well-being of the delivery partners are important factors. Delivery partners should be provided with an adequate time cushion to factor in the variation in delivery time because external circumstances are not in their control. Therefore, recognising shortcomings in order processing, correctly identifying the customer requirement for quick delivery, and considering the safety of employees, including delivery agents, would affect the profitability and success of quick commerce ventures. Understandably, a business's long-term sustenance depends on the incentives for every stakeholder in the value chain.

Therefore, quick commerce firms must strike the right balance between delivery time promise, availability of resources, and urgency for customers, to survive and expand in the long run. As discussed above, optimisation of warehousing operations can help achieve speed and efficiency in order fulfilment. It is an essential element of the quick commerce supply chain. The following section builds a case for adopting automation in the warehouse operations of dark stores.

RaaS (Robotics as a Service) and Automation solution

Flexible warehouse operations play a vital role in the e-commerce business. The need for an agile warehouse operation assumes great significance in a typical B2C environment where consumers frequently place small orders. Currently, most dark stores are handled manually, unlike the bigger mother warehouses where automation has been integrated into their warehousing operations. Dark stores, also known as micro-fulfilment centres, should have varying capacities for managing demand fluctuations. Demand surges may hinder operations in manually operated dark stores, consequently affecting the timely delivery of products.

Pre-COVID, many firms were already struggling with labour shortages. During COVID19, various other parameters came into the picture, such as the safety of employees, maintaining social distancing at workplaces, reducing human handling of grocery goods, etc. Therefore, an option to automate various warehouse processes is being considered by various e-commerce firms.

Warehouse operations can be optimised by deploying a Warehouse Management System. A WMS can help make operations more efficient by using barcode readers, ERP, and various data collection and analysis tools, which will help reduce time, manual effort and the probability of errors, and predict demand using the gathered data. Physical operations in the fulfilment centre can be either wholly or semi-automated, depending on the business needs. Automated Storage and Retrieval Systems (AS/RS), robotic material movement solutions such as Automated Guided Vehicles (AGVs), Autonomous Mobile Vehicles (AMVs) and robotic shuttle systems, and automatic sorting and packaging solutions are available to firms to mechanise and automate their warehousing operations. This will help enhance warehouse capacity and the speed of operations. Pick to Light or Put to Light systems can be very efficient for medium-sized dark stores.

Dark store solutions are offered by automation service providers like AutoStore, SwissLog, and Affordable Robotic and Automation Limited's subsidiary - ARAPL RaaS, to minimise the time needed for store turn-around. Also, a few companies are now working on fully autonomous delivery robots. For example, Doora, a delivery robot developed by the company Foodora, supplies goods to households in Stockholm. The hyper-local delivery firm Dunzo is experimenting with drone delivery and working towards automating its warehouse operations.

There are various advantages of automation over manual processes. Some of them are listed below.

1. Manual operations require a lot of floor space for the storage of parts, movement of pallets, and vehicles used for carrying pallets. However, automation can help save significant space, and more SKUs can be kept more densely in the limited space.

2. Automation helps reduce the travel time of warehousing staff involved in replenishing and picking the goods by reducing the need for operators to move around the warehouse searching for locations.

3. With automation, higher levels of accuracy in storing the right parts in the inventory in the right location are achieved.

4. Automation reduces the overall operational cost by improving efficiency and through better management of human resources.

5. Automation systems can handle volume and variety with speed.

6. Minimal reliance on human resources and COVID protocols of distancing can be managed better with automation.

7. With drones, deliveries to remote and logistically challenging areas, such as mountain terrains or areas affected by natural disasters, can be made possible.

Although automation can enhance efficiency, it comes with huge capital investment, which is threatened due to technology obsolescence caused by rapidly changing business dynamics. Therefore, quick commerce firms must evaluate the target market and the business model holistically before installing appropriate automation tools.

Sustainability in the Quick Commerce business

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The growth of quick commerce has been fuelled by the pandemic, which not only made customers order most products online but also made finance to businesses available at a cheaper cost, with central banks engaging in monetary easing. The sector's phenomenal growth has attracted multiple players in India and worldwide. This has also raised questions about the sustainability of quick-commerce businesses.

To assess the sustainability of the quick commerce industry, the paper has used the three pillars of sustainability provided by the World Conservation Union (IUCN, 2006). The model has put forth three overlapping dimensions namely, economic, social, and environmental, to analyse sustainability. It adopts an interdisciplinary and transdisciplinary approach to sustainability (Todorov and Marinova, 2009). The economic pillar explores the long-term financial viability of the industry. Here, it has been further divided into financial and market factors to comprehensively analyse the industry's economic sustainability. The social pillar explores the impact of quick commerce businesses on their employees, stakeholders, society, and the overall community. It includes factors like the safety and well-being of the employees at the workplace, philanthropic activities for society and the overall ethical conduct of the businesses involved in the sector. The environment pillar seeks to assess the impact of the industry's business activities on the environment via emissions, pollution, and ecological degradation, among others.
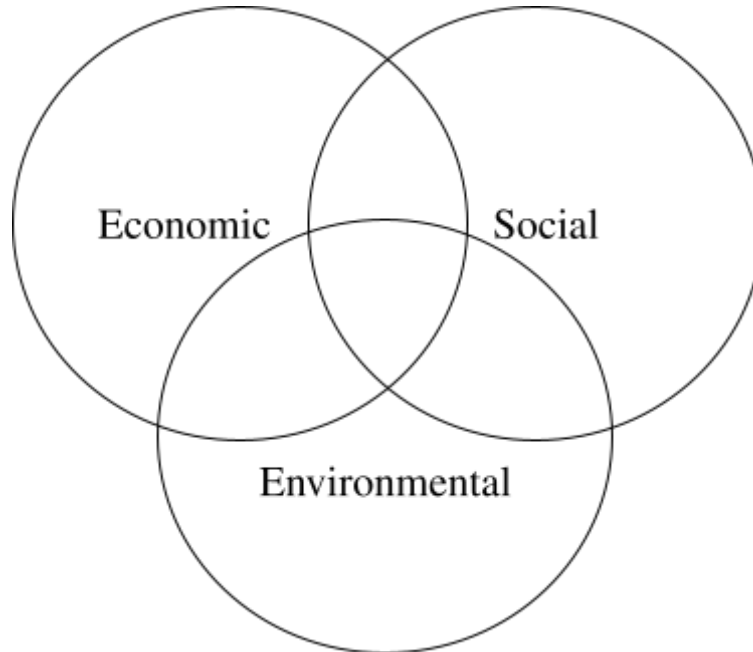
Figure 10: Three pillars of sustainability (Source - The World Conservation Union, 2006)

Concerns have been raised on the economic sustainability of quick commerce businesses since most of the ventures are running into losses due to their focus on growth over profitability. While it is common for startups to prioritise growth over profitability in the initial stages of their business, quick commerce ventures are finding it difficult to convince customers to pay full cost for deliveries and stick to them. Deep discounts and free deliveries are the most common way of gaining customers for quick commerce startups. While it does help in gaining market share, it also leads to loss for the companies. According to a report by Yipitdata, a Turkish instant delivery startup, discounts over 80% of its orders in Germany and France, while US-based GoPuff discounts around 30% of its orders in the US. Intense competition from new entrants backed by competing VCs makes customer stickiness dependent on the continuation of such deep discounts.

This adversely affects the profitability of instant delivery companies, leading to a fall in their valuation and a lack of interest from investors. Some ventures have wound up their

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businesses and filed for bankruptcy. For example, Send, an Australian quick commerce startup wound up its business due to difficulties in raising capital. Similarly, multiple US-based startups like Buyk, 1520, and Fridge No More ended their operations due to industry-related issues and competition.

The inflated demand due to the pandemic-induced lockdown is also facing correction, thereby impacting investor sentiments. Share prices of many Indian and foreign product delivery startups have dropped significantly. Reopening of retail stores post-pandemic is another challenge for quick commerce businesses since these businesses offer great discounts in the grocery segment, thereby pulling a section of customers back into the offline retail segment. To make their business model financially sound, quick commerce companies need to start working on reducing discounts in a manner that does not negatively affect their reorder rates and, at the same time, improving the efficiency of their operations through automation.

The operations of quick commerce companies revolve around instant deliveries. Instant deliveries also face the challenge of the safety of delivery partners and fellow commuters on the road. The 10-minute delivery model is criticised for its extreme emphasis on quick deliveries, thereby creating an ethical problem of choosing time over the safety of human life. Apart from that, it increases instances of over-speeding and rash driving. Unlike conventional e-commerce, quick commerce does not club delivery to multiple nearby addresses over a few days and deliver products accordingly. Most of the deliveries are made to an address almost uniquely to ensure timely delivery of the product. Small volumes and higher resupply frequency that need to be completed in a short duration of 15 minutes present a huge challenge in optimising vehicle load and harmonising delivery addresses. Multiple round trips to the same address for supplying individual items lead to higher fuel consumption and duplication of effort by delivery partners. Not only that, but a higher

number of deliveries per hour by delivery partners also leads to congestion on roads which reduces the fuel efficiency of other vehicles on the road. Thus, the carbon footprint of the business poses a big challenge in achieving the climate goals announced by countries around the world. Solutions to this problem can be the electrification of delivery vehicles and the usage of drones in delivering small quantities over short distances, but that involves a huge capital investment in procuring the devices. Firms will also have to incur costs in upskilling manpower to operate such costly devices.

Table 4: Long-term sustainability challenges for quick commerce companies

Economic		Social	Environmental
Financial	Market		
Concerns/Challenges for long term sustainability			
- Deep discounts - Free deliveries - Low average order value - Raising capital	- Intense competition - Customer stickiness - Marketing costs - Reopening of retail stores post-pandemic	- Safety of delivery partners - Impact on road safety due to congestion on roads - Ethical challenges with 10-minute delivery promises	- Carbon footprint - Impact on fuel efficiency due to congestion on roads

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Possible solutions			
● Minimum order size ● Dynamic delivery charge ● Subscription and membership plans ● Generate additional revenue sources by way of advertising and marketing ● Growth with profitability	● Process innovation and efficiency ● Automation to reduce revenue costs and increase competency	● Rigid safety standards for delivery partners ● Insurance for delivery partners and prompt medical assistance in case of an accident ● Dynamic delivery time calculation based on distance and traffic congestion	● Electrification of delivery vehicles ● Usage of drones for short-distance deliveries ● Optimising deliveries by harmonising address

Source: Author's analysis

The long-term sustainability of quick commerce firms will depend on how efficiently they can manage their finances, increase value to society by offering safe and secure employment to their employees and contribute towards decarbonising the e-commerce supply chain and reducing carbon emissions.

Future of Quick commerce

Rising competition in the e-commerce sector and rising customer expectations such as live order tracking, order cancellations and returns, and speed in delivery would require e-commerce grocery businesses to be agile and flexible. They would need hybrid business models that help in quick warehouse order fulfilment complemented by efficient logistics to deliver the goods.
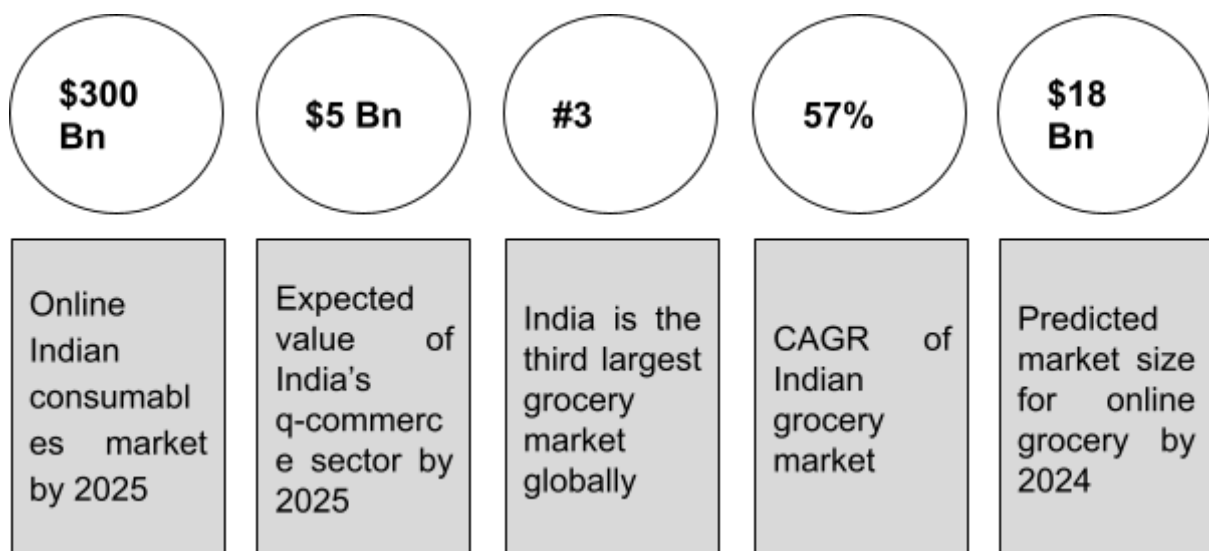

Figure 11: Future of Quick commerce in the Indian market. (Source: *Top 5 Quick Commerce Brands In India, n.d.*)

Industry trends predict the exponential growth of quick commerce (Figure 11) in the coming years, when multiple retailers would adopt micro-fulfilment solutions. Change in consumer behaviour after COVID19 is adding to its growth. Customers' expectations will rise for a greater variety of products like clothing, electronics, and cosmetics to be delivered

instantly. This would require the expansion of product offerings by firms which will come with its own set of infrastructural and logistical requirements. Technology and automation must be integrated into warehousing and logistics so that the industry can adapt to this change in the market. Also, a sustainable delivery time window needs to be estimated by quick commerce firms that does not risk their core value proposition as well as the safety of delivery partners.

The future of e-commerce in India looks extremely encouraging. It would depend on how smartly firms in the industry would invest in their business growth and create their differentiating factors. It would be interesting to see the future innovations and novel business models developed in this business.

Conclusion

The last decade has seen an exponential rise in e-commerce in India. The change in consumer behaviour fuelled by the wide accessibility of the internet has provided enormous business opportunities for entrepreneurs and vendors to sell online. The COVID19 pandemic led to frequent and stringent lockdowns and social distancing norms, pushing customers to do grocery shopping online. The quick commerce industry's growth represents its evolving and dynamic nature. This paper has conducted a comprehensive review of the industry, providing the industry's fundamental operating model and the different business models used by various firms in the industry. Automating dark stores is key to making the business more efficient and competitive. The industry also faces long-term challenges in making its business economically viable, socially responsible, and environmentally sustainable. There is scope for creating innovative business models that comply with the three pillars of sustainability. While the industry's prospects appear positive, the focus should be on optimising the quick commerce supply chain by making it more agile and automated.

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