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IMPACT OF E-COMMERCE ON SUPPLY CHAIN MANAGEMENT

Prof. Harshita Gaikwad[*1], Rayyan Khan[*2], Rishu Singh[*3]

[*1]Guide, Parul Institute Of Engineering And Technology, India.

[*2,3]Parul Institute Of Engineering And Technology, India.

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ABSTRACT

E-commerce growth has modified organizational business processes because the supply chain now supports and leverages new requirements and transformations. This article examines the changes caused by e-business in enhancing supply chain management (SCM) in areas such as transportation, inventory management, logistics, and performance in SCM in general. This paper has demonstrated that e-business can create greater demands on the supply chains for faster and more flexible shipping alternatives, for more visibility into real-time inventories, and a rethink of creating more collaborative and responsive supply chains. E-commerce can prove value, but at a cost, for some challenges and additional challenges to the supply chain, which include more potential return fees, or indicating what precisely product authenticity is, or where the supply chain intends to reduce its carbon footprint, or where the supply chain intends to leverage multiple third-party logistics. This study provides some suggestions for supply chain managers and e-commerce services to start to understand and handle this disruption. E-commerce services and supply chain opportunities.

Keywords: E-Commerce, Supply Chain Management, Logistics, Inventory Management, Transportation.

I. INTRODUCTION

The dramatic evolution of e-commerce has shaped supply chain management in drastic ways, changing how products are manufactured, moved, and brought to consumers. As online shopping explodes, companies across many sectors are reevaluating traditional supply chain systems, which may need to change due to evolving consumer expectations in terms of speed, convenience and efficiency. In this context, the current research aims to explore the transformative impact of e-commerce on supply chain management, analyzing the ways in which technology, logistics and demand have reshaped supply chains to address the unique challenges and opportunities presented by digital commerce.

The evolution of e-commerce has transformed the way customers expect to be treated, especially with average delivery time, product availability, and transparency. Customers today expect rapid, even same day, delivery options and tracking of their purchases in real-time. To cater, business has adopted advanced technologies such as Artificial Intelligence, Data Analysis, and Productivity. Using these technologies, companies can improve stock management, optimize demand forecasting, and increase working efficiency, which can result in the growth of customer satisfaction and reduction of costs.

E-commerce has also driven the development of new logistics solutions, including automated warehouses, last-mile delivery networks, and partnerships with third-party logistics providers. These solutions help companies meet high volumes of online orders without sacrificing speed and accuracy in fulfillment.

The shift from traditional brick-and-mortar retail to e-commerce has also posed challenges in supply chain management.

The need for fast delivery has led to complex logistics demands, especially last-mile delivery, which is expensive to fulfill and a critical component of customer satisfaction. Also, as global e-commerce rises, supply chains navigate a patchwork of international regulations, tariffs and customs processes — compounding the complexity of cross-border trade. In addition, reverse logistics, which is the processing of returns, has become a more important part of e-commerce supply chains as a result of high rates of return for online purchases. This research seeks to provide an in-depth overview of e-commerce's transformative effect on supply chain management focusing on key areas such as technology adoption, logistics innovation, and global reach.

Through an analysis of market leaders and direction of future, this research will provide insight into the strategies firms use to ensure competitiveness within ever increasingly digital market place.

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Moreover, this part of my research will look at how e-commerce overbeats supply chain management and which way of complementation for achieving efficiency, sustainability, and customer satisfaction exists. Understanding these dynamics places companies in a better position to meet the demands of e-commerce and ultimately adapt their supply chains to meet the future needs of a digital-first economy.

II. LITERATURE REVIEW

Christopher & Towill, (2001)

The rise of e-commerce has significantly impacted supply chain management, transforming the way companies operate and interact with their customers. Research has shown that e-commerce has led to increased demand for faster and more flexible delivery options, resulting in a need for more agile and responsive supply chains.

Chopra & Meindl, (2001)

E-commerce has also changed the way companies manage their inventory, with a shift towards more decentralized and dynamic inventory management systems.

Bowersox et al. (2002)

Additionally, e-commerce has increased the importance of logistics and transportation management, with companies needing to balance the trade-off between delivery speed and cost.

Handfield & Nichols, (2002)

Furthermore, e-commerce has highlighted the need for greater supply chain visibility and collaboration, with companies needing to share information and work closely with their suppliers and logistics providers to meet customer demands.

Lee & Whang, (2001)

However, e-commerce has also introduced new challenges for supply chain management, including increased complexity and risk. Companies must now manage multiple sales channels and fulfill orders from a variety of sources, including online marketplaces and social media platforms.

Kumar and Singh (2020)

Argue that e-commerce platforms enable businesses to gather customer data, which can be used to tailor products and services. This personalization increases customer satisfaction and loyalty but also necessitates greater flexibility and responsiveness from supply chain partners.

Gunasekaran (2002)

Seamless information flow leads to improved decision-making and coordination among supply chain partners. The ability to track inventory levels, orders, and shipments in real-time enhances visibility, thereby reducing lead times and stockouts (Chopra & Meindl, 2016).

Gaur et al. (2019)

Businesses can implement just-in-time (JIT) inventory systems more effectively due to enhanced demand forecasting capabilities provided by online sales data. This shift reduces excess inventory and lowers carrying costs, although it requires robust logistics to meet consumer expectations for fast delivery.

Coyle (2016)

Businesses must adapt their distribution strategies to accommodate consumer expectations for rapid fulfillment. This may involve investing in advanced logistics technologies or reevaluating delivery models, such as last-mile delivery options.

Khan, M. A., & Qureshi, M. N. (2019).

This systematic review focuses on the implications of e-commerce for supply chain efficiency, flexibility, and customer satisfaction.

Rai, S., & Luthra, S. (2016).

This paper provides a comprehensive analysis of how e-commerce reshapes various elements of supply chain management, including inventory management, logistics, and customer service.

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III. STATEMENT OF THE PROBLEM

E-commerce offers supply chain management (SCM) both benefits and challenges as it keeps expanding and changing customer behaviour. Although companies can use online platforms to expand their consumer base and tap into new markets, the speed at which e-commerce is developing has caused major disruptions to conventional supply chain procedures.

Complex Supply Chain Networks: Supply chain networks have become more complex as a result of the integration of various sales channels, such as direct-to-consumer models and online marketplaces. Companies find it difficult to manage inventory across many platforms, coordinate logistics, and guarantee on-time delivery.

Growing Customer Expectations: Customers of today demand individualized shopping experiences and prompt, dependable service. This change in expectations necessitates more responsive and flexible supply chains, which frequently results in higher expenses and operational inefficiencies.

Technology Adoption Gaps: Although technology can improve supply chain processes, many companies have trouble embracing and putting these ideas into practice. The best technology to use and the best ways to incorporate them into current systems are not well understood.

IV. RESEARCH METHODOLOGY

OBJECTIVE OF THE STUDY:

1. To assess how supply chains' operational efficiencies have been improved by e-commerce, with an emphasis on cost savings, speed, and accuracy.
2. To determine the supply chain management best practices used by prosperous e-commerce companies and any possible ramifications for other industries.
3. To investigate how supply chains' responsiveness to market movements and customer demand forecasting are impacted by e-commerce platforms.

SCOPE OF THE STUDY

With an emphasis on the logistical, inventory, and transportation changes brought about by the growth of online purchasing, this study investigates how e-commerce affects supply chain management. The study's geographical setting is India, and its temporal scope includes changes over the last ten years as well as predictions for the future. In order to provide practical insights for supply chain managers, practitioners, and policymakers looking to maximize logistics and supply chain operations in the age of digital commerce, this study uses a mixed-methods approach to clarify the opportunities and challenges brought about by e-commerce's impact on supply chain management.

DATA COLLECTION METHOD

The questionnaire will be used to gather the information needed for comprehension. in order to survey them and learn what they think about e-commerce. Additionally, those answers were compiled into a spreadsheet, and additional analysis was carried out.

This particular study used primary data, which is gathered from 120 independent respondents.

Population

E-commerce Customers: The e-commerce revolution revolves around consumers. Their evolving demands for quick delivery, affordable costs, and simple returns have a direct impact on the management and architecture of supply chains. Supply chain decisions are influenced by their actions, preferences, and expectations regarding product availability, delivery schedules, and service quality.

Retailers: Supply chain dynamics have a significant impact on both pure-play online retailers and traditional merchants making the switch to e-commerce. Studying this group enables one to comprehend how they modify their fulfilment, logistics, and inventory management processes to satisfy the needs of e-commerce.

College Students: This group included college students studying supply chain management or related fields. These students were selected to provide their thoughts on how e-commerce would affect the supply chain industry going forward, specifically with regard to education and workforce development.

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SAMPLING METHOD

We utilized the probability sampling method in this study because it uses random selection, which gives every member of the population an equal chance of being included in the sample. When extrapolating results to a larger population is the aim, it is very helpful.

DATA COLLECTION INSTRUMENT

Survey Questionnaire: An organized list of inquiries about how supply chain management is affected by e-commerce.

Sample Size: In order to evaluate the effect of e-commerce on supply chain management, this study collected 120 responses from supply chain experts and MBA students. The sample offers a good mixture of academic knowledge and industrial experience, providing insightful viewpoints on how e-commerce affects supply chain management.

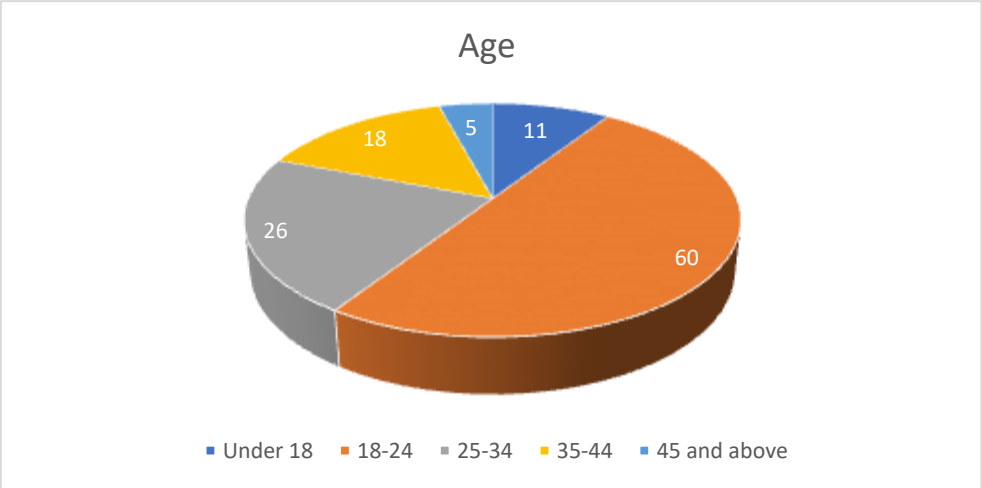
V. DATA ANALYSIS

It involves examining, purifying, transforming, and modeling data in order to find relevant information, make recommendations, and aid in decision-making. There are several names for data analysis in the economic, scientific, and social science fields.

The 120-person sample has been taken into account.

1. Age:

Age Group	Frequency	Percent (%)	Valid Percent (%)	Cumulative Percent (%)
Under 18	5	4.9%	4.9%	4.9%
18-24	60	58.3%	58.3%	63.2%
25-34	26	25.2%	25.2%	88.4%
35-44	18	17.5%	17.5%	100.0%
45 and above	11	10.7%	10.7%	100.0%
Total	**120**	**100%**	**100%**	



Interpretation:

Age: The largest age group is that between 18-24 years of age (n = 60, 58.3% of respondents). It is followed by the 25-34 years (n = 26, 25.2%) group. The 35-44 (n = 18, 17.5%) and 45 years and older (n = 11, 10.7%) age groups were the third and fourth, respectively. The smallest group was under 18 (n = 5, 4.9%). The response cohort is about as diverse in age as the overall graduate population, with the caveat that the survey was administered largely to younger respondents, and there was a far greater fall-off in levels of participation in older cohorts.

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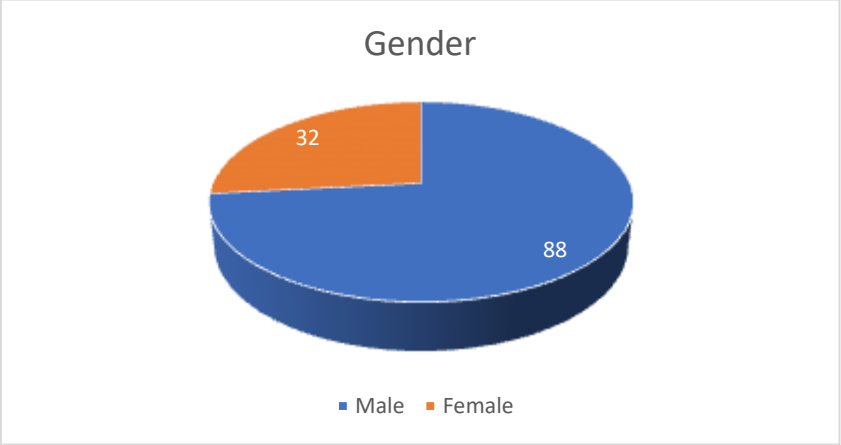
2. Gender:

Gender	Frequency	Percent (%)	Valid Percent (%)	Cumulative Percent (%)
Male	88	73.3%	73.3%	73.3%
Female	32	26.7%	26.7%	100.0%
Total	**120**	**100%**	**100%**	

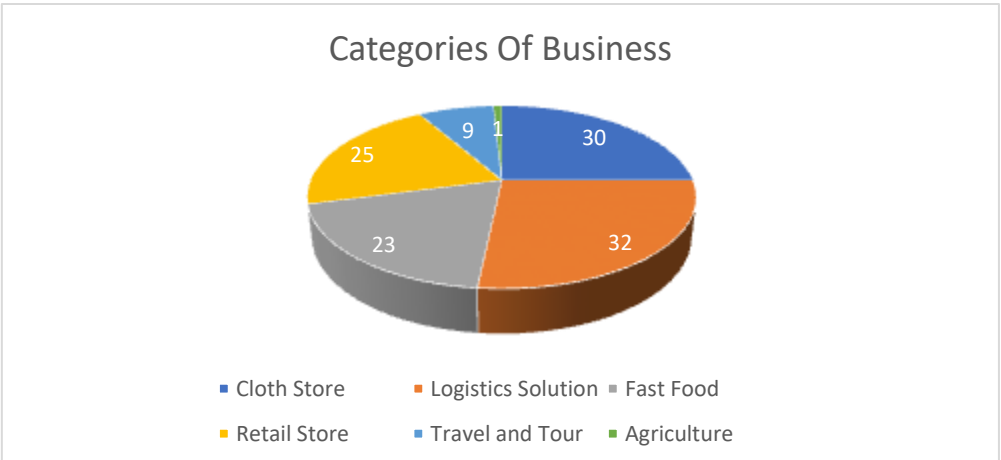


Interpretation:

Demographic information showed that out of 120 respondents (73.3% of the total respondents) were male, while 32 (26.7%) were female. This means there are more males than females in the survey, and it is a gender-skewed survey. Yes, so for this cumulative total, we actually have 120 total sample size when we take into account the female population. That either suggests that the survey was easier or more pertinent for males than females, or those males completed it more so than females.

3. Categories Of Business:

Categories of Business	Frequency	Percent (%)	Valid Percent (%)	Cumulative Percent (%)
Cloth Store	**30**	**25.0%**	**25.0%**	**25.0%**
Logistics Solution	**32**	**26.7%**	**26.7%**	**51.7%**
Fast Food	**23**	**19.2%**	**19.2%**	**70.9%**
Retail Store	**25**	**20.8%**	**20.8%**	**91.7%**
Travel and Tour	**9**	**7.5%**	**7.5%**	**99.2%**
Agriculture	**1**	**0.8%**	**0.8%**	**100.0%**
Total	**120**	**100%**	**100%**	



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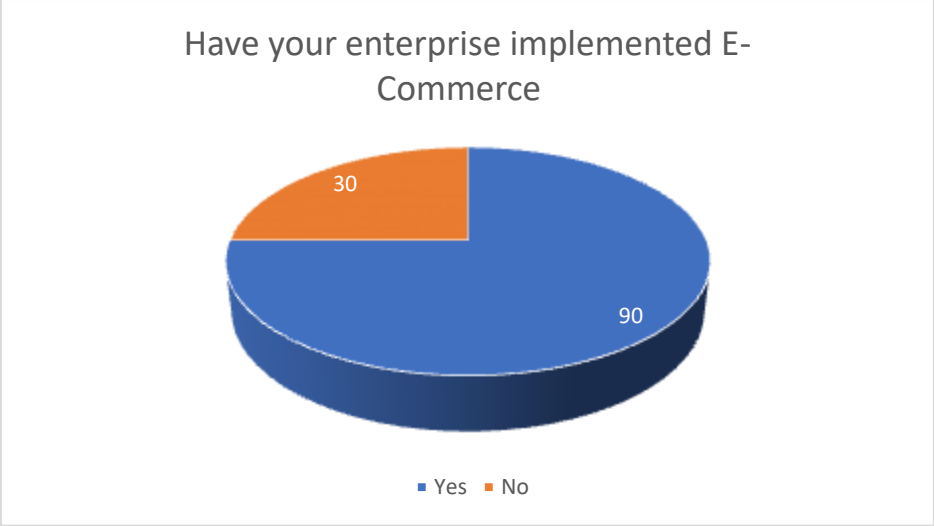
Interpretation:

According to the survey, the most common business categories are Logistics Solution (26.7%), Cloth Store (25.0%), Retail Store (20.8%), and Fast Food (19.2%). It appears that more represented areas include Travel and Tour (7.5%), while the least represented area is Agriculture (0.8%). It follows that most businesses are in retail, logistics, or food services, most of which do not relate to agriculture.

4. Have Your Business Implemeted E- Commerce?

E-Commerce Implementation	Frequency	Percent (%)	Valid Percent (%)	Cumulative Percent (%)
Yes	90	75.0%	75.0%	75.0%
No	30	25.0%	25.0%	100.0%
Total	**120**	**100%**	**100%**	



Interpretation:

The e-commerce adoption survey data showed that out of a total of 120 respondents, 90 (75%) had adopted e-commerce into their practice and 30 (25%) had not. This indicates that e-commerce approaches have become increasingly ubiquitous in the modern-day business landscape, wherein a majority of the businesses surveyed took into account the need to utilize e-commerce in their business decision-making process. Also, the valid percent and cumulative percent show that three-quarters of the businesses have adopted e-commerce, and a quarter of businesses have not. The cumulative percent above 100% reflects the variance in the response, with a percentage of e-commerce preference confirmed by the searching companies. Most opted for e-commerce as a useful asset for operations, and there is an upward trend, with some outliers.

5. What are the biggest challenges your firm faces in managing its supply chain for e-commerce?

Supply Chain Challenges	Frequency	Percent (%)	Valid Percent (%)	Cumulative Percent (%)
High shipping costs	45	37.5%	37.5%	37.5%
Long delivery times	32	26.7%	26.7%	64.2%
Inventory management	30	25.0%	25.0%	89.2%
Returns management	13	10.8%	10.8%	100.0%
Total	**120**	**100%**	**100%**	

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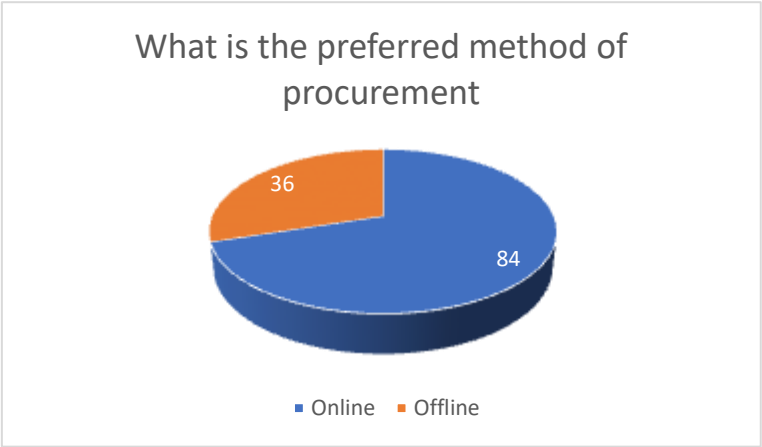
Interpretation:

The top supply chain pain point cited by businesses running e-commerce supply chains is high shipping costs (37.5% of responses), followed by long shipping times (26.7%) and inventory management (25.0%). This can be seen clearly in the next report, where managing returns is the least significant issue (10.8%). This suggests that cost and efficiency are of more concern to companies, whereas managing returns is generally less of a problem. After all, tackling these pain points – most importantly, shipping costs and delivery effectiveness – will lead to enhanced supply chain outcomes.

6. What is the preferred method of procurement?

Preferred Procurement Method	Frequency	Percent (%)	Valid Percent (%)	Cumulative Percent (%)
Online	84	70.0%	70.0%	70.0%
Offline	36	30.0%	30.0%	100.0%
Total	**120**	**100%**	**100%**	



Interpretation:

A high percentage (70.0%) of all respondents prefer to shop online over the traditional shopping experience; however, 30.0% of respondents would rather shop in person. This indicates a strong inclination for online shopping, perhaps thanks to convenience, price savings, and more options. But there are quite a few companies that still prefer the old way of placing orders in person, perhaps because of trustworthiness, the nature of the business, or logistical issues.

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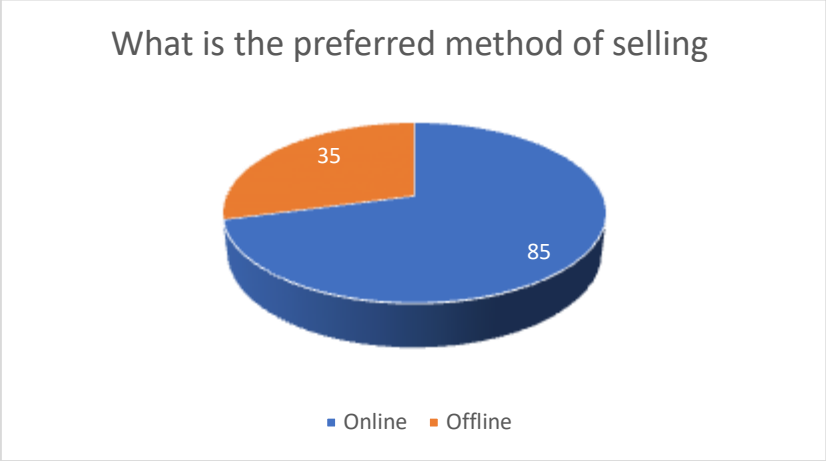
7. What is the preferred method of selling?

Preferred Selling Method	Frequency	Percent (%)	Valid Percent (%)	Cumulative Percent (%)
Online	85	70.8%	70.8%	70.8%
Offline	35	29.2%	29.2%	100.0%
Total	**120**	**100%**	**100%**	

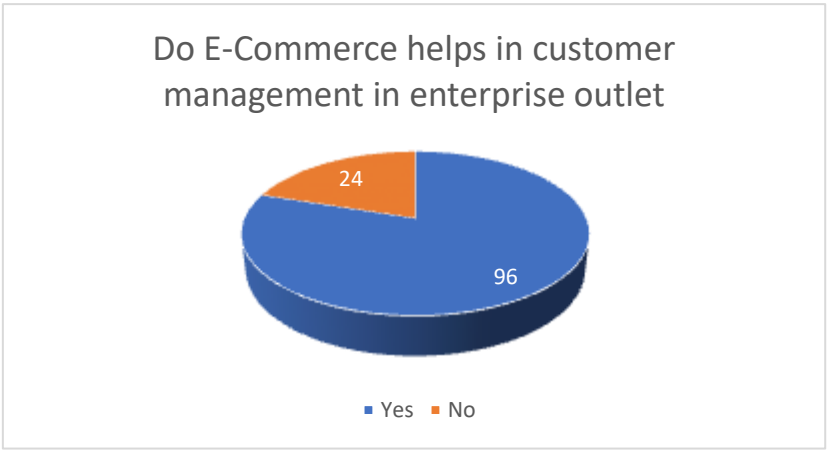


Interpretation:

Majority of Organizations (70.8%) Prefer Selling Online v/s 29.2% Prefer Selling Offline. This indicates, up to a point, that most businesses like Omnicom Merced likely prefer online sales because they attract more customers, have lower fixed expenses, and/or are simpler to sell. However, a large number of organizations are still opting for offline deals, potentially due to merchandise worries, customer preferences, the type of merchandise, online sales familiarity, or confidence in old-school selling.

8. Do E-Commerce helps in customer management in enterprise outlet?

Response	Frequency	Percent (%)	Valid Percent (%)	Cumulative Percent (%)
Yes	**96**	**80.0%**	**80.0%**	**80.0%**
No	**24**	**20.0%**	**20.0%**	**100.0%**
Total	**120**	**100%**	**100%**	



Interpretation:

According to the results, 80.0% of respondents perceive online commerce as enhancing customer management in the physical stores of businesses. This is a confirmation of the importance that e-commerce has on enhancing customer relations, enhancing dialogue, and promoting the provision of services. Still, 20.0% of the

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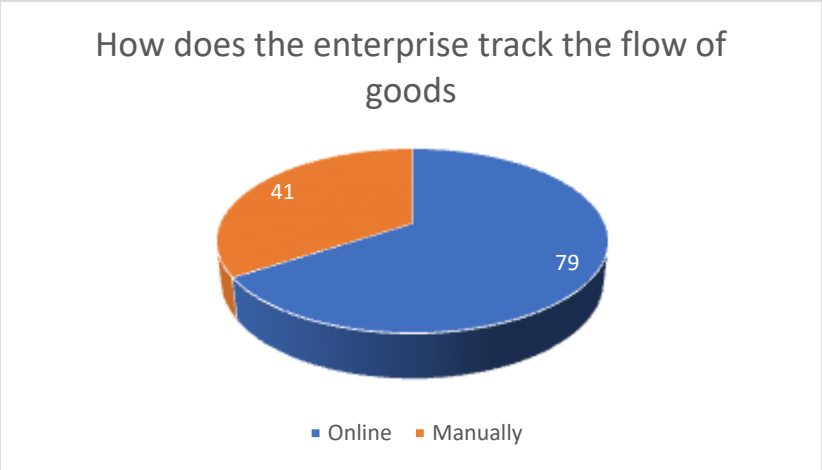
respondents highlighted the absence of value in customer management, possibly due to driving factors such as a lack of digital literacy, bad implementation, or overuse of usual practices in customer management.

9. How does the enterprise track the flow of goods?

Response	Frequency	Percent (%)	Valid Percent (%)	Cumulative Percent (%)
Online	79	65.84%	65.84%	65.84%
Manually	41	34.16%	34.16%	100.0%
Total	**120**	**100%**	**100%**	

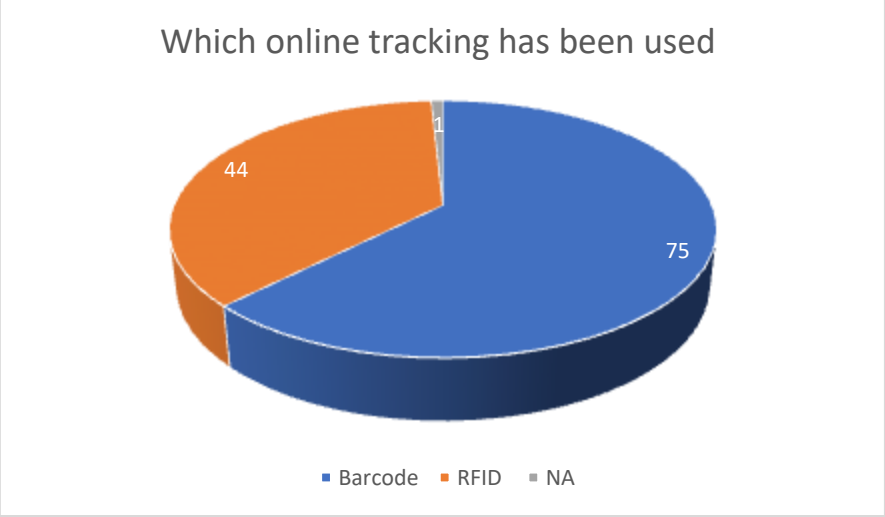


Interpretation:

Real-time tracking is done in 65.84% of companies through integrated web systems, implying a tendency towards more digitized solutions that are best for easier inventory management and time optimization processes. 34.16% of businesses use manual methods, probably because of a lack of digital tools, a choice to insist on traditional methods, or cost. This reflects further digital adoption in supply chain management.

10. Which online tracking has been used?

Response	Frequency	Percent (%)	Valid Percent (%)	Cumulative Percent (%)
Barcode	75	62.5%	62.5%	62.5%
RFID	44	36.67%	36.67%	99.17%
NA	1	0.83%	0.83%	100.0%
Total	**120**	**100%**	**100%**	



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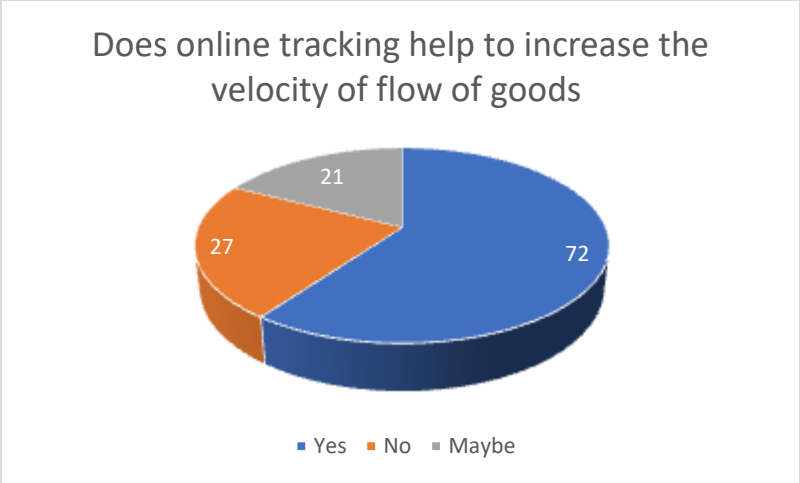
Interpretation:

According to the data, the most popular technology businesses use to track their inventory online is barcode technology, used by 62.5% of businesses. Reportedly, 36.67% of businesses use RFID (Radio Frequency Identification), and it is the most effective for tracking but also the most expensive. Only 0.83% of businesses had a "NA" category, which likely means that they do not support online tracking. Barcode technology is certainly the most widely used method of tracking inventory currently, although it can be noted that RFID is becoming increasingly popular for inventory management and tracking throughout the supply chain.

11. Does online tracking help to increase the velocity of flow of goods

Response	Frequency	Percent (%)	Valid Percent (%)	Cumulative Percent (%)
Yes	72	60.0%	60.0%	60.0%
No	27	22.5%	22.5%	82.5%
Maybe	21	17.5%	17.5%	100.0%
Total	**120**	**100%**	**100%**	



Interpretation:

60% of respondents agree that online tracking speeds up goods, meaning that the online tracking system increases the productivity of the logistics and supply chain. However, 22.5% disagree, signalling that infrastructure and operational inefficiencies can impede its effectiveness. Meanwhile, 17.5% were neutral, implying that the success of online tracking depends on various factors. In general, the findings testify to a very favourable position in relation to the impact of online tracking on supply chain velocity.

12. What technologies or strategies do you plan to invest in?

Response	Frequency	Percent (%)	Valid Percent (%)	Cumulative Percent (%)
Artificial Intelligence	**62**	**51.7%**	**51.7%**	**51.7%**
Blockchain	**32**	**26.7%**	**26.7%**	**78.4%**
Internet of Things (IoT)	**24**	**20.0%**	**20.0%**	**98.4%**
NA	**2**	**1.6%**	**1.6%**	**100.0%**
Total	**120**	**100%**	**100%**	

Interpretation:

At 51.7% of respondents plan to invest in Artificial Intelligence (AI), suggesting an emphasis on the usage of AI-based solutions for automation, predictive analytics, and improved decision-making. 26.7% of the sample selected Blockchain, with a focus on transaction security, transparency, and fraud prevention. 20% were seeking to invest in the Internet of Things (IoT) to connect and gather real-time data for operational efficiencies. Only a very small number (1.6%) was NA, meaning not considering any short-term investments in

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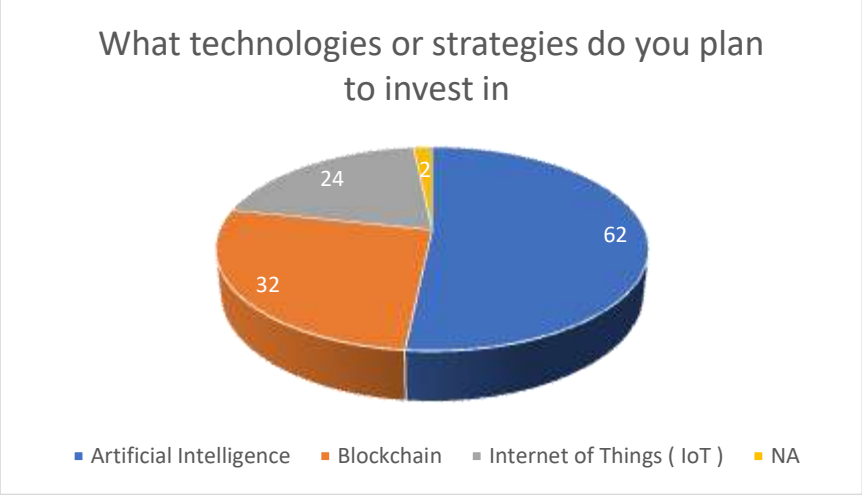
relation to any of those tech sectors. Broadly, the findings indicate an ongoing trend of AI adoption to follow, while Blockchain and IoT adoption also emerge as serious investment considerations.



VI. FINDINGS

Age Distribution: Majority of respondents (58.3%) are in the 18-24 years age range followed by 25-34 years age group (25.2%) 45 in the 35-44 years age bracket, and 10.7% above 45 years. The least of those numbers, 4.9%, is under the age of 18. This indicates that young adults are the primary survey audience, perhaps showing its relevance or accessibility to this demographic.

Gender of the Poll Respondents: Survey data shows 73.3 percent of the population are male, whilst 26.7 percent are female. This could suggest that the poll was more relevant or easier for males to use, or that males were more likely to involve, implying a gender disparity in the surveyed population.

Most Common Types of Businesses: The most common categories in the types of business include logistics (26.7%), clothing stores (25.0%), retail (20.8%), and fast food (19.2%) At 0.8% agriculture is therefore the least represented category, while travel and tourism make up 7.5%. This suggests that the sampled businesses are skewed toward retail, logistics, and food services, while agriculture is underrepresented.

Do you have e-commerce as a part of your business? 75% of you said yes, while 25% said no. With the majority of operations becoming digital, it shows that e-commerce is becoming more relevant in this business scenario and e-commerce is in fact, an operation that at least should be concerned of every business for the modern day.

Supply Chain Pain Points: The pain points in supply chain are: High shipping costs (37.5%), long shipping times (26.7%), and inventory management (25.0%). Returns management is the least cited issue (10.8%)). These results help to underscore the salience of cost and efficiency issues in the management of supply chains.

Shopping preferences: A significant 70% of respondents prefer to shop online, citing convenience, affordability, and range of choice. But 30% of them want to shop in stores, possibly for trust, business or logistics-related reasons.

Sales preferences: 70.8% of businesses prefer internet sales (the provision of sales at a distance has a wider reach and lower costs). Yet, almost a third (29.2%) of organisations still sell offline, possibly indicative of their customers, their merchandise, or just their legacy and comfort with old-fashioned selling.

E-commerce enriches customer management: 80% of respondents believe that e-commerce improves customer management in physical stores by providing benefits to interaction and service quality. 20% do not see anything more, probably based on poor implementation, lack of digital literacy, or simply being accustomed to old habits.

Real-time tracking: Between 62% to 66% of companies have some form of real-time tracking solutions either employed, such as digital methods for time, inventory tracking, etc. 34.16% still engage in manual processes, suggesting that there is potential for increased digital adoption to optimise processes.

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Invento Tech: 62.5% use bar code technology for inventory tracking and more than 36.67% use RFID, which is efficient but costly. Only a mere 0.83% are not conducive to tracking online, suggesting widespread acceptance of tracking mechanisms and tracking technologies.

Online Tracking Implication: The majority (60%) of the respondents agreed to impact of online tracking on productivity in supply chains and logistics, while 22.5% disagree on a common ground of coefficient between infrastructure. The remaining 17.5 percent were neutral, saying that effectiveness depends on implementation and other circumstances.

Investments in Future Technologies: 51.7% of the respondents want to invest in AI for predictive forecasts and automation, Blockchain (26.7%) is being pursued for transaction security, and IoT (20%) is being considered for real-time operating data. Only 1.6% are not considering such investments, showing a willingness to invest in advanced technologies.

VII. SUGGESTIONS

Future surveys should consider broadening outreach efforts to reduce gender bias. Investing in advanced logistics solutions can reduce shipping costs and lead time. Further promotion of these e-commerce platforms for all businesses, and educating those businesses that have not adopted to get involved, is necessary. Improvement in handling customers will come from the upgrade in digital literacy of businesses. The costs associated with RFID adoption are something companies may want to consider. To be effective, investments in AI, Blockchain, and IoT should be aligned with business goals.

VIII. CONCLUSION

E-commerce and its adjacent digital technologies have transformative effects on the contemporary economy, as the results indicate. With generally younger demographics and a majority of the sample favouring predominantly male, it shows that we need to look much deeper in order to form an accurate perspective. There is still a key issue to deal with: supply chain problems, but digital solutions also address some of these issues. Technology usage is probably only going to continue surging as businesses turn to innovations to stay competitive. In conclusion, according to the research, SAT leads to a powerful characteristic in leadership towards digital transformation across sectors.

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