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"Role of Digital Technology in Supermarkets for Insights on Customer Experience"

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Abstract: The importance of the Internet era in our daily lives has grown, giving rise to sophisticated businesses. The objectives and goal of my research is to study how much various digital technologies are deployed in supermarkets of today. What are the factors in deploying the technology which is used worldwide, the gaps between old technology and new technology and finally this study identifies the gaps between the technology delivered and the task customers want to be simple. This is achieved by collecting all the digital technologies that are deployed in supermarkets and then doing surveys of digital technologies with customers and shop managers that gave us insight that there were gaps between the supermarket managers view of digital technologies and users view of digital technologies leading us to suggest them more suitable options and understand more accurately their preferences which leads to innovation in digital technologies.
Key-words: Digital technology, Interior Design, Design research, human-computer interaction, User-centred design

1. Introduction

Larger populations are the focus of smart cities, which also include a variety of intelligent individual building management systems. Smart cities improve the quality, efficiency, and interaction of urban services while reducing costs and resource consumption and enhancing citizen-government interaction. One of the many services that fall under the umbrella of the smart city idea is smart shopping. The use of IOT, or the network of physical items integrated with electronics, software, sensors, and network connectivity, which allows these objects to gather and exchange data, is varied and includes both indoor and outdoor services, in supermarkets and grocery stores. The focus of supermarket outdoor services is typically on delivery, smart parking management, and online shopping experiences. (Makdessi et al, 2019)

Since the past 30 years, supermarket structures and the urban environment have blended. Self-service grocery stores on the high street develop into enormous retail behemoths that stand out as recognisable buildings (Kirby et all, 2008). Resulting in significant effects on patterns of behavior, consumption attitudes, and lifestyle. These supermarkets encourage the growth of new fraternities, and the goal of this study of supermarkets is to make them something enormous, stand alone, particularly a large and powerful organization, and to make supermarket architecture a building composed of products & thus deny its appearance as a container and increase job opportunities for communities. Additionally, moderate shopping can be helpful (sometimes known as "retail therapy") (psychologist Scott Bea, PsyD, 2021)

Over 10% of the nation's gross domestic product (GDP) and over 8% of jobs are generated by the retail sector in India. India is the fifth-largest international retail market in the world. Removing the middlemen, advancing technology, investing in infrastructure, and helping Indian manufacturing. The main drivers for retail in India, according to IBEF (Indian Brand Equity Foundation), are favourable demographics, a rise in income and purchasing power, a change in consumer mindset, brand consciousness, easy consumer credit, and an increase in high-quality items.

The retail industry in India is expanding rapidly, with new stores opening up not only in large cities and metro areas but also in tier II and tier III cities. In the US and UK markets, private label approach accounts for 19% and 39% of market share, respectively, while it only makes up 6% of the market in China. Private label brands account for 15 to 25% of the sales at stores like Shoppers Stop & Lifestyles in India.

Large retail players choose India as a sourcing base because of its low prices because it is so competitive. Global retailers including Walmart, GAP, Tesco, and JC Penney are sourcing more from India and transitioning from using third-party buying offices to setting up their own wholly owned/wholly managed sourcing and buying offices. Gourmet retailing, fragrances, accessories, and jewellery are all examples of luxury retailing. According to ASSOCHAM, the Indian luxury industry is anticipated to increase from US $30 billion in 2020 to US $200 billion by 2030, driven by Indian youngsters' increased exposure to foreign brands and their better spending power in tier II and III cities. (Nielsen, Jefferies report 2021)

These supermarkets cater to those with unique dietary needs and are entirely vegetarian. They also encourage others to be compassionate and kind by not harming other living creatures or the environment. Supermarkets provide a number of benefits, including fixed prices, lower costs, availability of all daily necessities, diversity of items, and freedom of choice. the availability of common items, increased sales, increased earnings, less risk of bad debts, economies of scale and supermarket drawbacks include the following: big capital investment required, space issue, difficult for buyers to choose from, not appropriate for the sale of technical goods, the potential for spoilage of perishable commodities, Lack of finance availability, less employment possibilities, and low consumer satisfaction. (Googlesir team 2019)

This paper also discusses the cutting-edge contactless technologies that the store would provide its patrons, including robot help, facial recognition technology, scan-and-go contactless counters, self-checkout counters, and digital technology-enabled online buying. Supermarkets seem to have maintained a fairly unique regional identity despite spreading across the nation like politicians on a campaign trail. In New Delhi NCR, these shops are frequently referred to by the titles Reliance Fresh, Le Marche, Modern Bazaar, Spar, Spencer's, Big Bazaar, and 24/SEVEN. There are many different names and types of stores depending on the location or state, however in other states we do not find the same stores. Convenience stores are expanding quickly, but while being a popular national trend, they nevertheless seem to have a local flavour. How would these supermarkets and their customers act if they were to transform into Flagship stores using the most cutting-edge AI technology and offer an entirely new customer experience? Being 100% vegetarian, how does one company create the complete urban structure for the entire nation and look farther towards globalisation.

2. Literature Review

Currently, traditional grocery stores compete with Indian supermarkets, which puts a lot of financial pressure on suppliers and local shops. (Liverpool-Tasie, A. W. 2020). Furthermore, the 2030 Sustainable Development Goals include the elimination of hunger, attainment of food and nutrition security, and promotion of sustainable agriculture. (Saweda Lenis O. et al., 2020). Thus, the small-scale producers benefit from the food systems' current rapid growth and spread. When connecting to markets, small-scale producers engage in interactions with a variety of parties, including retailers, processors, logistics companies, and product merchants. Facts on whether non-contractual interactions between small farmers and both large- and small-scale value chain actors have impacted small farmers' livelihoods are poorly understood. By offering small-scale producers complementary services including input provision, loans, information, and logistics through informal arrangements, small and medium enterprises—not only large enterprises—address the peculiar market failures and asset shortages of small-scale producers. By enhancing welfare through the adoption of technology and increased productivity, the provision of these services directly advances the goal of sustainable development. (Saweda Lenis O. et al., 2020) The goods are dispersed over numerous retail establishments that offer a wide range of goods. Such a working and retail space, where all the products are sold under one roof, do not exist. At the moment, there are no stores that might rival a worldwide supermarket in terms of architecture and interior design. Additionally, these flagship store/ supermarkets that currently lack the latest contactless technologies created with the Covid-19 standards in mind, such as wearing a mask, maintaining social distance, & periodically washing hands, have them. (Kent Anthony, 2011)

3. Retail Industry

Retailers' operating strategies are facing intense competition as a result of the altering consumer market and the global economy. Retailers adapt to meet shifting consumer demands and trends in order to expand their market reach. This causes consumers to become more cautious and sensitive when making purchases, especially

in more developed nations. India and other developing nations work together to adapt to the shifting retail environment worldwide. India's market history begins with the introduction of open markets for fruits and vegetables, community-based thela shops, Kirana stores. With the shift in consumer tastes and inclinations, the industry became more organised. The newly built shopping centres in metropolitan areas promise its patrons a first-rate experience. Retail establishments around the nation include Food World in FMCG, Planet M and Musicworld in music, and Crossword and City bookshops in books entered. Indian retail is now the fifth-largest in the world, and in 2014, it's worth was US$543.2 billion. (BMI India Retail Report, 2021). Across the nation, grocery chains have been established by corporate giants like RPG and Birla. Local retailers in India are largely responsible for the country's retail modernization. The huge transformation is being driven in large part by international retailers. Additionally, alterations in consumer behaviour have had the biggest impact on the development of modern trade. The rise in the number of working women has greatly aided the expansion of contemporary trade, yet the 3% growth rate of organized retail in India hasn't been very thrilling. (Knox and Denison 2000). Corporate giants like RPG and Birla have established grocery networks across the country. However, in recent years, shop closures and employee layoffs have occurred as a result of declining consumer spending, tight working capital conditions, and rising interest rates. Because customers often spend twice as much in the main store as they do in other stores, it is crucial for businesses to be the first-choice locations. (Knox and Denison 2000) The shops operate in a supermarket format and sell food and other items. These shops provide customers with a variety of educational and cost-effective options. As a result, clients frequently abandon their regular establishments in favour of these supermarket-style stores. As a result, a store's ability to retain and attract customers is a key sign of its health. (Rhee and Bell 2002) Knox and Denison highlighted the significance of creating a corporate retail strategy to manage customer loyalty and deter customers from switching stores (2000). There is a lack of consumer perception research in the retail sector in developing nations like India. This turns out to be a significant restriction of the research in this field. Therefore, in order to determine whether customer satisfaction and customer loyalty findings and ideas are universally applicable, they must be examined in many contexts. As a result, the three constructs of customer pleasure, store image, and customer loyalty are thought of as the main themes or areas of interest that one would like to gauge through survey questions. (Thomas Sam, 2013)

3.1 Then and Now:

"Old technology meets contemporary technology" is the topic of this study. Or, to put it another way, drivers of change would be bridging the old and new gaps. Implementing new trends, a novel concept or method of purchasing, such as idea generation, are important actions that need be made to close the gap between the current condition and the intended state of supermarkets, educating the team about the new approach, idea screening and evaluation, the creation of promotional content Plan your go-to-market plan, research your target market, create a positioning statement, establish a launch objective, and then launch. The conceptual framework for comprehending cutting-edge in-store technology infusions is introduced in this research. A classification of several cutting-edge and futuristic technologies with an emphasis on the customer's level of convenience and social presence. On the premise that convenience and social presence can stimulate vividness by boosting consumer contact, imagery, and elaboration, which eventually results in increased sales, a number of propositions are put forth. In order to understand how they could affect the vividness perceived through the AI, four moderating areas must be considered: consumer characteristics, product/service dimensions, mental models, and social networks. (Grewal Dhruv et al., 2019)

3.2 Consumer purchasing process:

The study of consumer behavior focuses on how individuals, groups, or organizations select, acquire, utilize, and discard concepts, products, and services to satisfy their needs and preferences. For marketers, understanding consumer expectations makes studying buying behavior more crucial. (Kirk and Ritkin. 2020, Zwanka and Buff, 2020)

3.3 Identifying the problem:

In the process of making a decision, it is the initial step. A consumer will not start a purchase if they are unaware of their demands or wants. A consumer will decide to make a purchase when they feel compelled to do so for a specific product. The buyer's process begins when they become aware of a need that has been triggered

by either internal or external factors. Internal stimuli include feelings like hunger, thirst, etc. that the consumer personally perceives. External cues, such as advertising, word-of-mouth, or neighbourly admiration, can also be used to identify a need. (Jaiswal, Rahul et al., 2020)

3.4 Seeking information:

The consumer is aware of their need or desire at this point. They are also aware that they want to purchase a product that will help them solve their issue. As a result, people are interested in learning more about the solution that can solve their issue. This brings us to the phase of information search. The customer will look for the best alternative and available options for the issue. (Kirk and Ritkin.,2020)

3.5 Analyzing potential solutions:

Consumers assess all of their product and brand options at this stage based on a scale of characteristics that can provide the benefit the client is looking for. Customers typically compare alternatives based on a variety of product characteristics. Consumers take into account a variety of aspects, including appearance, utility, quality, pricing, services, brand recognition, popularity, and social media reviews. Marketers need to be aware of the advantages consumers are seeking, as well as the qualities that will have the biggest impact on their choice. (Kent Anthony, 2011)

3.6 Purchase selection:

Customers are at this stage when they are prepared to make a purchase and have determined where and what to buy. They are aware of the costs and possible payment methods. Customers are contemplating whether to buy the product at this point, but even then, they have the option to back out and leave. A marketer needs to identify the numerous factors influencing the consumer's decision-making at this point. Price, value, or a shift in consumer needs may be the causes. (Zwanka and Buff, 2020)

3.7 After-purchase conduct:

Customers compare the merchandise with their expectations after making a purchase. Either a satisfied or unhappy conclusion is possible. If a product fulfils the needs of its customers, they will be pleased with their purchase. However, if the item falls short of their expectations, the customer will be dissatisfied. (Zwanka and Buff, 2020)

4. Smart Technology:

The most recent events of the last few decades covered in this paper are the introduction to the COVID-19 pandemic. Globally, it has significant social and economic repercussions. Studies on consumer behavior have suggested stages of behaviour, compared old and new habits, or explained behaviors based on similarities with earlier crises and disruptive events, such as other pandemics, wars, or natural disasters. (Kirk and Ritkin. 2020, Zwanka and Buff, 2020) Information and communication technology (ICT) is a smart technology that can significantly reduce risk. Smart technology can assist in managing human resources, including crowd control, crowd quarantine, effectively adhering to government regulations, distributing food and medicine, enforcing social segregation, etc. The following are a few examples of efficient methods: Place technology in a position to combat any disaster system. Used to access the issue in the hotspot area and locate one's precise location with the use of a navigation satellite system. With the aid of the drone, this technology is utilised to transport food, medication, medical supplies, and other important services. With the use of accurate mapping and trustworthy data, it can locate the precise location of infected individuals and the contaminated region, as well as track the moving position and contain the infected. Better transportation facilities can benefit from this technology as well. It is employed to pinpoint a geographic area for a variety of reasons, including locating the COVID hospital's specific location, keeping track of it, and preserving social distance by keeping an eye on the afflicted. In a crisis, robot technology is highly advised. (Jaiswal, Rahul et al., 2020). Systems that serve several purposes use this technology. Reduced human contact results. AI-powered robots act as a frontline defence against the COVID risk's increased spread. It is useful for preserving the lockdown, providing the necessary service, and other things. By using a cloud-based system, this technology is used to create smart and digital hospitals. Apart from being useful in a grocery store setting, it is the finest approach to communicate with the doctor virtually.

4.1 Robot assistant technology:

The following are a few crucial aspects of robot technology that can lower the danger of COVID: To prevent interaction with an infected person, it is used to bring food, medication, medical equipment, and other necessary services to hospitals. It is employed for preserving social distance and watching the local populace. It is used to gauge an infected person's body temperature. It serves as a sanitizer, in public locations like airports, trains, malls, movie theatres, etc., it is utilised for thermal screening. They are used to scan the inventory of a supermarket and to shop with customers. Robots assist humans during quarantine by doing cleaning tasks. The use of drone technology can help to stop the COVID risk from spreading. This technology's use is comparable to robot technology. This technology offers images of geographic features so that you can keep a safe distance from sick people. (Jaiswal, Rahul et al., 2020) The new supermarket structures stand out like sculptures against the backdrop of the city, inspiring customers' curiosity and fostering expectation. As these stores entirely transform in the next ten years than they have in the last one thousand, supermarkets urge customers to enjoy the new shopping experience. Websites act more like stores, and stores act more like websites! Understanding the basics of what a store is, what it does, and why. (Kent Anthony, 2011)

Author's own compilation

Fig 1: Some photographs of the Supermarkets showing Robot Assistant Technology

4.2 Beacons:

Introducing beacons, a little wireless gadget that continuously sends out radio signals. Smart phones pick up the signal and relay the id to a cloud server. The targeted content can be sent from the server to the device. E.g., If there is a beacon nearby, your phone could notify you of the sale if the customer is passing by your favourite supermarket and there is a sale. The Bluetooth/Bluetooth smart device's low energy version broadcasts advertisements on one or more of the three designated channels for finding slaves. The data transfer begins as soon as the slave device is identified and takes the form of recurring connection events where the slave and master wake up simultaneously to exchange various frames. Energy conservation for devices is also practised. BLE (Bluetooth low energy) technology has a lot of promise overall and will be crucial to the development of the IOT. As a result, an accurate and effective micro location system that employs particle filtering to find an entity or user in an indoor/GPS-restricted environment is needed. It was prototyped using extensive trials that varied the number of particles, the number of beacons, and the tracking area. Experiments were used to get the conclusion that adding more beacons will only increase accuracy up until a point where the area is saturated. In order to avoid obstructions, beacons should be suitably positioned at higher heights inside the area. The tracking area shouldn't be crowded with beacons, as this could cause interference and reduce accuracy. (Zafari Farheem et al., 2019)

Author's own compilation

Fig 2: Photographs of Beep-call device (Beacons)

4.3 Facial Recognition Technology:

As soon as a consumer enters the store, supermarkets want to recognise them using facial recognition technology. Retailers are using facial recognition technology to offer a customised experience. It's like knowing who is going to walk into your store before they do. Radio-frequency identification (RFID) technologies, digital cameras, and other sensors are all used in the passive collecting. In contemporary retail management, intriguing patterns in consumer behaviour can be found through data mining, and building data-driven models enables the forecast of consumer behaviour, which improves the management of shopping malls or individual stores. Additionally, store traffic forecasting models are created using data from a digital camera that monitors foot traffic to a supermarket. Additionally, this opens up a wide range of store management opportunities, such as security, customer acquisition strategies and promotions, store window and layout design, inventory control, and human resource management. (Cortez Paulo et al., 2016).

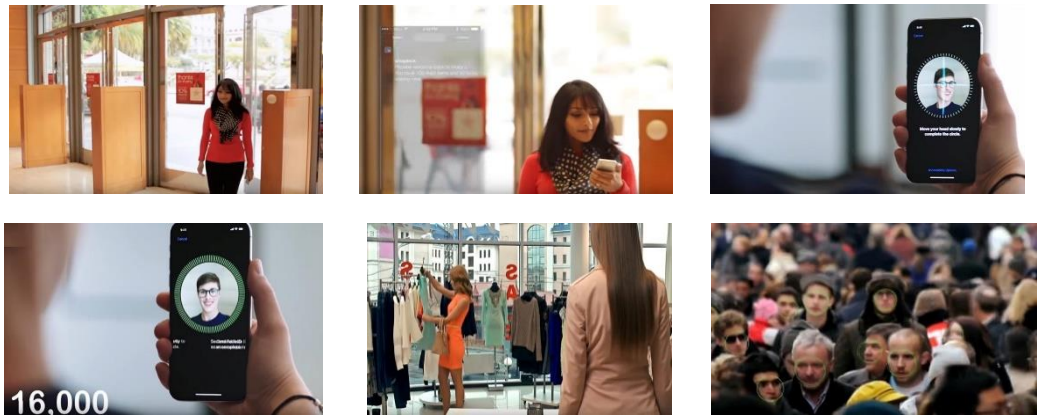


Fig 3: Photographs of Beep-call device (Beacons): Author's own compilation

Businesses don't want clients to use their system and then walk away without purchasing the goods they intended to. User happiness and sales revenue are impacted by this. The cashier employs the facial recognition technology to access the customer's emotional state. The approach is likewise focused on accumulating unfavourable feelings linked to a level of melancholy, which sets off events that prompt shop workers to assist clients. This method works well to gauge these feelings and serves as a valuable guide for store assistant intervention. (Borges Valter et al., 2019) As a result, technology-driven applications have the potential to influence how cities change into smart cities using contactless technologies. Smart city environments use applications, design concepts, technology standards, and economical procedures and user interfaces. (Manimuthu Arunmozhi et al., 2021)

4.4 Artificial Intelligence:

AI enables systems to make resourceful decisions and execute tasks automatically without human intervention. What AI achieves is a system that think and act like a human being, and act rationally and take actions that have the highest tendency of achieving a specific goal. (cerka et al., 2015)

"AI will be the best or worst thing ever for humanity" – Elon Musk

Because AI automates repeated learning and data discovery, we are going towards it. Intelligence is added by AI. AI examines a wider range of data. AI is remarkably accurate. Continual, highly effective work. AI decreases the need for human labour.

"Success in creating AI would be the biggest event in human history. Unfortunately, it might also be the last, unless we learn how to avoid the risks."- Stephen Hawking

Application of AI is in medical. AI doctor is a robot containing knowledge of a doctor. Physical application for handicap: with the help of Bio sensors like EMG & EEG sensors, handicaps movement is analysed and trained to move the robotic arm/leg even. Prediction of disease from medical image: It is the application where medical images are used to classify the diseased and healthy like diabetic retinopathy. Voice recognition for ALS

patient: ALS (amyotrophic lateral sclerosis) is a kind of disease which causes speech problems. It affects motor neurons- those nerve cells in the brain & spinal cord that control voluntary muscle movement.

Application of AI in Agriculture for weather prediction & suggestion: AI applications are used to analyze the weather & forecasting the weather to give the vegetation suggestion based on crops in a field which decreases spoiling the crops due to natural disaster. Plant disease detection & pesticide recommendation: This AI application is to monitor the crops 24X7 to detect the disease using image processing & to spray the suitable pesticide. Classification: After cultivation, fruits & vegetables needed to be segregated based on the quality like Rotten or Healthy. This is done with great accuracy and in a short span of time.

Application of AI in voice assistance such as Google assistance/Alexa/Siri/Chatbot. Google Home/Amazon Echo/Hike Natasha. The voice input from the speaker is converted to text which recognises each and every word and complete sentences.

Application of AI in Autonomous Vehicle. The challenges like it should know where it is going like GPS location. It should follow the lane. It should not collide with any other vehicle, object or person i.e., accidents should be avoided. To obey the traffic rules & signals.

Application of AI in search engines. Use in Google. Google suggestion: AI is used to predict & suggest the result based on the search history. Search Engine Optimisation. Result: AI helps to understand the need from the search & filter out related result in short time. Web Ads.

Application of AI in social media like Facebook, Instagram, WhatsApp. Music-composing recommendation: In composing AI is used to identify the pattern of every musician to compose music for certain situation in the style of certain composer or by itself. AI in recommendation used in Spotify to recommend the type of song based on users. E-commerce: AI used to analyse the user need, and to recommend the products for every individual user. Social Media: AI is used to analyse user interest in several topics, Finding bad contents, chat bots etc. AI in cooking. (Pantech solutions, 2022)

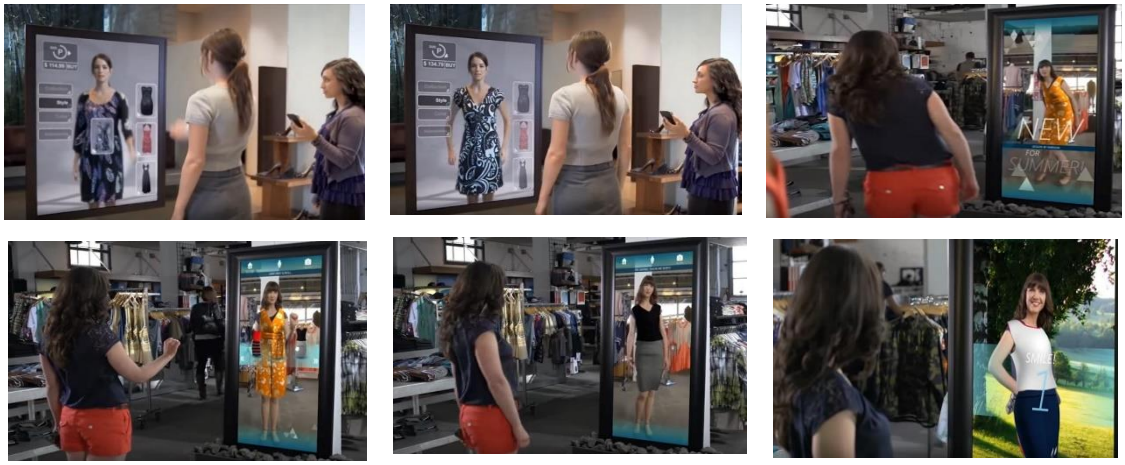
4.5 Supermarkets of the future:

Supermarkets take pride in their interior design and latest fashion trends. Experience at the food court is prioritised. Customers' interests can be catered to and motivated by services like provided coffee and in-store cooking workshops. Self-checkout lanes, product scanning and identification, intelligent mirrors, kiosk devices, no pay lanes and one is billed later; payment is made by mobile phone. These physical stores are the brick and click retailers of the future because their online counterparts do not completely replace them. Applications and online shopping help users find goods and services. Along with other items like food, groceries, confections, bakery goods, clothing, home goods, stationery, toys, and electronics, a book store and pharmacy are also added to the interior. Electronic price tags for display shelves are automatically updated and eliminate the hassle of changing paper tags. It is an entirely new method of interaction between shoppers, shop owners, and their goods. Through one-click cashless payments, no wait times for transactions, and no line-ups. Additionally, there will be a 40% reduction in labour hours, and supermarkets may improve the shopping experience thanks to their extremely effective digital operations. (Ebner Tanja and Torchalla Jens, 2021)

Author’s own compilation

Fig 4: Photographs of Food Courts and free cookery classes offered

Traditional mirrors are replaced by smart displays. Clothing can be layered over your in-store appearance in the mirrors. Without ever taking off your clothes, the mirror serves as your personal changing area. (Tejas Patil et. al, 2020)



Author's own compilation

Fig 5: Photographs of smart mirrors

5. Description Of The Research Work

Digital technologies are electronic tools, systems devices and resources that generate store or process data. It enables an immense amount of information to be compressed on small storage devices that can be easily preserved & transported. Digitization also quickens data transmission speeds. Digital technology has transformed how people communicate, learn & work. (Eleorora Pantano, Virgina Vennuice) Since the government of India has included the notion of smart cities in its agenda, the issue of Indian supermarkets not implementing the required digital technology is one of national relevance. Smart cities are held up as models of best practices, such as Barcelona and Amsterdam. Built entirely from scratch on "empty ground," Songdo in South Korea is a high-tech smart city project. It is the largest private real estate development in the world and the metropolis of the future. Interior design is expanding in tandem with urban infrastructure expansion to support emerging technology everywhere. Ahold, Aldi, Auchan, Carrefour, Costco, Lidl, Metro, Tesco, and Walmart are just a few examples of the modern supermarkets in the west that use digital technology. Considering the issues that Indian supermarkets had, such outlets are the way of the future. National borders might be problematic when determining the scope and architecture of a retail network in markets that are still developing in terms of contemporary trade. Instead, merchants should focus on growing in urban areas or urban clusters. Supermercados Guanabara, the market leader in Rio de Janeiro, for instance, is restricted to the metro region and only has 23 stores, yet it outperforms imposing rivals like Carrefour and Walmart. Some shops in China have decided to focus initially on a single city or city cluster, such as Shanghai or Shenyang, before going global. (Peter Child, Thomas Kilroy, James Naylor) Instead of a huge national explosion plan, this research is for a supermarket that will most likely emerge as a result of a number of players developing in distinct cities and states.

5.1 Research Methodology:

The study focuses on digital technology used in supermarkets to tackle COVID 19. This overview concentrates on the fundamental ideas and comprehension of smart cities, supermarket technology, and related applications. A review of the literature offers a thorough understanding of the topic that was the focus of the desktop search. The geographical location of supermarkets is Delhi NCR, as they come under smart cities project mission. The size of the supermarkets is 700+ for Reliance while the others that are mentioned in this report range from 1-5 in number. Initially all the various digital technologies prevalent in supermarkets were studies

thoroughly. Then the data was collected using the methodology of card sorting technique. Where cards were made of every digital technology that the supermarkets implement with their name, description, photograph, category and merits and demerits on the card. These cards were then classified into different categories according to the ease of operations and customer experience. The methodology used is dichotomous key, which is a visual tool that allows determining, identifying, and grouping different objects and aspects of supermarket technologies in the right categories. Dichotomous key classification for supermarket technologies (refer to Figure 1) For full forms of different categories refer to the legend in Table 1.

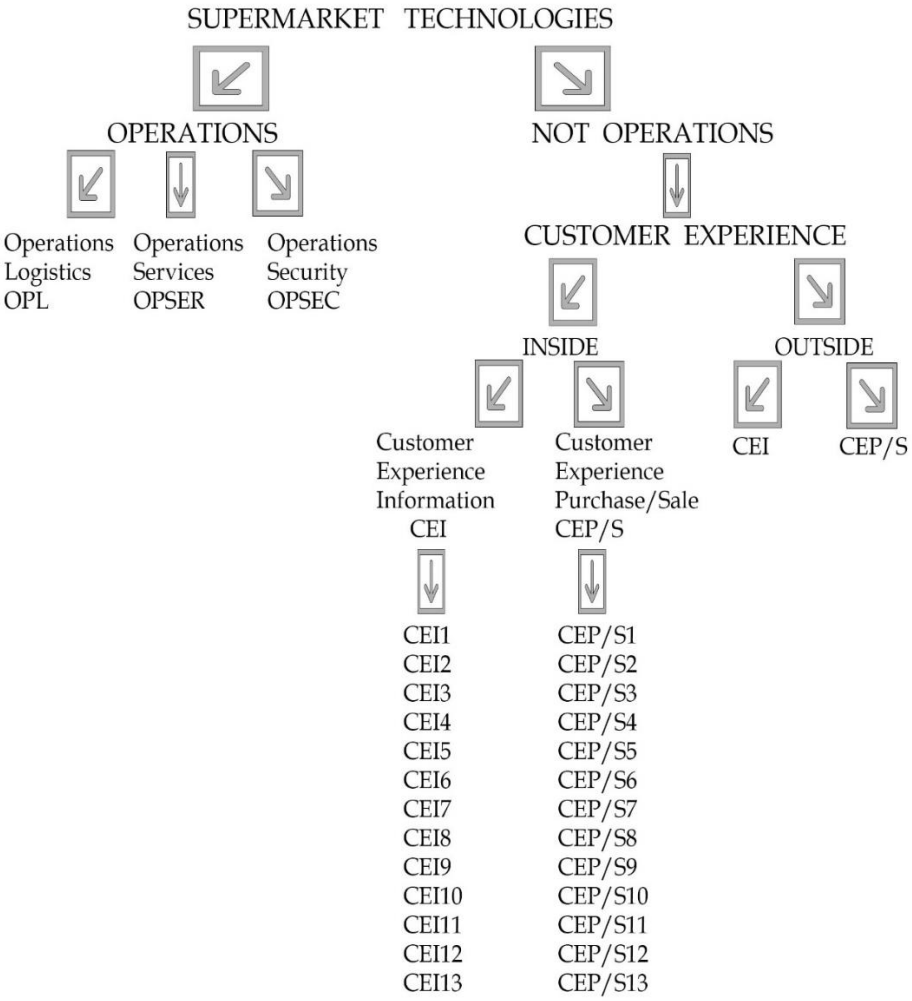


Fig 6: Dichotomous Keys Classification for Supermarket Technologies

For full forms please refer to the legend given below:

Table 1: LEGEND

S.NO.	ABBREVIATION	FULL FORM
1.	OP	Operations
2.	OPL	Operations logistics
3.	OPSER	Operations Services
4.	OPSEC	Operations Security
5.	CE	Customer Experience
6.	CEI	Customer Experience Information
7.	CEP/S	Customer Experience Purchase/Sale

These categories are:

1. Operations (OP)

a. Logistics (OPL)

1. Smart Parking (OPL1)
2. Public Transport, Airlines & Trains (OPL2)
3. Shipping (OPL3)
4. Self-Driving Delivery (OPL4)
5. Real Analytics (OPL5)

b. Services (OPSER)

1. Smart Grid/Electric Grid (OPSER1)
2. HVACR (OPSER2)
3. Light Bulbs (OPSER3)

c. Security (OPSEC)

1. Facial Recognition Technology (OPSEC1)
2. RFID Technology (OPSEC2)
3. Finger Authentication Technology (OPSEC3)
4. Coin Trollies for Shopping (OPSEC4)
5. Smoke Alarm (OPSEC5)
6. Security Alarm (OPSEC6)

2. Customer Experience (CE)

a. Information (CEI)

1. Beacons (CEI1)
2. Digital Shelves/ Electronic Shelf labels (CEI2)
3. Virtual Shelves (CEI3)
4. Smart Mirrors (CEI4)
5. Occupancy (CEI5)
6. Transparent shop displays (CEI6)
7. Social media (CEI7)
8. E-Games (CEI8)
9. E-Brochures (CEI9) 13
10. E-Collages (CEI10)
11. Virtual Guides (CEI11)
12. Digital Signage (CEI12)
13. Infotainment (CEI13)

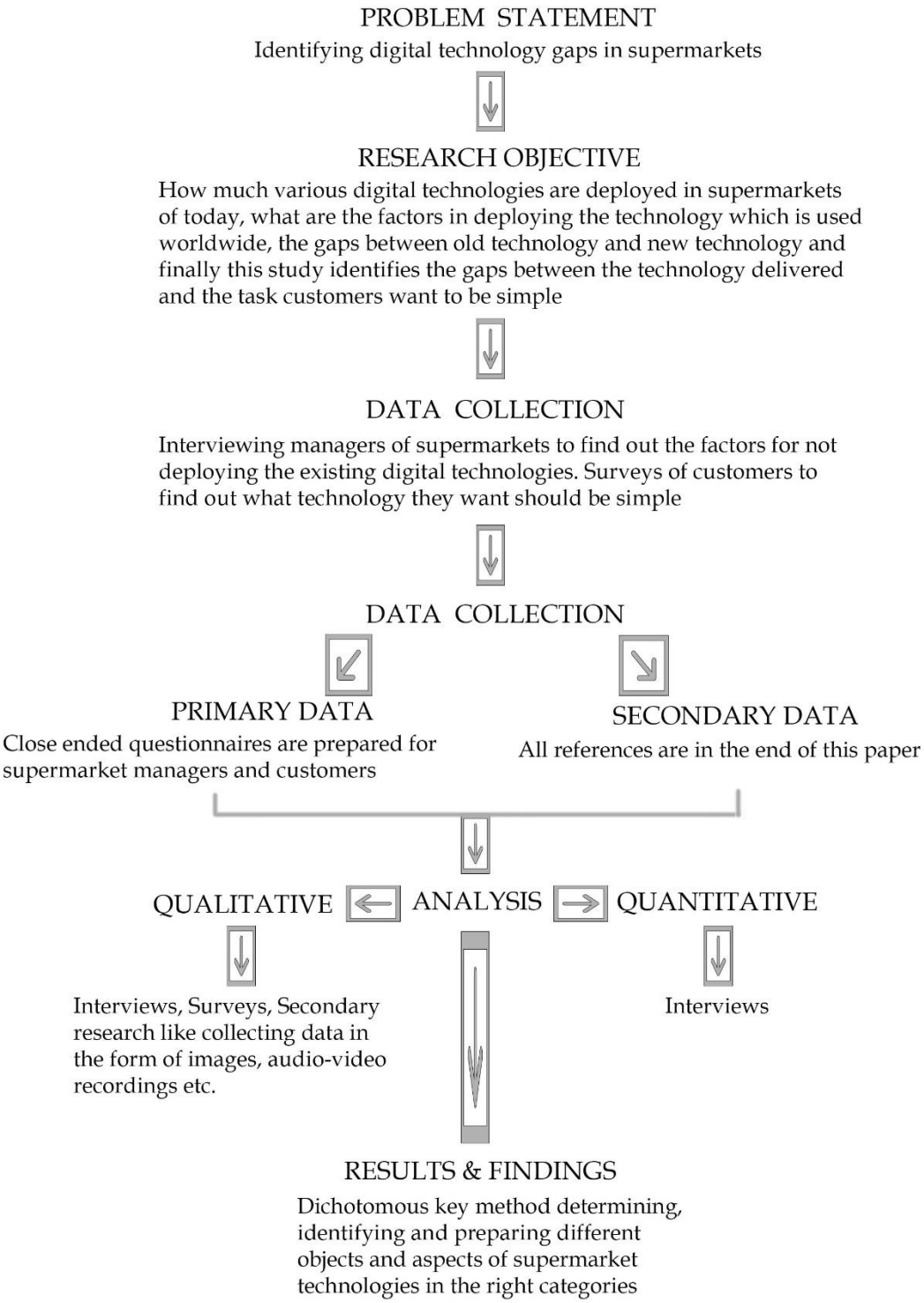
b. Purchase/Sale (CEP/S)

1. Robot Assistant Technology (CEP/S1)
2. Food Court Experience with free cooking classes and served coffee (CEP/S2)
3. Scan & Go System of Checkout (CEP/S3)
4. Self-Checkout Terminals/Machines (CEP/S4)
5. Object Recognition (CEP/S5)
6. Scanners & printers (CEP/S6)
7. Smart Cart with LCD Screen (CEP/S7)
8. Barcoding & Scanning Function (CEP/S8)
9. Vending Machines (CEP/S9)
10. ATM Machines (CEP/S10)

The scan code below leads us to the A6 cards having digital technologies that were used in the card sorting technique with their name, description, photograph, category and merits and demerits on them.

qr.codes/xIbSvX

PRIMARY & SECONDARY RESEARCH METHOD FLOW CHART



6. Surveys

6.1 Study of surveys of digital technologies of supermarkets

Aim: To find out the weightage of different categories of digital technologies used in supermarkets according to usage.

Objective: To compare the different categories of digital technologies to know which kind of category uses the most digital technologies.

Procedure: Surveys were taken of 20 different supermarkets regarding their deployment of various digital technologies in their stores. Then the raw data was converted to digital data. Then this data was used to assist in letting us know the maximum usage of digital technologies in supermarkets using histograms. Later these were put into different categories and again maximum usage of digital technologies in different stores was taken out in different categories using histogram and then compared.

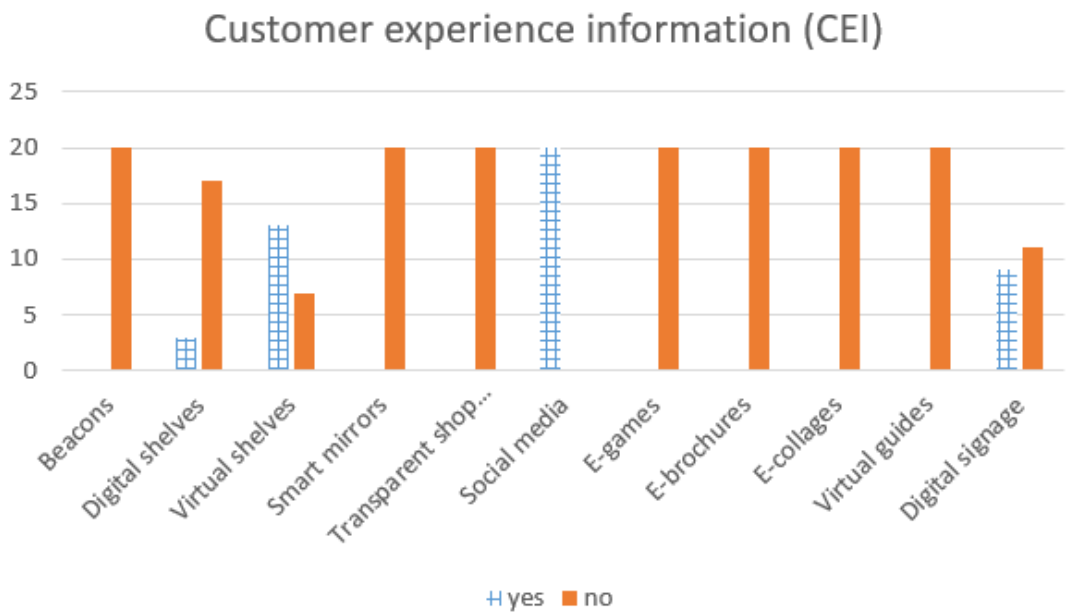
Results:

Customer experience purchase/sale (CEP/S):

1. Robot assistant technology: 0%
2. Food court with E-menu and E-billing: 90%
3. Scan & go system of checkout: 20%
4. Self-checkout counters: 0%
5. Object recognition: 0%
6. Scanners & printers: 90%
7. Smart cart with LCD: 0%
8. Barcoding & scanning (billing): 100%
9. Vending machines: 5%
10. ATM machines: 0%

    Average= 90%+20%+90%+100%+5% = 305/10 = 30.5%

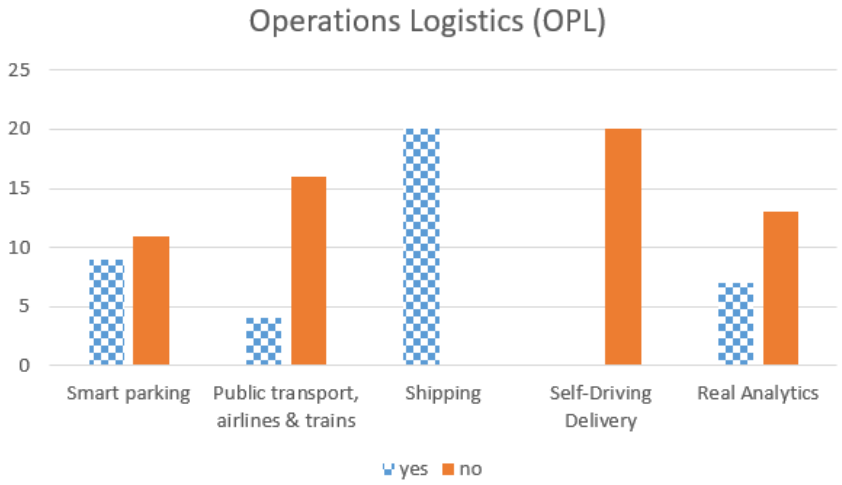
Customer experience information (CEI) usage in supermarkets:



1. Beacons: 0%
2. Digital shelves: 15%
3. Virtual shelves: 65%
4. Smart mirrors: 0%
5. Transparent shop displays: 0%
6. Social media: 90%
7. E-Games: 0%
8. E-Brochures: 0%
9. E-Collages: 0%
10. Virtual guides: 0%
11. Digital signage: 45%

Average = 15% + 65% + 90% + 45% = 215/11 = 19.54%

Operations Logistics (OPL) usage in supermarkets:

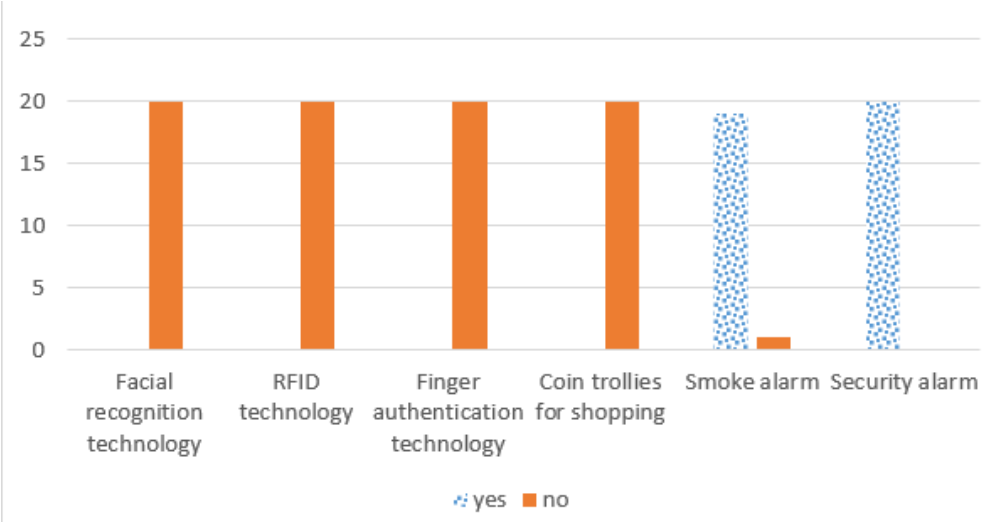


1. Smart parking: 45%
2. Public transport, airlines & trains: 80%
3. Shipping: 100%

4. Self-driving delivery: 0%
5. Real analytics: 35%

Average: 45% + 80% + 100% + 35% = 260/5 = 52%

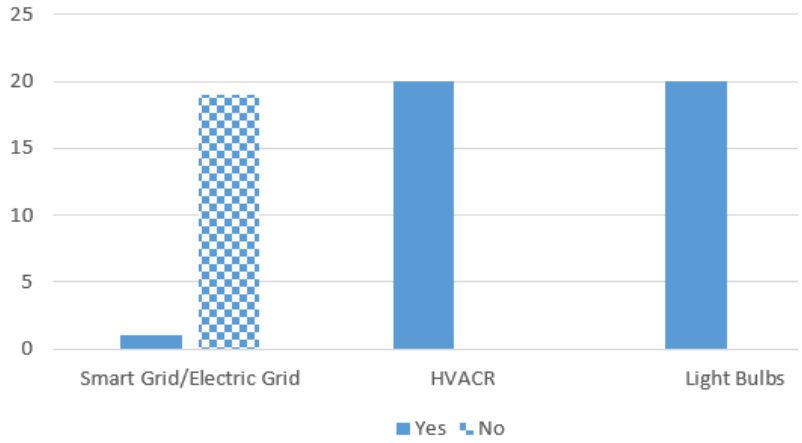
Operations security usage in supermarkets (OPSEC):



1. Faial recognition technology: 0%
2. RFID technology: 15%
3. Finger authentication technology: 30%
4. Coin trollies for shopping: 5%
5. Smoke alarm: 100%
6. Security alarm: 100%

Average = 15% + 30% + 5% + 100% + 100% = 250/6 = 41.67

Operations services usage in supermarkets (OPSER):



1. Smart grid/Electric grid: 5%
2. HVACR: 100%
3. Light bulbs: 100%

Average = 5% + 100% + 100% = 205/3 = 68.3%

Analysis:

Rankings based on Digital Technology utilization in supermarkets:

1. **Operations Services, OPS, (68.3%):** Operations services emerged as the most extensively utilized category of digital technology within the context of supermarkets, representing the primary preference among surveyed establishments.

2. **Operations Logistics, OPL, (52%):** Following operations services, operations logistics occupies the second position in terms of adoption and integration, showcasing significant traction in the supermarket sector.
3. **Customer Experience Purchase/Sale, CEP/S, (30.5%):** Customer experience purchase/sale occupies the fourth position, indicating a moderate degree of adoption, albeit with less prevalence than the preceding categories.
4. **Customer Experience Information, CEI, (19.54%):** Finally, in the fifth position, customer experience information is identified, representing a category with notable adoption but a relatively lower rate compared to the others.

The study delved comprehensively into the landscape of digital technologies deployed in supermarket settings. A meticulous research approach was employed, encompassing diverse data collection methods. This included the administration of surveys, extensive interviews conducted through audio recordings with store managers, and visual documentation through photographs of the supermarkets. The focus was squarely on discerning the current technological deployments within these supermarket establishments.

Subsequently, the collected survey data and responses from questionnaires were meticulously transcribed and converted into a digital format for comprehensive analysis. The analytical endeavour entailed the generation of histogram charts representing the prevalence of digital technologies, both those in use and those not yet implemented within the supermarket domain. To quantify the extent of digital technology adoption, these charts were then converted into percentage values.

The resulting findings have illuminated the relative adoption rates across five distinct categories:

1. Customer experience sale/purchase (CES/P)
2. Customer experience information (CEI)
3. Operations Logistics (OPL)
4. Operations services (OPSER)
5. Operations security (OPSEC)

These insights have culminated in a clear identification of the most widely adopted digital technology category in supermarkets, with operations services leading the way. Subsequently, operations logistics, operations security, customer experience purchase/sale, and customer experience information follow in succession, elucidating their relative prominence within the supermarket landscape.

6.2 Second Study Of Supermarket Digital Technologies

Aim: To find out from customers which digital technology they want should be simple for them while shopping.
Objective: To rank the digital technologies according to customer preference that they want to be simple and use while shopping.
Procedure: In a recent survey involving 20 respondents we endeavored to discern our customers' inclinations concerning a range of digital technologies integrated into our services. Participants were asked to rank 21 digital technologies, ranging from most preferred to least preferred. From the analysis of the collected data and the insights gathered from bar charts, we have arrived at the following notable conclusions:

SURVEY REPORT: Customer preferences for Digital Technologies

20 customers filled the Google Form questionnaire. The customers chose digital technologies they want should be preferred or simple to use while shopping ranging from least required (1), somewhat required (2), neutral (3), required (4) to most required (5).

In a recent survey involving 20 respondents we endeavored to discern our customers' inclinations concerning a range of digital technologies integrated into our services. Participants were asked to rank 21 digital technologies, ranging from most preferred to least preferred.

Analysis of survey:

From the analysis of the collected data and the insights gathered from bar charts, we have arrived at the following notable conclusions:

First Place (Most Preferred):
Home Delivery Service and HVACR technologies emerged as the unequivocal favorites among our customers, securing the top position on the preferences list. These technologies received the highest number of "most preferred" rankings, highlighting their exceptional popularity.
Second Place:
E-menu and Digital Shelves technologies garnered substantial interest, securing a solid second place in our customers' preference.
Third Place:
The third spot was occupied by ATM, Digital Signage, Smart Parking, Coin Trolleys for Shopping, and Security technologies, signifying a significant degree of customer preferences.
Fourth Place:
Barcoding & Scanning, Self-Checkout Counters with Barcoding & Scanning and Virtual Guides found themselves in the fourth position, indicating notable interest among respondents.

Fifth Place:
Scan & Go and Self-Checkout Terminals held the fifth place, suggesting a moderate level of preference within our customer base.
Sixth Place:
Smart LCD Cart and E-Social Media technologies were positioned in the sixth place, demonstrating noteworthy customer interest.
Seventh Place:
Beacons technology was rated seventh in the preferences, indicating a level of interest within the surveyed group.
Eight Place (Least Preferred):
Vending Machines and E-games technologies rounded off the rankings in eighth place, suggesting relatively lower levels of preference compared to other digital technologies.
These findings offer valuable insights into the preferences of our customers regarding digital technologies. The prominence of Home Delivery Service and HVACR, closely followed by E-menu Digital Shelves, underscores their significance in meeting customer needs. These insights will guide us in tailoring our technological offerings to better align with our customers' expectations and preferences.
This report succinctly summarizes the survey results and provides a clear understanding of how customers ranked each technology based on the bar chart analysis.

A. Rankings:

Based on the preferences expressed by the respondents, rankings are as follows:

1. Home Delivery Service and HVACR
2. E-menu and Digital Shelves
3. ATM, Digital Signage, Smart Parking, Coin Trolleys for Shopping, and Security
4. Barcoding & Scanning, Self-Checkout Counters with Barcoding & Scanning, Virtual Guides
5. Scan & Go and Self-Checkout Terminals
6. Smart LCD Cart and E-social media
7. Beacons
8. Vending Machines and E-Games

B. Mode:

From the visual analysis of bar charts, we saw that the following digital technologies received "most preferred" rankings:

- Home Delivery Service and HVACR (First Place)
- E-menu and Digital Shelves (Second Place)

Since "Home Delivery Service and HVACR" have the highest frequency of "most preferred" rankings (they were ranked first by the respondents), they are the mode in this survey.
So, the **Mode** is "Home Delivery/Shipping Service and HVACR".

C. Percentage Distribution:

- Home Delivery Service and HVACR (First Place): 100% (20 out of 20 respondents ranked them as "most preferred".
- E-menu and Digital Shelves (Second Place): 0% (since none of the respondents ranked them as "most preferred)"
- ATM, Digital Signage, Smart Parking, Coin Trollies for shopping, and Security (Third Place):0%
- Barcoding & Scanning, Self-Checkout Counters with Barcoding & Scanning, Virtual Guides (Fourth Place): 0%
- Scan & Go and Self-Checkout Terminals (Fifth Place): 0%
- Smart LCD Cart and E-Social-Media (Sixth Place): 0%
- Beacons (Seventh Place): 0%
- Vending Machines and E-Games (Eight Place): 0%

For detailed survey reports scan the code below and scroll down where it says surveys

qr.codes/xIbSvX

There was also detailed research on Autonomous Vehicles, Smart Mirrors and IOT. Separate research papers were made for these studies.

7. Conclusion

In conclusion, our study has illuminated the significant influence that supermarket artificial intelligence has on consumer purchasing decisions. The results of the polls show a clear pattern of how AI-powered techniques affect consumer purchase behaviour. As a result of AI technologies, consumers are becoming more receptive to personalised recommendations, frictionless checkout procedures, and real-time inventory information.

Significant ramifications flow from these findings for both academics and store stakeholders. Researchers might explore variables like demographics and purchasing patterns to better understand the subtleties of AI's influence. Managers and decision-makers at supermarkets should think about implementing AI-driven tactics to increase customer loyalty and happiness.

The use of AI in supermarkets is expected to increase as we move forward. To fulfil changing consumer expectations, it is crucial for the retail sector to remain at the forefront of technology innovations. The future of shopping is being shaped by AI, which is more than simply a tool.

Finally, we encourage further study and innovation in this dynamic area and invite all stakeholders to consider the possibilities of AI in supermarkets. We can design retail spaces that cater to changing consumer requirements and tastes in an increasingly digital age by properly utilising AI. This research emphasizes the need for supermarkets to adapt and innovate in response to evolving technology and changing customer expectations.

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