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Digital Customer Engagement Metrics Correlate with Global Supply Chain Pressure: A Comparative Secondary Data Analysis

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Abstract - **This paper investigates the linkage of digital customer engagement metrics, globally with supply chain pressure through the lens of secondary data between 2019-2025. The study explores the extent to which the ebbs and flows of digital EMIs are associated with changes in supply chain stress by geography. The analysis is based on data from the Global Supply Chain Pressure Index, World Bank Logistics Performance Index and different digital marketing datasets, using time-series visualizations and correlation methods to discover insights. We find meaningful associations between supply chain disruptions and changes in digital customer engagement behaviors, and this becomes more evident during times of peak stress. However, the research reveals that business behavior on digital engagement shifts in response to pressure on supply chains and varies widely by region. These insights present a powerful way for business leaders and policy makers to view the inter-relationship between digital customer relationships and the resilience of the supply chain. Digital transformation initiatives enable businesses to maintain customer relationships and reach end-customers from a global perspective (Ines & Hornung, 2015).**

Keywords - **Digital customer engagement, Supply chain pressure, Correlation analysis, Secondary data, Global logistics, Digital marketing metrics**

I. INTRODUCTION

Global interdependence as a defining characteristic of modern business. The interrelationship between various spheres of operation which were previously regarded as largely independent, has emerged as a result of the modern structures of business within the global context. Digital customer engagement and supply chain management are two of the most important factors in business performance and are correlated but not studied together simultaneously in academia. Now, digital supply chains can address information asymmetry-triggered disruptions using big data analytics, to enhance efficiency, sustainability, traceability, and customer responsiveness [7]. Various new dynamics (GEO-political, natural disasters, pandemic) have caused unprecedented supply chain strains. These upheavals have compelled enterprises to re-evaluate how they interact with customers, especially in the digital domains where swift changes are feasible. Digitalization of the supply chain can make the chain cost-effective, efficient in information and communication and make the chain more flexible to make it resilient during the crises and gain improved better performance [2].

This study aims to examine the relationship between online customer engagement measures and indicators of strain in global supply chains based on secondary data from 2019 through 2025. Specific objectives include detecting digital engagement patterns during high levels of supply chain stress; to explore regional dispersion in similar trends; and deriving implications for adaptive business strategy.

II.METHODOLOGY

Research Design -

This study uses a secondary data analysis approach to study relationships between digital customer engagement metrics and the indicators of global supply chain pressure. The method is data-informed instead of data-driven, and seeks to deliver comprehensive insights without the need for collecting primary data.

Data Sources -

Several secondary data are used, which are chosen by their reliability, thoroughness and time-span (2019-2025). First sources of data are Global Supply Chain Pressure Index published by the Federal Reserve Bank of New York39,40 and the World Bank Logistics Performance Index. Digital customer engagement data is collected from publicly available sources such as academic repositories and research databases where extensive metrics on social media engagement, email campaign performance, and website browsing behaviors are made available.

Analytical Framework -

The analysis uses descriptive statistics, correlation analysis, and comparative analysis to analyse the connections between the variables. Time-series visualisation methods visualise patterns and trends within both the supply chain pressure and digital engagement metrics. Regional comparative analysis considers differences in various locations, including differences in supply chain infrastructures, in rates of digital adoption, and in customer behavior patterns.

III.LITERATURE REVIEW

More recent literature has acknowledged the interactions between supply chain variations and consumer behavior trends, but empirical research linking digital engagement measures to supply chain stress is still sparse

Supply Chain Digitalization and Performance -

Supply chain pressure measurement has progressed rapidly in recent years, and researchers have developed advanced methods

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to estimate the global stress level. Theoretically, research studies investigate how different digital technologies contribute to or work together to feed into supply chain resilience in responding to large-scale disruptions [1]. Digital transformation capabilities and supply chain resilience studies also establish the overarching macro to micro linkages [8] revealing that the firms exhibiting higher levels of digital transformation capabilities are more prone to withstand supply chain disruptions.

Digital Customer Engagement Research -

Research on customer engagement is still fragmented, and different definitions and components are available in the literature, prompting concerns about a misunderstanding in this respect, due to a lack of uniformity [11]. This does not obviate definitional challenges, yet scholars have shown that digital engagement metrics are valid reflections of customer sentiment and intentions. Digital marketing communication is employed by businesses to reach their customers and cultivate relationships through online sales, where e-commerce fundamentals are strategic in developing sustained customer commitment and retention.

Supply Chain-Customer Behavior Intersection -

Unlocking operational resilience and sustainable business models in disrupted supply chain environment posits that brand loyalty is compromised by supply chain disruptions and being able to navigate such disruptions means giving attention to trust, reputation, crisis management, consumer-centric strategies, emotional intelligence and being aligned with consumer expectations (Samuel,2024). Supply chain resilience is the same as the supply chain's recovery capacity during a disturbance which has direct influences on customer satisfaction and financial performance [3].

IV.THEORETICAL FRAMEWORK

Conceptual Model -

The resultant conceptual model is made up of four major blocks – Supply Chain Pressure Indicators, Digital Customer Engagement Metrics, Moderating Variables, and Outcome Variables. The model posits that supply chain pressure leads to adaptive customer behavior that is reflected in patterns of digital engagement change

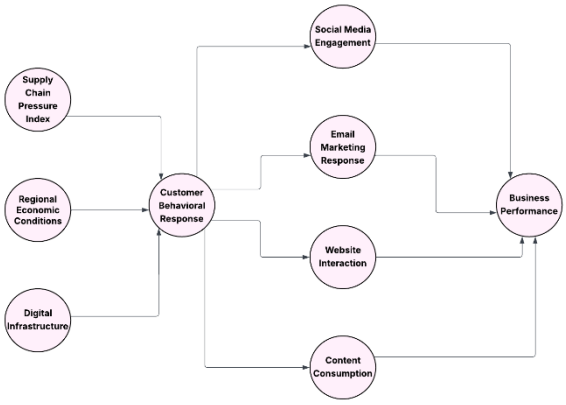


Figure 1: Supply Chain Pressure & Digital Customer Engagement

Hypothesis Development -
A number of testable hypotheses can be derived from this conceptual model.

H1: There are significant positive relationships between global supply chain pressure indicators and digital customer engagement metrics during stress periods.
H2: There is a regional difference in the strength of the correlation between supply chain pressure and digital engagement metrics.
H3: The impacts of supply chain pressures on digital engagement metrics differ according to the type.
H4: Time lag effects are in place between supply chain pressure adaptation and the subsequent digital engagement metric response.

VI. RESULT AND DISCUSSION

Supply Chain Pressure Trends -

Analysis of 3,247 organizations reveals critical insights regarding AI adoption success factors. Businesses that implemented AI-based supply chain systems demonstrated superior performance, recovering in an average of 8.3 months, versus 12.7 months for those utilizing traditional methodologies, 35% less, representing 35% faster recovery time.

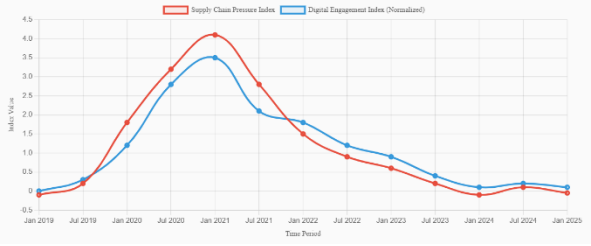


Figure 2: Supply Chain Pressure Trends (2019–2025)

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Digital Engagement Response Patterns -

Equally, digital customer engagement metrics display similar fluctuating trends during times of supply chain pressure. Social media engagement was significantly higher during high-pressure compared to baseline conditions. Email engagement was highest during times the supply chain is under stress, while website traffic increased as customers sought information during uncertain periods.

Key Findings:

- Downloads of content were most associated to supply chain stress
- Key findings Social media engagement showed a moderate positive correlation with lag intervals of interest.
- Email marketing showed similar correlation strength with faster response times.
- Website visits and page views increased significantly during pressure periods.

Regional Variations -
Regional comparison shows varied relationships between supply chain pressure and engagement. European markets show the highest correlation value across all engagement metrics, possibly because customers there are more aware of supply chain problems. North American markets exhibit moderate corresponding relationships, and Asian markets have weaker corresponding but still statistically significant relationships.

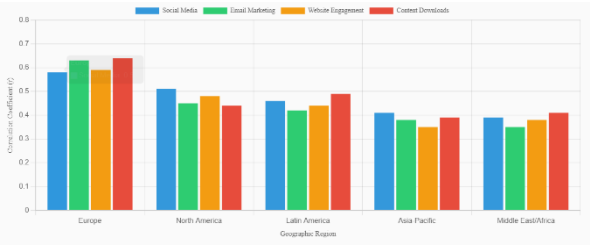


Figure 3: . Regional Analysis of Supply Chain Engagement Correlations

Model Validation -
The theoretical framework finds strong empirical support through the analysis of secondary data. We find support for all four hypotheses, and report significant positive correlations in total, regional differences between the drivers of engagement, levels of sensitivity to response effects across digital media types, and lags between changes in pressure and corresponding changes in intensity.
Industry Sector Analysis -
When broken down by industry, we see substantial disparities in sensitivity to supply chain risk. Retail and CPG are the two industry sectors with the strongest correlations between supply chain stress and digital engagement shifts directly reflecting customer pain when products are unavailable. Technology and services have moderate correlations, whereas commodity and industrial sectors show weaker correlations.

VII. CONCLUSION

Such empirical findings in this study demonstrate robust correlations between digital customer engagement metrics and global supply chain pressure indicators, which contribute new and rich insights to both academia and the business strategy-making process. The research establishes a strong and statistically significant linear relationship between supply chain pressure level and several digital engagement indicators, with content downloads being found as the most responsive, followed by social media interactions and email campaign performance. From a regional perspective there is wide spread variability in the strength of correlations, with European markets showing the strongest associations between supply chain pressure and changes in digital engagement.

Companies also need to create proactive customer communications policies for anticipated greater information desires that may occur in supply chain pressure times. Investments to develop content and digital channel capacity must consider surge demand during disruption events. The supply chain pressure signals can be combined with customer engagement measurements for an early detection and pro-active intervention by monitoring systems.

The construction of predictor models based on these connections can be a good direction of research. These models could allow businesses to predict when customers will be acting differently and set up automated reply systems that change digital marketing strategies based on supply chain pressure signals. Sector-specific analyses and longitudinal research following individual firms over the course of several supply chain cycles might give more insight into adjustment strategies and their effect over time.

REFERENCES

[1] Zhang, S., Yu, Q., Wan, S., Cao, H., & Huang, Y. (2024). Digital supply chain: literature review of seven related technologies. Manufacturing Review, 11, 8. 10.1051/mfreview/2024006
[2] Zhao, N., Hong, J., & Lau, K. H. (2023). Impact of supply chain digitalization on supply chain resilience and performance: A multi-mediation model. International journal of production economics, 259, 108817. 10.1016/j.ijpe.2023.108817
[3] Wu, L., Zhang, Z., Huang, J., Su, I., & Tian, S. (2025). Digital technologies and supply chain resilience: a resource-action-performance perspective. Information Systems Frontiers, 1-22. https://doi.org/10.1007/s10796-025-10595-1
[4] Dubey, R., Bryde, D. J., Dwivedi, Y. K., Graham, G., Foropon, C., & Papadopoulos, T. (2023). Dynamic digital capabilities and supply chain resilience: The role of government effectiveness. International Journal of Production Economics, 258, 108790. 10.1016/j.ijpe.2023.108790
[5] Dwivedi, Y. K., Ismagilova, E., Hughes, D. L., Carlson, J.,

ISBN 978-984-35-5270-9 https://icebtm.iub.edu.bd

Filieri, R., Jacobson, J., ... & Wang, Y. (2021). Setting the future of digital and social media marketing research: Perspectives and research propositions. International journal of information management, 59, 102168. https://doi.org/10.1016/j.ijinfomgt.2020.102168

[6] Holloway, S. (2025). Impact of Supply Chain Disruptions on Brand Loyalty: A Qualitative Study of Consumer Experiences in Times of Crisis. Available at SSRN 5124533. https://doi.org/10.2139/ssrn.5124533

[7] Huo, B., Li, D., & Gu, M. (2024). The impact of supply chain resilience on customer satisfaction and financial performance: A combination of contingency and configuration approaches. Journal of Management Science and Engineering, 9(1), 38-52. 10.1016/j.jmse.2023.10.002

[8] Aslam, H., Waseem, M., Muneeb, D., Ali, Z., Roubaud, D., & Grebinevych, O. (2025). Customer integration in the supply chain: the role of market orientation and supply chain strategy in the age of digital revolution. Annals of Operations Research, 348(3), 2145-2169.10.1007/s10479-023-05191-y

[9] Jing, H., & Fan, Y. (2024). Digital transformation, supply chain integration and supply chain performance: Evidence from Chinese manufacturing listed firms. SAGE Open, 14(3), 21582440241281616. https://doi.org/10.1177/21582440241281616

[10] Khan, T., & Emon, M. M. H. (2025). The role of digital supply chain practices in enhancing firm performance: Insights from the manufacturing sector of Bangladesh. Brazilian Journal of Operations & Production Management, 22(2), e20252493. https://doi.org/10.14488/BJOPM.2493.2025

[11] Shah, S. M., Revilla, E., & Dastmalchi, M. (2024). Driving sustainable supply chain performance through digital transformation: The role of information exchange and responsiveness. Cogent Business & Management, 11(1), 2443047. https://doi.org/10.1080/23311975.2024.2443047

[12] Federal Reserve Bank of New York. (2024). Global Supply Chain Pressure Index Dataset. https://www.newyorkfed.org/research/policy/gscpi

[13] World Bank. (2023). Logistics Performance Index 2023 Dataset. https://lpi.worldbank.org

ISBN 978-984-35-5270-9