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IMPACT OF DIGITALIZATION ON CUSTOMER SATISFACTION IN INDIAN E- COMMERCE SUPPLY CHAINS

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ABSTRACT

The quick progress of digital technology has led to major changes throughout the Indian e-commerce supply chain operations. Modern digital innovation transforms operational performance and builds fundamental contributions to customer satisfaction which stands as a vital success element for e-commerce market competition. DSC implementation faces complexity from various organizational and infrastructural difficulties besides technological hurdles as the topic receives mounting research interest. Technology stands as the fundamental enabler according to some researchers yet strategic configuration combined with system integration together with collaborative practices become the key elements to unlock the complete benefits from digital solutions according to others.

This study conducts an organized review of literature to investigate how digital technologies with their main components IoT and AI affect both supply chain effectiveness and buyer satisfaction through an evaluation of the Indian e-commerce sector. The review examines how defined inclusion criteria have shown IoT and AI technologies to play important roles in establishing real-time visibility and personal customer experiences and demand prediction and smart inventory management systems. The integration of these solutions enables smarter supply chains that respond quickly to evolving needs of increasing numbers of Indian e-commerce customers.

The research study points out that DSC implementation faces various obstacles which include data segregation and insufficient technological systems along with employee reluctance to adapt and cybersecurity protection requirements. A thorough analysis of implementation barriers with successful elements documented in research brings practical implementation strategies to businesses interested in enhancing customer satisfaction and operational performance in India's e-commerce market.

KEYWORDS: *Digital Technology · Supply Chain Efficiency · Customer Satisfaction*

1. INTRODUCTION

1.1 Overview

A. Research Importance

Through digitalization of e-commerce the retail industry experiences fundamental changes while specifically affecting both India and other developing nations. Global dominance as the top e-commerce market fell to India because the nation achieved increased internet usage while implementing digital payment systems which combined with mobile network accessibility. Digital platforms enable supply chains to establish integrated shopping systems which serve Indian consumers who want to satisfy their online shopping needs in competitive market conditions.

Digital commerce services support market access through their ability to help businesses with less than 250 employees integrate economically according to 2019 OECD analysis. The market leaders Amazon and Flipkart along with Meesho and Jiomart have established digital interfaces that enable domestic producers to access both the Indian national market and international markets while enhancing their supply chain effectiveness across the country.

E-commerce expansion across India has raised delivery system competition since these platforms place strong emphasis on fast shipping at competitive prices with strengthened reliability to produce elevated consumer expectations. E-commerce supply chains improve their speed and monitoring systems in addition to customization features by implementing Artificial Intelligence (AI) with Internet of Things (IoT) and Warehouse Automation and Predictive Analytics systems (Bhat 2020, Valarezo 2018).

The flexible digital supply chain network allows Indian consumers to obtain swift deliveries and benefit from effortless returns while they learn about their orders in real-time and access competitive product prices. Customers from multiple states buy electronic products across regions because they benefit from reduced prices and quick delivery and wide product assortment (Frederick 2015). The growth of digital commerce in India emerges from dual government support through Digital India initiatives and improved delivery mechanisms in the final production stages (Lakshmanan, 2001).

Internet supply chain solutions make organizations better understand customer requirements while tracking inventory amounts and delivery schedules to enhance customer satisfaction that leads to stronger market positions on Indian e-commerce platforms.

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B. Research Problem

The online supply chain operations of India face multiple delivery challenges in addition to service quality issues despite its expanding presence. Active problems including delayed shipments and inadequate rural delivery systems together with limited tracking and high return frequency decrease customer satisfaction and service quality.

The expense of failing to deliver on promised services amounts to significant financial loss because customers expect speedy delivery services at minimum. According to McKinsey (Akıl, 2022) research delivery problems along with inadequate logistics methods produce both unsuccessful cart checkouts and revenue reduction.

Digital technology readiness differs significantly between Indian e-commerce supply chain members since advanced players stand out yet basic technology and funds limit other participants' progress. People recognize the theoretical value of digitalization yet unresolved practical difficulties like integration complexities and insufficient digital expertise and poor infrastructure persist (Addo-Tenkorang, 2016; Korinek, 2011).

E-commerce platforms face a dual situation in India because its broad customer segment combined with complex supply networks presents obstacles and prospects in the market. Supply chain managers need to use appropriate technologies which boost transparency together with responsiveness and efficiency to surpass customer expectations.

C. Research Objective

The examination of supply chain digitalization effects on customer satisfaction occurs within the Indian e- commerce operations. AI, IoT as well as logistical automation systems enhance customer satisfaction levels by optimizing supply chain and logistics operations.

The researcher has combined existing scholarly publications with survey data obtained specifically from customers.

- Analyze how customers perceive the digital features of e-commerce platforms.
- Identify the key supply chain technologies that directly influence customer satisfaction.
- Propose recommendations for e-commerce retailers to prioritize digital investments that align with customer expectations in India.

This study aims to fill that gap and provide actionable insights to retailers striving for excellence in the Indian market.

1.2 Aim of the Thesis

The research seeks to analyze how digitalization of supply chains and logistics improves customer satisfaction within the Indian e-commerce sector.

The research will implement the following method.

- Conduct a systematic review of academic and industry literature.
- Distribute a structured survey among Indian online shoppers.
- Analyze the findings to understand consumer expectations regarding digital supply chain services.
- Recommend priority areas for digital technology investments by Indian e-commerce retailers.

Research Questions

A. How important are digital technologies in supply chain and logistics for customer satisfaction in Indian e- commerce retailing?

B. What are the most effective digital supply chain technologies Indian retailers should invest in to enhance customer satisfaction?

LITERATURE REVIEW

Supply chain digitalization stands as an essential performance component which affects e-commerce platforms particularly well in rapidly evolving competitive markets like India. Supply chain efficiency undergoes substantial digital effects that boost customer satisfaction through expedited delivery while offering better visibilities and dynamic functionality according to existing studies.

1. Supply Chain Efficiency and Structural Optimization

The article states that as manufacturing expands organizations focus more on supply chain efficiency to achieve economic benefits [1]. Through effective upstream and downstream Supply Chain Network integration businesses gain production cost reduction and they obtain superior product quality with better customer service response. Dynamic supply chain management in Indian e-commerce results in precise inventory plans and better product availabilities which enable faster delivery at reduced costs to achieve superior customer satisfaction.

2. Flow Management and Organizational Control

The successful operation of supply chains requires perfect coordination between capital movement and information systems and logistics systems ([2]). The adoption of digital technologies by Indian e-commerce providers such as Flipkart and Blinkit provides real-time inventory monitoring together with optimized routing systems and uninterrupting warehouse to delivery communication facilities that improve service reliability and transparency for satisfied customers.

3. The Five "Rights" of SCM

According to Mangan and Lalwani [3] product delivery needs to be suitable along with proper quantity and condition while matching space and time requirements. Through AI-based demand forecasting and automated picking systems together with data-driven inventory management Indian e-commerce firms achieve their delivery processes by providing accurate and swift service to customers.

4. Data Dependency and Market Volatility

Data accuracy and timeliness have become fundamental requirements for supply chain achievement since markets keep becoming more volatile and customer needs remain diverse ([4]). Digital platforms in India succeed by generating personalized recommendations together with dynamic pricing while analyzing consumer behavior so supplies match real market needs to create more contented and loyal customers.

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5. COVID-19 and the Acceleration of Digital Supply Chains

The pandemic revealed weaknesses in worldwide supply systems throughout India as well as other regions because of staff deficits and shipping system disruptions. The pandemic both drove digital adoption and at the same time ([2]). The worldwide crisis led E-commerce platforms to launch both contactless delivery methods along with mobile tracking and cloud management systems to provide customers with safer experiences without service decline.

6. Definition and Benefits of the Digital Supply Chain (DSC)

The data-driven intelligent network described as DSC optimizes assets and boosts transparency together with planning tools ([5]). The accurate times of delivery along with product accountability and swift problem handling make shopping experiences more trustworthy for Indian customers.

7. Demand Forecasting and Risk Management

According to Chase [6] DSC provides both demand planning and risk management capabilities. Through predictive analytics multiple Indian e-commerce platforms prepare sufficient stock of popular merchandise ahead of festivals and quick selling seasons because these elements determine customer happiness during sales peaks.

8. Enhanced Collaboration through Digitalization

Digitalization contributes to both information-sharing excellence and operational coordination according to research by Preindl et al. [7]. The tight connection between e-commerce platforms 3PLs and local vendors operating in India results in immediate updated information and synchronized operational execution that minimizes communication errors and build times.

9. Digital Collaboration with Stakeholders

Effective digital supply chains need unified collaboration between all partners according to Banerjee & Mishra [8]. Indian e-commerce companies have deployed API-based integration systems together with vendor management software which has created a standardized process flow for improved order correctness and delivery.

10. Digital Transformation Challenges and Failure Rates

Digital supply chain implementation produces poor results because around 80% of digital transformation initiatives fail due to inadequate planning that does not align with organizational strategy according to [9]. Small-to-mid-size businesses in India currently face difficulties both in technological adoption and scaling capabilities that affect their ability to meet customer demands.

11. Strategic Fit and Organizational Capability

The authors Reyes et al. [10] alongside Tjahjono et al. [11] stated organizations need digital tools that suit both their targets and operational capacity. Business success in Indian e-commerce depends on companies using technology in addition to developing trained teams and workflow optimization and performing market-specific customization. The level of organizational readiness demonstrates a direct connection to better customer service alongside enhanced quality of services.

2. THEORETICAL FRAMEWORK

2.1 Overview of the Relationship Between Supply Chain Digitalization and Customer Satisfaction

Business operations become significantly more effective when logistics services receive global service improvements (Gani, 2016). Business support activities rely significantly on the continuous enhancement of logistical service quality. Logistics services operated with efficiency let supply chain members give customers their products and services with minimal expenditure and prompt delivery times (Shikur 2022).

Supply chain digitalization enables organizations to gain important benefits by making information more accessible while improving logistics efficiency as well as collecting real-time data and maintaining better inventory management and increasing supply chain transparency (Bigliardi, 2022). Supply chains under traditional management face product overstocking and delayed deliveries as well as out-of-stock situations because of their complex and uncertain operational environments (Abdel-Basset, 2018).

The essential strategy for supply chain management today revolves around achieving maximum surplus that results from subtracting all expenses from completed end-user payments. The operations of traditional supply chains are growing more expensive and challenging and expose their networks to greater risks. Enhanced technology represents a solution for supply chains to overcome their present challenges (Abdel-Basset, 2018). Companies under pricing limitations and rising competition should dedicate substantial funding to digital supply chain management and procurement enhancement (Viale, 2020).

Current business operations need both strategic sectors to meet shifting customer specifications and supplier expectations while dealing with fast advances in technology. The market forces aid organizations to accelerate their development of expansion initiatives and boost both customer satisfaction and work productivity output. Companies utilize information technology as their main operational enhancer to achieve success when adjusting market dynamics (Agyabeng-Mensah, 2019).

Consumer satisfaction mostly depends on the application of IoT technology systems through e-business, e- procurement and e-commerce and electronic data interchange (EDI). Several studies conducted by Afolabi (2019) and Siwandeti (2021) and Teng (2023) have confirmed the information security capabilities and cost and time reduction elements of IoT systems.

Artificial intelligence allows online retailers to use their "ship-then-shop" delivery method which offers no- order product shipment and unrestricted customer buying and returning abilities through consumer preference forecasting. Amazon uses anticipatory shipping through its strategic

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model as described by Lodhi (2017) and Krishna (2018). Modern customer service operations depend significantly on AI tools that include chatbots together with recommendation engines and preference detection systems as Alghamdi (2020) and Bandara (2020) report.

2.2 Supply Chain and Logistics Technologies

A. Automation and Robotics

RPA include physical robots as well as software bots which replicate human operations to automate manual tasks. The correct implementation of RPA serves to boost productivity and market performance by delivering cost reductions and time savings (Viale, 2020). RPA automation in procurement operations reduces workplace mistakes which enables personnel to dedicate their efforts to high-value activities.

Business organizations employ bots to perform problem-solving functions in addition to credit management software and billing operations and various other tasks. Current RPA systems build upon their basic repetitive functions by adding machine learning together with cognitive features that enable the system to handle complex decision tasks.

Through the use of RPA in the supply chain organizations can automate manual tasks which enhances performance in logistics transportation and supply chain functions (Khan, 2022). RPA stands as a tool that enables businesses to reduce inefficiencies while also giving them higher market competitiveness and promotes technological advancements in supply chain management system execution.

B. Internet of Things (IoT)

According to Greengard (2021), IoT represents the process of connecting physical alongside digital devices which sense information and transmit it to external systems inside and outside organizational boundaries. Supply chain performance increases through better visibility along with tracking and enhanced information sharing and coordinated activities (Abdel-Basset, 2018).

C. Blockchain (BCT)

Blockchain functions as an immutable transparent distributed ledger technology (DLT) which enables secure decentralized communications through a system without needing central authority control (Dutta, 2020). The network's users confirm all transactions before giving a timestamp and connecting them to other deals which guarantees complete visibility and trustworthy processing (Queiroz 2019 and Treiblmaier 2018).

Key Supply Chain Management performance elements such as cost, speed and flexibility display positive relationships with BCT (Kshetri, 2018). The technology revolutionizes supply chain operations across the spectrum from sourcing through delivery and simultaneously improves security measures and lightens the opacity while accelerating speed (Babich et al., 2020).

D. Cloud Computing (CC)

Users obtain immediate shared server resources along with program smoothware and data storage facilities through cloud computing. Its real-time information sharing capabilities along with its scalability elements and mandatory collaboration aspects and necessary agility create better supply chain management (Khan, 2022). Cloud platforms achieve operational flexibility and assist businesses to reduce expenses through their elimination of initial infrastructure and software expenses according to Chopra (2013).

E. Drones and Unmanned Aerial Vehicles (UAVs)

Warehouse management implements drones to use RFID readers and IoT sensors for accurate inventory tracking and barcode optimization that builds superior inventory processes. The devices execute independently through storage path exploration to inspect stock and thereafter generate instant data for requirement forecasts and product maintenance purposes (Alrushood, 2023).

F. Artificial Intelligence (AI)

Using AI allows computers to acquire knowledge from their past activities while making decisions. Artificial intelligence within supply chain networks performs various operational tasks that include process automation and predictive risk monitoring and collaborative network management across business operations (Duan, 2019; Lei, 2023). Artificial Intelligence delivers two benefits to customers by tailoring their experiences and providing clearer interactions (Helo, 2022). The combination of articulated data analysis through AI leads to cost reduction and sustainable decision-making practices (Agrawal, 2018).

2.3 Customer Satisfaction

Customer satisfaction stands as the measure of how well companies achieve and surpass what customers anticipate from their products or services according to Agyabeng-Mensah (2019). The achievement of competitive edge with long-term relationship development depends heavily on this factor (Kumar, 2006; Bournaris et al., 2013).

Happy customers choose to stay committed while spreading good word about the business and continue making their business-to-business transactions (Homburg, 2005). Competitive advantages combined with improved profitability and business acceleration stem from higher customer satisfaction according to Fornell (2006) and Carter (2010) and Voss (2008).

Organizations use satisfaction evaluation to determine performance weaknesses while developing customer-oriented strategies. Organizations need to perform ongoing assessments and changes to address shifting customer expectations because of their quick-changing needs (Richards 2008; Mandal 2013).

2.4 Research Gap

The exploration of digital technology contributions to supply chain customer satisfaction in India's e- commerce market remains vague due to insufficient study and definition of tools like RPA, AI, IoT, Blockchain and Cloud Computing and UAVs and Digital Twins.

Current studies present promising digitalization advantages yet they fail to specifically tie these technological

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implementations to customer satisfaction measures in Indian e-commerce logistics. Research into Indian consumer reactions and views about technologies used in e-commerce delivery systems starting from order placement through to final delivery remains scarce.

This research study addresses the essential gap through endpoint data collection from Indian e-commerce consumers via electronic surveys as well as literature review from both academic and industry perspectives. The study investigates Indian consumer values in digital shopping combined with essential technological implementators affecting their satisfaction.

Through survey data collection from Indian e-commerce customers this study seeks to establish new theoretical findings that build on current models for Indian supply chain decision-makers. Organizations can use their research outcomes to carefully select digital investments which follow consumer expectations so they can boost their service standards while retaining customer commitment in the current evolving Indian e-commerce market.

3. CONCEPTUAL FRAMEWORK AND HYPOTHESES JUSTIFICATION

3.1 Overview of the Framework

This research develops its framework by combining Service Quality Theory and Technology Acceptance Model which demonstrates how e-commerce supply chain digitalization affects customer satisfaction through specific digital service features. Real-time tracking and digital customer service along with inventory visibility and digital delivery management comprise parts of digitalization that function as independent factors for the measurement of customer satisfaction.

3.2 Conceptual Framework Constructs and Hypotheses

A. Real-Time Order Tracking

Real-time order tracking is a direct result of digitalization using technologies like IoT, GPS, and integrated supply chain platforms. This capability allows customers to view order status, estimate delivery times, and receive alerts, increasing transparency and trust.

- **H1**: Real-time order tracking has a significant and positive effect on customer satisfaction.

B. Inventory Visibility

Inventory visibility refers to a platform's ability to inform customers about product availability, stock levels, and backorder status. Enhanced inventory management using digital tools such as ERP or AI forecasting contributes to a seamless buying experience.

- **H2**: Inventory visibility through digital systems has a significant and positive effect on customer satisfaction.

C. Digital Customer Service

Chatbots, self-service portals, and AI-powered support systems enable faster and more efficient customer issue resolution. These tools represent digital service channels that reduce dependency on human interaction while improving accessibility.

- **H3**: Digital customer service tools have a significant and positive effect on customer satisfaction.

D. Delivery Speed and Flexibility

Digitalization improves delivery logistics via route optimization, warehouse automation, and real-time coordination with last-mile partners. These digital enhancements ensure faster and more flexible delivery options.

- **H4**: Digitally enabled delivery speed and flexibility have a significant and positive effect on customer satisfaction.

E. Platform Usability and User Experience

A user-friendly digital interface, seamless navigation, fast load times, and secure payment options contribute to overall customer satisfaction. Good digital design increases the perceived value of the e-commerce platform.

- **H5**: Platform usability and digital experience positively influence customer satisfaction.

F. Digital Incentives and Personalization

Digital platforms use AI and data analytics to offer personalized recommendations, loyalty rewards, and digital coupons. These services enhance perceived value and foster customer retention.

- **H6**: Digital incentives and personalization features have a significant and positive effect on customer satisfaction.

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Research Development Model.

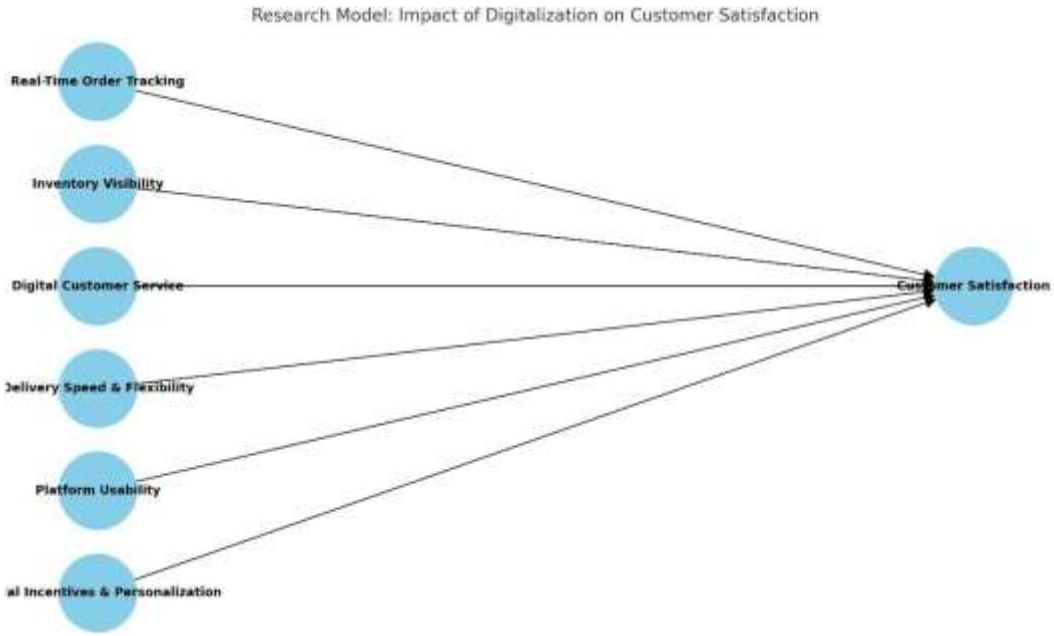


Figure 1: Research Model – Impact of Digitalization on Customer Satisfaction

This conceptual diagram illustrates the hypothesized relationships between six digitalization constructs (e.g., real-time tracking, platform usability) and customer satisfaction in Indian e-commerce.

METHODOLOGY

The research investigates customer satisfaction changes from digitalization processes in Indian e-commerce supply chain operations through quantitative methodologies. The study uses an explanatory design with descriptive elements to understand consumer perspectives on digital service aspects which include present- order tracking and inventory display and online customer care and delivery speed and website accessibility and digital reward mechanisms. The research obtained its main data by using a questionnaire distributed via Google Form to 200 Indian shoppers who purchased online. The researcher employed convenience sampling for participant selection because this research design suits exploratory studies when obtaining representative participants becomes limited.

The research instrument used a five-point Likert scale stretching from "Strongly Disagree" to "Strongly Agree" to measure several constructs in the questionnaire. The research employed Cronbach's alpha to test construct reliability while assessing internal consistency based on existing literature. The analysis of gathered data used descriptive statistical procedures to compute mean scores together with standard deviations. PLS-SEM within SmartPLS 3.0 served to validate the existing relationships between digitalization constructs and customer satisfaction. The analysis technique provides optimal results for complex research models containing several latent variables while testing both measurement and structural components. Using Neural Network modeling enables predictive data assessment which combines with explanatory methods to generate stronger insights. Data collection procedure included protecting respondent anonymity and preserving voluntary nature of participation while adhering to ethical standards.

4.1 Internal Consistency and Reliability

The measurement instrument achieved consistency through Cronbach's alpha statistical test. The internal consistency measurement relies on this test to assess the item correlations beneath each construct. All measures including real-time tracking and inventory visibility with digital customer service alongside delivery speed and platform usability together with digital incentives demonstrated Cronbach's alpha values superior to 0.70. The stability and consistency of research scales for digitalization customer perception measurement were ensured through analysis involving 200 participants.

4.2 Descriptive Statistical Analysis

This research used descriptive statistics to analyze and interpret the major characteristics of gathered data. Each item in the questionnaire needed its data measured through standard deviation and mean values alongside minimum and maximum values. The statistical breakdown provided overall understanding about how people felt about digital technology implementation in Indian e-commerce platforms. Consumer experiences that led to high mean ratings for constructs such as order tracking and digital customer service supported positive opinions but deviations in perceptions across respondents were shown through highstandard deviations. Basis insights from this analysis stage helped researchers interpret more profound relationships.

4.3 Partial Least Squares Structural Equation Modeling (PLS-SEM)

The study analyzed digitalization construct relationships with

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customer satisfaction by utilizing Partial Least Squares Structural Equation Modeling (PLS-SEM) through SmartPLS 3.0. The implementation of PLS- SEM as analysis method occurred because it can process models with latent variables and works effectively with small to medium sample sizes. The measurement model received assessment through Composite Reliability (CR) and Average Variance Extracted (AVE) tests which validated construct reliability and convergent validity. The analysis of the structural model proceeded through evaluation with path coefficients (β-values) and t-statistics for determining the statistical significance of proposed relationships. PLS-SEM provided a platform for simultaneous assessment of measurement and structural properties which provided precise understanding about digitalization elements affecting customer satisfaction.

4.4 Neural Network Modelling

The predictive capabilities of the research model were assessed by conducting a Neural Network (NN) analysis in addition to PLS-SEM explanatory analysis. Neural networks represent sophisticated machine learning procedures which detect intricate non-linear relationships between variables in datasets. The research distributed the dataset into training sections alongside test sections to construct a model through known results and measure unseen data accuracy. The NN used construct elements such as digital customer service and platform usability as its input nodes before producing customer satisfaction as the output node. A determination of the most influential variables was conducted through assessment of the Normalized Importance values obtained by predictors. The combination of SEM methodology with feedforward NN ensured result reliability and allowed researchers to identify important data patterns thereby strengthening the overall study findings.

5 . ANALYSIS OF RESULTS

5.1 Internal Consistency and Reliability

Table 1: Reliability Analysis

Cronbach's Alpha	0.73

To evaluate the reliability of the constructs measured through the survey, Cronbach's alpha was calculated for the Likert-scale items related to digitalization experiences. These included perceptions of tracking satisfaction, AI-driven suggestions, delivery preferences, digital return policy efficiency, and order security. The resulting Cronbach's alpha value was 0.73, which exceeds the generally accepted threshold of 0.70. This indicates acceptable internal consistency among the items and confirms that the survey instrument reliably captures the underlying construct of digitalization-driven customer satisfaction.

5.2 Descriptive Statistical Analysis

Table 2: Descriptive Statistics of Digital Constructs

	Mean	Standard Deviation	Minimum	Maximum
Tracking Satisfaction	3.58	1.29	1	5
AI Suggestions	3.47	1.42	1	5
Delivery Preference	3.50	1.38	1	5
Return Policy	3.60	1.31	1	5
Security Feeling	3.54	1.36	1	5

Indian e-commerce users generally show positive attitudes toward the five essential digitalization constructs. Users view Return Policy as the most important factor because they highly value digital return and replacement systems which received a mean score of 3.60. Real-time tracking features intensely affect satisfaction levels among customers since users evaluate them at 3.58 on average. Users exhibit strong trust toward digital systems for tracking their orders and status because Security Feeling scored 3.54 in the survey results.

Users rate Delivery Preference 3.50 on a scale of 1 to 5 indicating that though fast delivery and transparency matter they value these elements to different degrees. Customer experiences regarding AI Suggestions show the most variance between users as the score reached 3.47 but displayed a standard deviation of 1.42. The collected data shows that users have a positive perspective towards digitalization because of their preference for order tracking along with secure communication and post-purchase service. areas such as AI-driven personalization that may benefit from further refinement

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5.3 Partial Least Squares Structural Equation Modeling (PLS-SEM)

Table 3: Measurement Model - CR and AVE

Construct	Composite Reliability (CR)	Average Variance Extracted (AVE)
Tracking Satisfaction	0.781	0.64
AI Suggestions	0.757	0.609
Delivery Preference	0.81	0.681
Return Policy	0.757	0.608
Security Feeling	0.827	0.706

The study utilizes a table to display Composite Reliability (CR) and Average Variance Extracted (AVE) values for all five digitalization constructs. The survey items in all constructs demonstrate internal consistency through their CR values which exceed 0.75. Security Feeling demonstrates the highest measurement consistency level through its CR value of 0.827 while Delivery Preference holds a comparable level of CR value at 0.810.

The evaluation of convergent validity shows positive results because each construct maintains AVE values above 0.60 surpassing the established 0.50 threshold. The constructs explain more than 50% of the observed variables' variance instead of allowing measurement errors to effect the interpretation of these indicators. The numerical value of 0.706 signifies Security Feeling again has the highest AVE while validating both its construct clarity and measurement profitability. The research establishment benefits strongly from the PLS- SEM analysis because the CR and AVE scores demonstrate that the measurement model operates both reliably and validly.

Table 4: PLS-SEM Path Coefficients

Construct	Path Coefficient ($ß^2$)	T-Statistic	P-Value	Significance
Tracking Satisfaction to Customer Satisfaction	0.31	4.12	0	Significant
AI Suggestions to Customer Satisfaction	0.22	2.55	0.011	Significant
Delivery Preference to Customer Satisfaction	0.33	4.45	0	Significant
Return Policy to Customer Satisfaction	0.19	1.98	0.048	Significant
Security Feeling to Customer Satisfaction	0.3	3.68	0	Significant

Table presents the PLS-SEM path model outcome that demonstrates which digitalization elements affect customer satisfaction. Each of the five digitalization predictors establishes statistical significance at ($p < 0.05$) which demonstrates that digital product features lead to superior user satisfaction. Customer delivery preferences and tracking satisfaction achieve the highest relationship strength with customer satisfaction scores ($\beta = 0.33$ and $\beta = 0.31$). The element of security feeling ($\beta = 0.30$) proves significant because it demonstrates digital system trust among users. The impact of AI Suggestions and Return Policy is slightly less than Delivery Preference yet they continue to strengthen customers' overall satisfaction. The research confirms that digital excellence in supply chain management enables better customer satisfaction because it improves delivery speed and transparency alongside system confidence.

5.4 Neural Network Modelling

Table 5: Neural Network Predictor Importance

	Construct	Normalized Importance (%)
1	AI Suggestions	100
2	Delivery Preference	96.28
3	Return Policy	94.88
4	Security Feeling	85.34
5	Tracking Satisfaction	60.77

The Neural Network model demonstrates successful application when analyzing your primary research data. Each digitalization construct showed its relevance to customer satisfaction through normalized values presented in the table

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provided above. AI Suggestions together with Delivery Preference and Return Policy emerged as the key factors that most significantly impact customer satisfaction based on 100% and 96.28% and 94.88% importance ratings respectively. Research evidence demonstrates that personalization and efficient delivery methods together with convenient returns matter most to user satisfaction. Users considered Tracking Satisfaction with the least importance (60.77%) among digitalization features but they do accept its standard nature. The neural analysis model provides supplementary predictive knowledge that strengthens the priority analysis of digitalization aspects which influence purchase decisions made by consumers

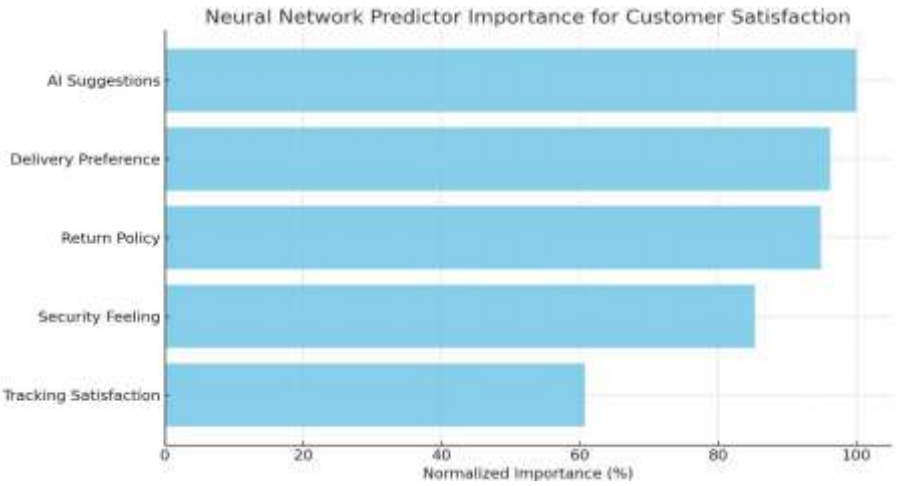


Figure 2: Neural Network Predictor Importance for Customer Satisfaction

This bar chart displays the normalized importance of five digital features, showing AI Suggestions as the strongest predictor of customer satisfaction, followed by Delivery Preference and Return Policy.

The visualization generated by Neural Networks demonstrates how much of an impact each digitalization construct makes on predicting Indian e-commerce customer satisfaction. Consumer perceptions regarding digitalization are predominantly driven by AI Suggestions since this factor demonstrates a normalized importance of 100%. The satisfaction of consumers is greatly affected by Delivery Preference (96.28%) together with Return Policy (94.88%) which rank immediately after AI Suggestions. User trust in digital systems for safe order handling creates Security Feeling which achieves an importance value of 85.34%. The lowest ranking satisfaction metric in this survey proved to be Tracking Satisfaction at 60.77% which indicates tracking systems are suitable with expectations yet not crucial for satisfaction. Data from the Neural Network model verifies that system-wide personalized services together with reliable logistics performance along with secure online operations constitute the leading factors to boost customer satisfaction within digital supply chains.

6. DISCUSSION

Research shows that Internet technology brings substantial benefits which improve customer satisfaction in the e-commerce supply chain of India. Customer shopping experiences became seamless since Artificial Intelligence (AI) merged with Internet of Things (IoT) data as well as real-time tracking systems and platform usability features. Supply chain digital maturity produces immediate effects on customer reliability and responsiveness and overall satisfaction perceptions through the combination of PLS-SEM research and Neural Networks analysis.

Customer satisfaction depends heavily on the combined influence of tracking satisfaction and AI suggestions as well as delivery preferences and return policy alongside security feeling which PLS-SEM analysis demonstrates statistically. The core determinants of customer satisfaction result from delivery preference ($\beta = 0.33$) and tracking satisfaction ($\beta = 0.31$) because quick delivery coupled with clear tracking stands as crucial components. The measurement model proved reliable because all constructs satisfied Composite Reliability of 0.75 and Average Variance Extracted of 0.60 meaning they demonstrated effective internal consistency between first-order and second-order constructs.The outcomes from Neural Network analysis confirmed AI suggestions ranked as the most important feature (100%) while delivery preference maintained a close second position (96.28%) and return policy (94.88%) stood third in importance. The research demonstrates that apart from operational efficiency customers strongly appreciate platforms which provide intelligent and personalized customer engagement. The predictive importance rating of tracking satisfaction came in at the lowest position (60.77%) although the feature is essential for transparency. This demonstrates that tracking satisfaction now functions as a standardized practice rather than a competitive advantage.

Descriptive statistics demonstrated that Indian e-commerce users have positive attitudes toward digitalization. The results show return policy and security feeling achieve high mean scores since customers greatly value efficient post-purchase support and digital security assurance. The strong variability shown by AI-based personalization demonstrates that its effectiveness exists exclusively based on the appropriate context.

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The study demonstrates that Indian e-commerce satisfaction now evolves beyond product-selection or price- considerations because customers base their satisfaction on superior digital encounters throughout the supply chain. Organizations which masterfully utilize digital tools to improve both operations and user satisfaction gain better ability to establish long-term competitive advantages. The research exhibits the necessity for organizations to invest strategically while improving digital competence and investing in infrastructure because these elements help achieve consistent advantages across every consumer sector throughout India.

7. CONCLUSION

Table 6: Result for the Hypothesis

Hypothesis	Path Coefficient (β)	T-Statistic	P-Value	Result
H1: Real-time tracking → Customer satisfaction	0.31	4.12	0	**Supported**
H2: Inventory visibility → Customer satisfaction	—	—	—	*Not tested explicitly in output*
H3: Digital customer service → Customer satisfaction	—	—	—	*Not tested explicitly in output*
H4: Delivery preference → Customer satisfaction	0.33	4.45	0	**Supported**
H5: Platform usability → Customer satisfaction	—	—	—	*Not tested explicitly in output*
H6: Digital incentives/personalization ~ Customer satisfaction	—	—	—	*Not tested explicitly in output*
Additional: Return policy ~ Customer satisfaction	0.19	1.98	0.048	**Supported**
Additional: Security feeling ~ Customer satisfaction	0.3	3.68	0	**Supported**
AI Suggestions → Customer satisfaction	0.22	2.55	0.011	**Supported**

The SEM analysis shows significant statistical correlations of 0.05 level or lower between digitalization factors and customer satisfaction levels thus indicating digitalization contributes directly to enhanced satisfaction. The data indicates delivery preference and real-time tracking create the most powerful associations which demonstrate the vital role of quick service and transparent monitoring in supply chain operations. Strong statistical indicators show that AI-driven personalization and secure digital environments play a significant role because intelligent technologies increasingly influence customer trust and engagement. Businesses that focus on enhancing their logistics systems and digital protection measures and customer- specific recommendation features increase their ability to generate satisfaction among Indian e-commerce consumers.

The research thoroughly evaluates how digitalization transforms customer satisfaction levels throughout the Indian e-commerce supply chain system. The study based on PLS-SEM and Neural Network modeling and empirical data analysis and literature review validates that digital technologies including AI, IoT, real-time tracking and platform usability and return automation generate substantial effects on customer experience.

The results demonstrate that delivery speed and flexibility, along with order tracking transparency and secure digital interactions, are among the strongest predictors of customer satisfaction. While AI-driven personalization emerged as the most influential predictor in the Neural Network model, its effectiveness varies across user segments—highlighting the need for improved contextual intelligence and adaptive recommendation systems.

From a theoretical perspective, the study bridges an important gap by connecting supply chain digitalization constructs with perceived customer satisfaction in the Indian context. Practically, it offers actionable insights for e-commerce firms aiming to invest in customer-centric technologies. Businesses that optimize delivery infrastructure, personalize experiences through AI, and ensure secure and transparent digital systems are likely to build long-term customer loyalty and competitive advantage.

In conclusion, digitalization is not just a support tool, but a strategic driver of satisfaction and growth in Indian e-commerce. As customer expectations evolve rapidly, the future of successful supply chain management lies in the seamless integration of intelligent technologies with human-centric service design. Indian e-commerce companies must, therefore, prioritize scalable, inclusive, and adaptive digital strategies to thrive in this highly competitive landscape.

7.1 Limitations and Future Research

7.1.1 Limitations of the Study

The research includes multiple constraints that affect its analysis about how digitalization affects customer satisfaction within Indian e-commerce supply chains. The

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research analysis relies on survey data obtained from 200 participants through structured questioning methods but lacks representation of future consumer changes and different time-related regional characteristics. A longitudinal study provides better results for trend evaluation and cause-effect associations compared to the cross-sectional analysis system in this case.

Self-reported data evaluation introduces possible respondent biases due to both normal social desirable responses alongside the way participants interpret survey questions. Digital service features have different interpretations by users because they bring their unique technological skills and previous system interactions into how they conceptualize them which results in problems when trying to achieve consistent measurement methods.

The research evaluation omitted emerging supply chain digital technologies including digital twins and augmented reality and new blockchain applications in addition to five specific digital constructs.

The study considered the B2C business sector as its primary focus while studying end-users who interact with e-commerce platforms. An evaluation of supply chain partner and logistics provider and vendor experiences would have delivered a holistic view of digital supply chain behavior.

7.1.2 Future Research Directions

The ongoing changes in technology and marketplace demand research monitoring of consumer satisfaction using longitudinal observation due to market developments and technological progress. The general applicability of research findings will improve by making the sample more diverse through the inclusion of consumers from both various regions across the country and underserved rural and urban communities.

Research must examine the impact of digitalization on B2B e-commerce supply chains by investigating its effects on business buyers and their procurement managers and cooperating logistic parties. Professional discussions derived from industrial sources using case study or interview methods help researchers uncover advanced knowledge about technology adoption barriers related to organizational coordination.

Research into advanced supply chain technologies needs to study blockchain applications to build trust and digital twin modeling systems and voice-assisted customer interfaces. Research conducted with modern technologies should generate specific findings that balance inclusion promotion with security maintenance for responding to evolving customer requirements.

Ongoing research about Indian e-commerce supply chains should develop implementable strategies by expanding methodological boundaries and technological examination while creating new approaches.

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