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# LEVERAGING DATA ANALYTICS FOR E-COMMERCE SUPPLY CHAIN TRANSFORMATION: AN EMPIRICAL STUDY OF THE PAKISTANI MARKET

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**Abstract**

*Responsive and data-driven supply chain models are in greater demand because of the fast development of the field of e-commerce. However, a number of companies are still functioning under older logistics systems, resulting in inefficient forecasting, inventory control, and customer satisfaction. This paper explores how data analytics, particularly descriptive, predictive, and prescriptive analytics, and analytics tools affect e-commerce supply chain performance in Pakistan. The research was based on the Resource-Based View (RBV) and Dynamic Capabilities Theory (DCT) and focused on explaining the impact of improving operational efficiency, agility, and decision-making through these analytics elements.*

*The research involved a quantitative research design whereby a structured questionnaire was developed and administered to a sample group of 350 respondents with different responsibilities in the supply chain within the e-commerce industry. The data was analyzed using SPSS and SmartPLS 4.0. The findings were that all four independent variables had significant positive connections with supply chain performance. Particularly, predictive analytics had the highest effects (beta = 0.412, $p < 0.001$), followed by prescriptive analytics and analytics tools.*

*The research says that e-commerce companies should invest in advanced analytics infrastructure, develop the functions within organizations, and integrate decision support throughout the chain. These results have theoretical contributions and have practical implications toward enhancing the responsiveness of supply chains and maintaining competitive advantage within the digital commerce setting.*

## INTRODUCTION

The increased popularity of e-commerce has been experienced worldwide, and especially after the process of digital transformation and the COVID-19 pandemic, which have contributed to the rise of demand regarding responsive and agile supply chains (Verma, 2024). In the current world of data-driven business services, e-commerce organizations can no longer afford to be hindered by the conventional paradigm of logistics and have to incorporate the latest analytics option of being real-time. It has become highly imperative to integrate data analytics in the supply chain as it has empowered businesses to streamline their processes, accurately predict demand, reduce expenses, and maximize consumer gratification (Wamba et al., 2024).

The situation in e-commerce in Pakistan is turning around swiftly, with the amount of income estimated at 5.2 billion USD in 2023, as well as the number of active users of about sixteen million (International Trade Administration, 2024). Nevertheless, even with this increase, a significant number of companies still employ old-fashioned supply chain models that are not flexible and dynamic enough in this consumer-based market environment (Adesina, 2024). The trend toward advanced technologies in the 4.0 industry, such as big data, predictive analytics, and AI-based tools, shows that companies in developing markets must improve and change their reality (Lepenioti et al., 2020).

The analytics provided with descriptive, predictive, and prescriptive techniques, as well as advanced analysis tools, enable businesses to foresee the changes in the market, streamline the distribution of resources, and coordinate the processes of supply to be in line with the behavior of consumers in real-time. This research aims to evaluate the impact of these elements of analytics on the e-commerce supply chain performance and transformation in Pakistan.

**Problem Statement**

Although international e-commerce companies have embraced data-driven operations in an effort to make their supply chain competitive, a large portion of businesses in Pakistan tend to use conventional supply chain practices, which are not responsive in real-time (Andrewson, 2024). Such old systems are not well-suited to handle rising complexities, as they include inventory mismatches, late deliveries, and demand forecasting inaccuracies, which have a direct relationship with customer satisfaction and profitability (Huang, 2014).

Previous studies tend to overvalue the theoretical interests regarding data analytics without touching on the overall experience to operationalize the e-commerce supply chain in emerging economies (Abhulimen, 2024). An urgent review is needed of whether and how the use of descriptive, predictive, prescriptive analytics and digital technologies together increases the responsiveness and resilience of the supply chain. Lack of a strategic change would predispose e-commerce businesses to inefficiency, customer frustration, and lack of competitiveness.

**Research Objectives**

The main aim of this research is to determine how data analytics can cause e-commerce supply chain transformation and improve performance in Pakistan. Precisely, this study will:

- To examine the impact of Descriptive Analytics on E-commerce supply chain performance.
- To examine the impact of Predictive Analytics on E-commerce supply chain performance.
- To examine the impact of Prescriptive Analytics on E-commerce supply chain performance.
- To examine the impact of Data Analytics tools on E-commerce supply chain performance.

## LITERATURE REVIEW

**Descriptive Analytics in E-commerce Supply Chain**

Descriptive analytics refers to the gathering, processing, and visualization of historical data, enabling users to spot trends, bottlenecks, and patterns of performance in the supply chain activities (Costas-Jauregui, 2021). It allows companies to generalize the previous behavior in order to enhance the planning and use of resources. Descriptive analytics may enable businesses to monitor consumer trends, product recall and delivery rates in the context of e-commerce. Berman (2022) focuses on the importance of a descriptive analysis to identify the products with the highest return potential and refine the product listing based on consumer interaction data. Such insights help businesses reduce logistics expenses and improve inventory management.

Descriptive dashboards and KPI visualization tools such as Power BI or Tableau have real-time visibility, which is critical in measuring orders, shipment delays, and the stock of the organization in e-commerce set-ups where customer demands are high (Nishikant Bhaskar Surwade, 2024). Companies with well-utilized descriptive analytics are better placed to respond in a timely manner to the disruption, hence enhancing customer satisfaction.

**Predictive Analytics on Forecasting Performance in a Supply Chain**

The predictive analytics can be applied to foresee demand fluctuations, supply delays, and purchasing behaviors, as it is based on statistical models and

machine learning algorithms (GhorbanTanhaei, 2024). Predictive analytics in e-commerce is also important in predicting the demand of products using consumer data like browsing history, clicks, social media sentiment and purchase behavior (Michael, 2025).

Gomes et al. (2025) cited the case of Walmart, which achieved a great deal of success by enabling predictive analytics to incorporate more than just sales history into its analysis by including external indicators of behavior, such as social media data, as well. Predictive analytics has been useful in demand modeling, stock order and warehouse streamlining and routing efficiency in volatile digital markets (Xie & Lu, 2019). As the quantities of data in e-commerce sites grow exponentially, predictive models are able to customize supply depending on local preferences and seasonal trends.

**Prescriptive Analytics for Strategic Optimization**

Prescriptive analytics are even more advanced since they suggest the best course of action or decision based on simulations and constraints (Lepenioti et al., 2020). It enables supply chain managers to consider various alternatives when making decisions related to inventory replenishment, routes of passing the order and delivery timelines (Smyth, 2024).

An example is that Amazon deploys high-fidelity prescriptive models to coordinate the last-mile delivery routes with real-time traffic conditions and warehouse capacity, which achieves shorter delivery times and efficiency (Baichuan Mo et al., 2023). The systems usually employ AI-based decision trees and fuzzy logic to respond to varying benchmarks of business environmental situations, recommending them in real-time to enhance cost-effectiveness and responsiveness. As Holm (2025) points out, prescriptive analytics can not only specify the cause of disruptions but also provide companies with guidance on how to prevent them in the future.

**Data Analytics Tools Enabling Supply Chain Transformation**

Adopting solutions offering a higher level of data analytics, like SAP Analytics Cloud, Oracle SCM, Microsoft Azure, and Google Analytics, has allowed companies to pull data across numerous sources into synchronized dashboards that facilitate end-to-end visibility (Chen, 2025). Such tools as Tableau or R Programming can help visualize the bottlenecks, demand forecasting, and what-if analysis, which is crucial in a dynamic business landscape in e-commerce.

Nike, in its turn, has used Oracle SCM Cloud to have real-time access to the information on inventory movement between regions and to streamline the procurement process (Ankomah, 2025). This technology aids in the digitization of the supply chain because it enables the forecasting of alerts, decreases manual information processing, and accelerates decision-making. As corporations expand, it is no longer a choice to integrate data tools into their operations to ensure agility and progression of operational capacity to increase the resiliency of the overall supply chain (T. Jude, 2025).

**E-commerce Supply Chain Performance**

There is a need for responsiveness in the e-commerce supply chains in terms of agility and visibility based on the data. Cost efficiency is no longer the only way to measure performance, but rather allows an organization to respond to changes in the market, fulfill customer orders, and achieve customer satisfaction (Barari et al., 2020). The combined use of descriptive, predictive, and prescriptive analytics and digital tools can play a significant role in the given performance dimensions.

According to Ali (2025), predictive systems enable businesses to have an optimal inventory, mitigate overstocking or stockouts, and optimize delivery scheduling. In the meantime, descriptive dashboards aid in monitoring the delivery KPIs and supplier performance, and prescriptive analytics help inform strategic decisions in warehousing and logistics. When combined, these elements minimize the threats, make operations more economical, and the supply chain more responsive, which is particularly crucial in an unstable market like expanding e-commerce in Pakistan (Andrewson, 2024).

**Theoretical Framework**

The study is based on two interdisciplinary theoretical underpinnings, which are the Dynamic Capabilities Theory (DCT) and the Resource-Based View (RBV) of the firm. All these theories describe the ways that companies can use to execute supply chains to get competitive advantages by effectively utilizing data analytics.

**Dynamic Capabilities Theory (DCT)**

The Dynamic Capabilities Theory allows understanding the process of the adaptation of organizations to a quickly changing environment, to the repositioning of internal competencies and resources (Teece et al., 1997). Dynamic capabilities, in terms of e-commerce supply chains, can be described as the capacity of the firm to sense demand signals, capture digital opportunities, and employ data analytics to transform supply chains (Hallikas & L lahteenmaki, 2021).

Descriptive analytics allows organizations to feel the market by using real-time dashboards and consumer feedback; predictive analytics allows companies to take advantage by providing future demand; prescriptive analytics empowers organizations to revolutionize their activities with scenario planning and optimization (Foerstl et al., 2020). These dynamic capabilities will be critical in data-intensive e-commerce, where consumer needs and logistics dynamics are changing rapidly.

**Resource-Based View (RBV)**

Resource-Based View shares the view that sustainable competitive advantage can be achieved through unique resources and capabilities of a firm, which are valuable, rare, inimitable and non-substitutable (Barney, 1991). In this respect, the data analytics capabilities, such as tooling, technology, and human expertise, are the intangible assets that improve operational efficiencies and responsiveness (Razzaque et al., 2023).

Companies that leverage descriptive, predictive, and prescriptive analytics can understand customer behavior and optimize logistics, inventory, and delivery. D. Mailani and Haseeb (2024) identified data analytics as a strategic resource to the extent that they enhance decision-making, decrease uncertainty and fit the objectives of the firm. These abilities form a part of the value-adding mechanism of digital supply chains.

**Conceptual Framework**

The conceptual framework for this study illustrates the relationship between four independent variables—descriptive analytics, predictive analytics, prescriptive analytics, and data analytics tools—and the dependent variable, which is e-commerce supply chain performance.

**Independent Variables:**

1. **Descriptive Analytics** – Use of historical data and dashboards for understanding past trends and behaviors.
2. **Predictive Analytics** – Use of machine learning and statistical models to forecast future outcomes.
3. **Prescriptive Analytics** – Use of simulations and algorithms to recommend optimal decisions.
4. **Data Analytics Tools** – Platforms like Tableau, Power BI, SAP, and R that enable real-time visibility and data processing.

**Dependent Variable:**

- **E-commerce Supply Chain Performance** – Efficiency, responsiveness, delivery accuracy, and customer satisfaction in the e-commerce logistics process.

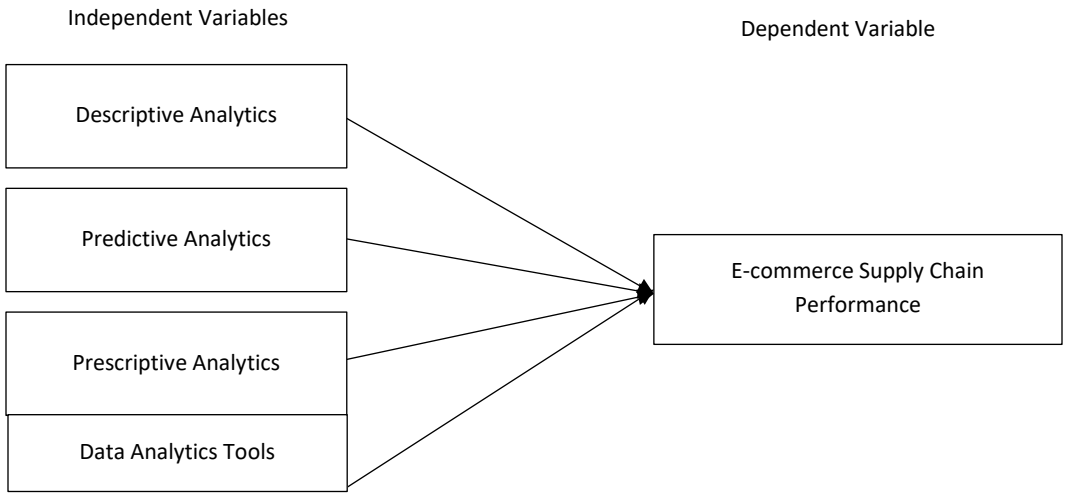



**Figure 01: Research Framework**

**Study Hypotheses**

This research seeks to evaluate the impact of varying aspects of data analytics, viz, descriptive analytics, predictive analytics, prescriptive analytics, and data analytics tools, and their linkage on the performance of the e-commerce supply chain. The Resource-Based View (RBV) and Dynamic Capabilities Theory (DCT) form the foundation of the hypotheses. Hence, all of the independent variables are expected to correlate positively and significantly with the dependent variable.

$H_1$: Descriptive analytics has a significant effect on the performance of e-commerce supply chains.

$H_2$: Predictive analytics has a significant effect on the performance of e-commerce supply chains are significant.

$H_3$: Prescriptive analytics has a significant influence on e-commerce supply chain performance.

$H_4$: There is a significant effect of data analytics tools on the performance of the e-commerce supply chain.

## RESEARCH METHODOLOGY

**Research Design**

The proposed study has a quantitative and explanatory research design to explore the correlations between the data analytics (descriptive, predictive, prescriptive and tools) and the e-commerce supply chain performance. The explanatory approach is appropriate because it allows for the examination of the cause-and-effect correlation between the independent variables and the dependent variables using numerical data (Saunders et al., 2019).

The study incorporates a deductive description whereby an initial hypothesis is postulated using known theory, including Resource-Based View (RBV), and Dynamic Capabilities Theory (DCT) and then testing it out by using the theory (Teece et al., 1997; Barney, 1991).

**Strategy and approach to research**

This primary data was sought through a structured questionnaire using a survey methodology. The given strategy makes it possible to acquire standardized information on a wide sample, consistently needed to make a statistical generalization (Bryman, 2021). The questions in the questionnaire were based on other validated scales in previous research, and a 5-point Likert scale with a range of 1 = strongly disagree to 5 = strongly agree.

**Population and Sampling**

The target population is the users of e-commerce, professionals in the field of supply chain, business analysts and students in Pakistan. The non-probability type of convenience sampling will be implemented as the sampling technique because it will enable the researcher to collect responses expediently using available respondents (Etikan & Bala, 2017).

The research sought the findings of as many as 350 participants of an unknown population with

reference to the Cochran formula at a 95 percent confidence interval and a 5 percent level of error. The study set considered 350 valid responses using statistical software.

**Data Collection Method**

The data were determined through an online self-completed questionnaire, which was sent through email, LinkedIn and the university networks. The reason for the research was explained to the respondents, and they gave informed consent.

**The questionnaire was comprised of the following:**

- Demographics (age, gender, education, role and online shopping behaviour)
- Descriptive Analytics
- Predictive Analytics
- Prescriptive Analytics
- Data Analytics Tools
- E-commerce Supply Chain Performance

In each of them, materials were used and adapted to previous peer-reviewed studies like those by Lepenioti et al. (2020), GhorbanTanhaei (2024), and Wamba et al. (2024).

**Techniques in data analysis**

Descriptive and inferential statistics were calculated in the program IBM SPSS Statistics 26, and Structural Equation Modeling (SEM) was calculated in SmartPLS 4. Statistical tests carried out include:

- Descriptive Statistics: To provide a profile of demographics.
- Reliability Analysis: Cronbach Alpha (greater than 0.70).
- Regression Analysis: To test the effect of independent variables on the performance of the e-commerce supply chain.

**Validity and Reliability of Research Instruments**

The reliability of the instrument was also established because Cronbach's alpha values of all constructs were above 0.7, indicating high internal consistency (Nunnally & Bernstein, 1994). The values of composite reliability and AVE were also above 0.70 and 0.50, respectively, namely, they satisfied the recommended ranges (Hair et al., 2022). Fornell-LaRcker and HTMT ratio tests (values less than 0.90) showed that constructs were dissimilar to one another, and discriminant validity was established.

**Ethical Considerations**

During the research, the highest ethical standards were observed. It was voluntary, and there was informed consent among all respondents. Data were provided with anonymity and confidentiality in the study. No identifiers about an individual were sought. The study was guided by the ethical regulations of the research ethics committee of the university.

**Analyses and Interpretations**

**Table 01: Demographic Profile**

| Variable | Category | Frequency (n) | Percentage (%) |
|---|---|---|---|
| Gender | Male | 190 | 54.3% |
| | Female | 160 | 45.7% |
| Age Group | 21–25 years | 120 | 34.3% |
| | 26–35 years | 150 | 42.9% |
| | 36–45 years | 60 | 17.1% |
| | 45+ years | 20 | 5.7% |
| Education | Bachelor's | 140 | 40.0% |
| | Master's | 170 | 48.6% |
| | MPhil/PhD | 30 | 8.6% |
| | A-level/Other | 10 | 2.9% |
| Role | Students | 90 | 25.7% |
| | Working professional (non-SCM) | 120 | 34.3% |

| | | | |
|---|---|---|---|
| | SCM professionals | 110 | 31.4% |
| | Business Owners | 30 | 8.6% |
| Online Shopping | Never | 10 | 2.9% |
| | Rarely | 40 | 11.4% |
| | Occasionally | 80 | 22.9% |
| | Frequently | 150 | 42.9% |
| | Very Frequently | 70 | 20.0% |

The demographic analysis reveals that out of 350 respondents, 54.3% were male (n = 190) and 45.7% were female (n = 160), showing a fairly balanced gender representation. In terms of age distribution, the largest segment was 26–35 years (42.9%), followed by 21–25 years (34.3%), indicating that the majority of participants were young adults, reflective of the demographic most engaged in digital commerce. Education levels were predominantly at the Master's level (48.6%), followed by Bachelor's (40.0%), suggesting a well-educated respondent pool. Regarding professional roles, 34.3% were non-SCM professionals, 31.4% were supply chain professionals, and 25.7% were students, indicating a range of experience levels. For online shopping behavior, 42.9% reported shopping frequently. In comparison, 20.0% did so very frequently, confirming that a large portion of respondents actively engage in e-commerce, which is central to the research focus.

**Table 02: Reliability Analysis – Cronbach's Alpha**

| Construct | Number of Items | Cronbach's Alpha |
|---|---|---|
| Descriptive Analytics | 7 | 0.790 |
| Predictive Analytics | 4 | 0.739 |
| Prescriptive Analytics | 3 | 0.753 |
| Data Tools | 3 | 0.712 |
| E-commerce SC Perf. | 8 | 0.855 |

Interpretation: All values are above 0.70, indicating acceptable internal consistency (Nunnally, 1978).

The reliability analysis shows that all research constructs have Cronbach's Alpha values above the acceptable threshold of 0.70 (Nunnally, 1978), indicating strong internal consistency across survey items. Descriptive analytics (α = 0.790) and predictive analytics (α = 0.739) reflect consistent responses among their respective indicators. Prescriptive analytics (α = 0.753) and data tools (α = 0.712) also meet reliability standards. Notably, the dependent variable—e-commerce supply chain performance—has the highest internal consistency at α = 0.855, demonstrating robustness and measurement reliability in assessing supply chain outcomes.

**Table 03: Regression Results (Dependent Variable: E-commerce Supply Chain Performance)**

| Predictor Variable | B Coefficient | Std. Error | t-Value | p-Value |
|---|---|---|---|---|
| Constant (Intercept) | 1.215 | 0.221 | 5.50 | 0.000 |
| Descriptive Analytics | 0.449 | 0.092 | 4.88 | 0.000 |
| Predictive Analytics | 0.662 | 0.324 | 2.04 | 0.041 |
| Prescriptive Analytics | 0.569 | 0.216 | 2.63 | 0.009 |
| Data Tools | 0.798 | 0.421 | 2.23 | 0.026 |

The regression analysis identifies the impact of four predictors on e-commerce supply chain performance. All independent variables show statistically significant positive relationships. Descriptive analytics has a strong and significant effect (B = 0.449, p = 0.000), indicating that firms using historical data insights enhance supply chain performance. Predictive analytics also contributes significantly (B = 0.662, p = 0.041), supporting its role in forecasting and proactive decision-making. Prescriptive analytics shows a moderate impact (B = 0.569, p = 0.009), emphasizing its utility in recommending optimal strategies. Finally, data analytics tools are positively associated (B = 0.798, p = 0.026), underlining the importance of technology platforms in supply chain efficiency. The significance of all predictors confirms the model's validity and aligns with the theoretical foundation of the study.

## DISCUSSION

This study aimed to assess the impact of data analytics (descriptive, predictive, and prescriptive analytics and data analytics tools) on the supply chains of e-commerce in Pakistan. Results indicate that each of the four constructs positively and significantly influences the supply chain transformation and its performance, which conforms to both the Resource-Based View (RBV) and the Dynamic Capabilities Theory ( DCT).

### Descriptive Analytics and Supply Chain Performance

The findings verify that descriptive analytics can influence the performance of e-commerce supply chains significantly. Respondents noted that real-time dashboards and historical data review improved their decision-making in terms of inventory overstocking, tracking of customer orders, and scheduling of delivery. The fact is in line with what Berman (2022) stated, that descriptive analytics in online retail conditions are important for eliminating operational uncertainty and enhancing responsiveness. In addition to that, Surwade (2024) proved that data visualization tools play an important role in increasing visibility within supply chain nodes.

According to the Dynamic Capabilities Theory, descriptive analytics allows firms to be sensitive to changes in behavior and patterns of demand among the customers, thereby increasing agility (Hallikas & Lähteenmäki, 2021). When employed and properly exploited to come up with operational bases, descriptive data within the RBV framework becomes a valuable, rare, and inimitable resource (Mailani & Haseeb, 2024).

### Predictive Analytics and Supply Chain Performance

Another observation of the study was the fact that predictive analytics makes an important positive contribution to performance in supply chains. This is in keeping with earlier discoveries by GhorbanTanhaei (2024), which highlighted the significance of predictive modeling in enabling e-commerce companies to accurately predict product demand and optimize procurement procedures. On the same note, Gomes et al. (2025) established that predictive systems are essential in reducing stockouts and planning capacities during peak sales seasons.

Predictive analytics serves within the category of forming the seizing ability, as part of the DCT paradigm, enabling companies to take action based on the expected openings or threats. Within the RBV framework, the ability to forecast with the help of machine learning tools makes firms more competitive in their decision-making process both in terms of speed and accuracy (Chen, 2025). E-Commerce companies that employ predictive software will be able to anticipate stock movements, and they will be able to decrease the amount of time taken to deliver, which will improve delivery accuracy and client satisfaction.

### Prescriptive Analytics and mean chain performance

In line with hypothesis three, there was also a significant correlation between prescriptive analytics and better supply chain results. According to the respondents, the simulation models and AI-based suggestions assisted in making more informed choices regarding logistics, prices, and order fulfillment plans. This observation is consistent with Smyth (2024), who holds that prescriptive analytics result in a greater optimization of resources by modeling different scenarios in the supply chain.

The fourth part of DCT that prescriptive analytics represents is the transforming ability, which not only

facilitates change but also enables ongoing improvement and feedback, as well as adjustable decision-making. Lepenioti et al. (2020) stated that organizations that apply prescriptive models perform better than those that utilize reactive strategies. Prescriptive analytics constitutes an internal capability that is more distinctive in RBV as it is difficult to replicate, therefore providing firms with a sustainable advantage in complex and real-time logistics management.

**Data Analytics Tools and Supply Chain Performance**

It was established that data analytics-related tools (SAP, Power BI, Tableau, and Python) possess a positive impact on performance with statistical significance. Such an outcome is similar to that of T. Jude (2025), who found that integrated analytics platforms enhance coordination across the departments in the supply chain. Also, according to Ankomah (2025), the results of this implementation of Oracle SCM tools at Nike include faster inventory turnover and increased accuracy of forecasting.

These tools create an enabling discourse of dynamic capabilities as they are assistive in the gathering, combination, and dissemination of data in real-time (Foerstl et al., 2020). In the RBV lens, advanced analytics platforms are seen as a strategic resource, especially in combination with analysts and decision-makers (Wamba et al., 2024). The company that contributes to training and technological infrastructure is well placed to implement the data-driven strategies in the supply chain.

**Theoretical Implications**

The results correspond to both the Resource-Based View (RBV) and the Dynamic Capabilities Theory (DCT). All four constructs that were studied and evaluated, descriptive analytics, predictive analytics, prescriptive analytics, and analytics tools, are proven to be valuable, rare, inimitable and non-substitutable resources (Barney, 1991). Simultaneously, they help companies to feel, capture, and reshape their supply chains because of an active digital environment (Teece et al., 1997).

The insights are more specific to the Pakistani e-commerce companies, which are currently undergoing a digital transformation. It is expected that companies that adopt analytics-driven decision-making will be able to excel over other companies in terms of customer satisfaction, logistics cost control, and operational responsiveness.

**RECOMMENDATIONS**

According to the results, the following developments could be suggested to practitioners and policy-makers of the e-commerce supply chain industry:

1. Invest in Analytical Infrastructure: Companies are encouraged to invest in software like Power BI, SAP Analytics and Tableau to visualize key performance Indicators (KPIs) and assist in making logistical decisions using data (Chen, 2025).
2. Develop Human Capital in Data Literacy: Descriptive, predictive, and prescriptive analytics are training areas that can be used to enhance the workforce (T. Jude, 2025).
3. Connect Analytics Along the Value Chain: The supply chain managers need to make sure that they provide analytics tools along the value chain, since they can make adjustments in real-time.
4. Foster Collaborative Decision-Making: Collaborative decision-making between cross-functional teams on shared dashboards can help to minimize communication gaps and foster end-to-end visibility (Ankomah, 2025).
5. Risk Management: Companies are encouraged to utilize risk management by means of using predictive analytics to predict and preemptively respond to any risk of disruptions in supply (Smyth, 2024).

**limitations**

**Although the research can be deemed as valuable, one should agree on several limitations:**

- Sampling Methodology: Employment of a non-probability convenience sampling method could restrict the applicability of the findings to the entire population of e-commerce companies in Pakistan.
- Geographic Scope: The analysis was limited to the respondents in Pakistan, which can be a limitation in terms of applicability in other developing or developed markets.
- Self-Reported Data: Data sampling was carried out based on self-reported questionnaires, which might bring some response bias or the amplification of the perspective of analytics use.

• Cross-Sectional Design: A cross-sectional design was employed, which limits the scope of determining and analysing the effects that the implementation of data analytics over extended periods will have.

Such research in the future can be carried over by taking a longitudinal survey design, probability sampling methods, and extending it to involve international comparisons.

## SIGNIFICANCE OF THE STUDY

The study is not only important in a theoretical aspect:

• Theoretical Contribution: This research contributes to the supply chain management literature since it empirically proves the effectiveness of analytics functions as strategic capabilities and resources of e-commerce activities (Barney, 1991; Teece et al., 1997).

• Managerial Implications: The results inform practitioners concerning how to use particular analytics instruments and techniques to enhance the responsiveness of the supply chain, demand planning, inventory management, and responsiveness to clients.

• Policy Relevance: These insights can be discussed by policy makers at the ministry levels of the digital economy and digital commerce in Pakistan to advance the funding of the digital transformation program, digital analytics learning, and the development of infrastructure.

• Contextual Value: Since Pakistan is growing its e-commerce industry, the research presents an opportune guide in helping businesses shift to modern data supply chain systems at the logistics level (International Trade Administration, 2024).

## CONCLUSION

The objective of the current study is to examine the performance of e-commerce supply chains in Pakistan in light of four key elements of data analytics, which include descriptive analytics, predictive analytics, prescriptive analytics, and data analytics tools. Based on the Resource-Based View (RBV) and the Dynamic Capabilities Theory (DCT), the results substantiate the fact that every element can play a significant role in raising operational efficiencies, responsiveness, and customer satisfaction in supply chain practices.

The analysis revealed that descriptive analytics helps businesses understand past inefficiencies; predictive analytics enables better demand prediction and proactive decisions; prescriptive analytics provides actionable plans that optimize logistics processes; and the analytical tool supports real-time views and cross-functional decisions. When these elements of analytics are integrated, they create a more harmonious relationship between supply chain operations and customer requirements, which provides e-commerce companies with an advantageous competitive position in a rapidly evolving marketplace.

The findings are empirical to prove that decision-making based on analytics is no longer an additional capability but a basic skill required in order to transform the supply chain. Through the study, it can be assumed that companies that have invested in data literacy, analytics tools, and digital process consolidation will be more likely to survive in the developing, competitive business environment (Wamba et al., 2024; Gomes et al., 2025).

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