The Impact of Digital Innovation Strategies on Organizational Performance: Evidence from the East African Biscuit Industry

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***Abstract*—This study investigates the impact of digital innovation strategies on organizational performance in the East African biscuit industry. Drawing on the dynamic capabilities framework and innovation literature, we examine how e-commerce adoption, digital marketing implementation, and supply chain digitization affect firm performance. Using survey data from 150 biscuit manufacturers across Kenya, Tanzania, Uganda, and Rwanda, we employ structural equation modeling to test the relationships between these digital strategies and various performance metrics. Results indicate that all three digital innovation strategies positively influence organizational performance, with e-commerce adoption showing the strongest effect. The findings contribute to our understanding of digital transformation in emerging markets and offer practical implications for managers in the food manufacturing sector.**

1. INTRODUCTION

The rapid pace of technological change is reshaping industries globally, with digital innovations offering new avenues for value creation and competitive advantage (Nambisan et al., 2019). In emerging markets, digital technologies present both opportunities and challenges for local firms seeking to enhance their performance and competitiveness (Luo et al., 2019). The biscuit industry in East Africa, characterized by growing consumer demand and increasing competition, provides an interesting context to examine the impact of digital innovation strategies on organizational performance.

This study focuses on three key digital innovation strategies:

1. E-commerce adoption: The implementation of online sales channels and digital payment systems.
2. Digital marketing implementation: The use of social media, content marketing, and data analytics for customer engagement and brand building.
3. Supply chain digitization: The integration of digital technologies in procurement, inventory management, and logistics processes.

Drawing on the dynamic capabilities framework (Teece et al., 1997) and the literature on digital innovation (Nambisan et al., 2017), we posit that these strategies enable firms to sense and seize new opportunities, reconfigure their resources, and adapt to changing market conditions, ultimately leading to improved organizational performance.

The research questions guiding this study are:

1. How do e-commerce adoption, digital marketing implementation, and supply chain digitization impact organizational performance in the East African biscuit industry?
2. Which digital innovation strategy has the strongest effect on performance?
3. How do firm characteristics moderate the relationship between digital innovation strategies and performance?

By addressing these questions, this study contributes to the literature on digital innovation in emerging markets and provides practical insights for managers in the food manufacturing sector.

2. LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

2.1 Dynamic Capabilities and Digital Innovation

The dynamic capabilities framework emphasizes the importance of a firm's ability to integrate, build, and

reconfigure internal and external competences to address rapidly changing environments (Teece et al., 1997). Digital technologies have been recognized as key enablers of dynamic capabilities, allowing firms to sense new opportunities, seize them through business model innovation, and transform their asset base (Helfat & Raubitschek, 2018).

In the context of emerging markets, digital innovations can help firms overcome institutional voids and resource constraints, enabling them to compete more effectively (Luo et al., 2019). However, the successful implementation of digital strategies requires firms to develop new capabilities and overcome organizational inertia (Kane et al., 2015).

2.2 E-commerce Adoption and Organizational Performance

E-commerce adoption allows firms to reach new customers, reduce transaction costs, and improve operational efficiency (Zhu & Kraemer, 2005). In emerging markets, e-commerce can help firms overcome physical infrastructure limitations and expand their market reach (Kshetri, 2018). Based on this, we hypothesize:

H1: E-commerce adoption is positively associated with organizational performance in the East African biscuit industry.

2.3 Digital Marketing Implementation and Organizational Performance

Digital marketing enables firms to engage with customers more effectively, build brand awareness, and gather valuable consumer insights (Kannan & Li, 2017). In emerging markets, digital marketing can help firms leapfrog traditional advertising channels and connect directly with consumers (Mou et al., 2020). Therefore, we propose:

H2: Digital marketing implementation is positively associated with organizational performance in the East African biscuit industry.

2.4 Supply Chain Digitization and Organizational Performance

Supply chain digitization can enhance visibility, improve coordination with suppliers and distributors, and increase operational efficiency (Büyüközkan & Göçer, 2018). In emerging markets, digital supply chain solutions can help firms overcome logistical challenges and reduce costs (Ageron et al., 2019). Thus, we hypothesize:

H3: Supply chain digitization is positively associated with organizational performance in the East African biscuit industry.

2.5 Moderating Effects of Firm Characteristics

The impact of digital innovation strategies may vary depending on firm characteristics such as size and age (Zhu et al., 2006). Larger firms may have more resources to invest in digital technologies but may also face greater organizational inertia. Younger firms may be more agile in adopting digital innovations but may lack the complementary assets to fully leverage them. Therefore, we propose:

H4a: Firm size moderates the relationship between digital innovation strategies and organizational performance.

H4b: Firm age moderates the relationship between digital innovation strategies and organizational performance.

3. METHODOLOGY

3.1 Sample and Data Collection

Data were collected through a structured survey of biscuit manufacturers in Kenya, Tanzania, Uganda, and Rwanda. The sampling frame was derived from industry associations and business directories in each country. A total of 150 valid responses were obtained, representing a response rate of 62.5%. Table 1 presents the sample characteristics.

Table 1: Sample Characteristics

Characteristic	Category	Frequency	Percentage
Country	Kenya	55	36.7%
	Tanzania	40	26.7%
	Uganda	35	23.3%
	Rwanda	20	13.3%
Firm Size	Small (<50 employees)	60	40.0%
	Medium (50-249 employees)	65	43.3%
	Large (≥250 employees)	25	16.7%
Firm Age	<5 years	30	20.0%

	5-10 years	45	30.0%
	>10 years	75	50.0%

3.2 Measures

All constructs were measured using multi-item scales adapted from previous literature. E-commerce adoption was measured using a 5-item scale from Zhu & Kraemer (2005). Digital marketing implementation was assessed using a 6-item scale adapted from Kannan & Li (2017). Supply chain digitization was measured using a 7-item scale based on Büyüközkan & Göçer (2018). Organizational performance was operationalized as a second-order construct comprising financial performance, market performance, and operational efficiency, using scales adapted from Venkatraman & Ramanujam (1986). All items were measured on a 7-point Likert scale.

3.3 Data Analysis

We employed structural equation modeling (SEM) using AMOS 26 to test the hypothesized relationships. The two-step approach recommended by Anderson & Gerbing (1988) was followed, first assessing the measurement model and then testing the structural model. Multi-group analysis was conducted to test the moderating effects of firm size and age.

4. RESULTS

4.1 Measurement Model

Confirmatory factor analysis (CFA) was performed to assess the reliability and validity of the measures. The measurement model showed good fit ($\chi 2/df = 1.82$, CFI = 0.95, TLI = 0.94, RMSEA = 0.059). All factor loadings were significant ($p < 0.001$) and above 0.7. Composite reliability (CR) and average variance extracted (AVE) values exceeded the recommended thresholds of 0.7 and 0.5, respectively, indicating good reliability and convergent validity. Discriminant validity was established as the square root of AVE for each construct was greater than its correlations with other constructs (Fornell & Larcker, 1981). Table 2 presents the correlation matrix and descriptive statistics.

Table 2: Correlation Matrix and Descriptive Statistics

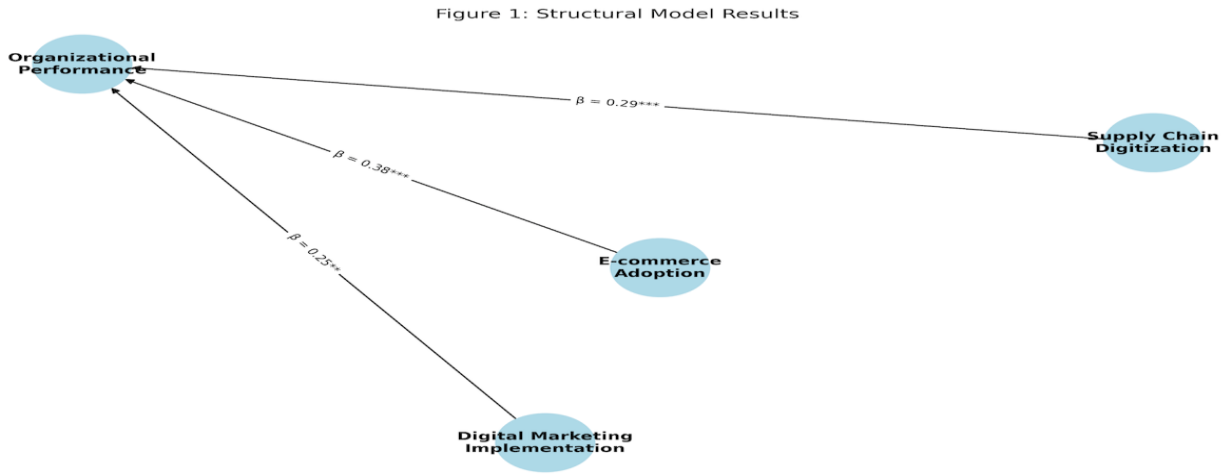
Construct	1	2	3	4	5	6	7
1. E-commerce Adoption	0.84						
2. Digital Marketing	0.58	0.82					
3. Supply Chain Digitization	0.52	0.49	0.79				
4. Financial Performance	0.45	0.39	0.36	0.87			
5. Market Performance	0.51	0.47	0.41	0.62	0.85		
6. Operational Efficiency	0.48	0.42	0.53	0.55	0.59	0.81	
7. Organizational Performance	0.54	0.48	0.49	0.83	0.88	0.85	0.83
Mean	4.62	4.89	4.35	4.78	4.95	4.72	4.82
Standard Deviation	1.38	1.25	1.42	1.19	1.07	1.15	1.05

Note: Square root of AVE on diagonal; all correlations significant at $p < 0.01$

4.2 Structural Model

The structural model also demonstrated good fit ($\chi 2/df = 1.95$, CFI = 0.94, TLI = 0.93, RMSEA = 0.063). Figure 1 presents the results of the structural model analysis.

Figure 1: Structural Model Results



All three digital innovation strategies had significant positive effects on organizational performance:

1. E-commerce adoption ($\beta = 0.38$, $p < 0.001$)
2. Digital marketing implementation ($\beta = 0.25$, $p < 0.01$)
3. Supply chain digitization ($\beta = 0.29$, $p < 0.001$)

These results support hypotheses H1, H2, and H3. E-commerce adoption showed the strongest effect on organizational performance.

4.3 Moderating Effects

Multi-group analysis was conducted to test the moderating effects of firm size and age. The sample was split into two groups for each moderator (small/medium vs. large firms; younger vs. older firms). The results are presented in Table 3.

Table 3: Moderating Effects of Firm Size and Age

Path	Small/Medium Firms	Large Firms	$\Delta\chi 2$	Younger Firms	Older Firms	$\Delta\chi 2$
E-commerce → Performance	0.41***	0.29**	4.23*	0.45***	0.33**	3.86*
Digital Marketing → Performance	0.27**	0.21*	1.75	0.29**	0.22*	1.92
Supply Chain → Performance	0.25**	0.38***	3.95*	0.24**	0.35***	3.78*

Note: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

The results indicate that firm size and age moderate some of the relationships between digital innovation strategies and organizational performance, partially supporting H4a and H4b. The effect of e-commerce adoption on performance is stronger for small/medium firms and younger firms, while the effect of supply chain digitization is stronger for large firms and older firms.

5. DISCUSSION

5.1 Theoretical Implications

This study contributes to the literature on digital innovation and organizational performance in several ways. First, it provides empirical evidence on the positive impact of e-commerce adoption, digital marketing implementation, and supply chain digitization on firm performance in an emerging market context. This supports the view that digital innovations can serve as important dynamic capabilities, enabling firms to sense and seize new opportunities and reconfigure their resources in response to changing market conditions (Teece, 2007). Second, the findings highlight the relative importance of different digital innovation strategies, with e-commerce adoption showing the strongest effect on performance. This suggests that in the East African biscuit industry, the ability to reach customers through

online channels and facilitate digital transactions is particularly crucial for success. This aligns with research highlighting the transformative potential of e-commerce in emerging markets (Kshetri, 2018).

Third, the moderating effects of firm size and age provide nuanced insights into the contextual factors influencing the effectiveness of digital innovation strategies. The stronger impact of e-commerce for smaller and younger firms suggests that these digital technologies may serve as equalizers, allowing newer entrants to compete more effectively with established players (Li et al., 2021). Conversely, the stronger effect of supply chain digitization for larger and older firms indicates that more established organizations may be better positioned to leverage complex digital solutions across their operations (Ageron et al., 2019).

5.2 Practical Implications

For managers in the East African biscuit industry, this study offers several practical implications:

1. Prioritize e-commerce initiatives: Given the strong impact of e-commerce adoption on performance, firms should invest in developing robust online sales channels and digital payment systems.
2. Leverage digital marketing: While showing a smaller effect than e-commerce, digital marketing remains an important driver of performance. Firms should focus on building their social media presence, content marketing capabilities, and data analytics skills.
3. Invest in supply chain digitization: Particularly for larger and more established firms, digitizing supply chain processes can yield significant performance improvements. This may involve implementing advanced inventory management systems, digital procurement platforms, and logistics optimization tools.
4. Consider firm characteristics: Smaller and younger firms may benefit most from focusing on e-commerce and digital marketing initiatives, while larger and older firms should pay particular attention to supply chain digitization opportunities.
5. Develop digital capabilities: To successfully implement these strategies, firms need to invest in developing their digital capabilities, including technical skills, data analysis competencies, and digital leadership (Kane et al., 2015).

5.3 Limitations and Future Research

This study has several limitations that provide avenues for future research. First, the cross-sectional design limits causal inferences. Longitudinal studies could better establish the direction of effects and examine how digital innovation strategies and performance co-evolve over time. Second, the focus on a single industry in East Africa may limit generalizability. Future research could test these relationships in other industries or compare across multiple emerging market contexts.

Future studies could also explore additional digital innovation strategies, such as the use of artificial intelligence or Internet of Things technologies. Moreover, investigating the potential negative effects or risks associated with digital innovation strategies, such as cybersecurity threats or digital divide issues, could provide a more comprehensive understanding of their impact in emerging markets.

6. CONCLUSION

This study provides evidence that e-commerce adoption, digital marketing implementation, and supply chain digitization positively impact organizational performance in the East African biscuit industry. The findings highlight the importance of digital innovation strategies as sources of competitive advantage in emerging markets, while also revealing the contextual factors that influence their effectiveness. As the pace of digital transformation accelerates globally, firms in emerging markets must carefully consider how to leverage these technologies to enhance their performance and competitiveness. This research offers insights to guide managers and policymakers in navigating the digital landscape and fostering innovation-driven growth in the East African food manufacturing sector.

REFERENCES

[1] Anderson, J. C., & Gerbing, D. W. (1988). Structural equation modeling in practice: A review and recommended two-step approach. Psychological Bulletin, 103(3), 411-423.

[2] Büyüközkan, G., & Göçer, F. (2018). Digital supply chain: Literature review and a proposed framework for future research. Computers in Industry, 97, 157-177.

[3] Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. Journal of Marketing Research, 18(1), 39-50.
[4] Helfat, C. E., & Raubitschek, R. S. (2018). Dynamic and integrative capabilities for profiting from innovation in digital platform-based ecosystems. Research Policy, 47(8), 1391-1399.
[5] Kane, G. C., Palmer, D., Phillips, A. N., Kiron, D., & Buckley, N. (2015). Strategy, not technology, drives digital transformation. MIT Sloan Management Review and Deloitte University Press, 14(1-25).
[6] Kannan, P. K., & Li, H. A. (2017). Digital marketing: A framework, review and research agenda. International Journal of Research in Marketing, 34(1), 22-45.
[7] Kshetri, N. (2018). 5G in E-Commerce Activities. IT Professional, 20(4), 73-77.
[8] Li, L., Su, F., Zhang, W., & Mao, J. Y. (2021). Digital transformation by SME entrepreneurs: A capability perspective. Information Systems Journal, 31(2), 287-322.
[9] Luo, Y., Zhang, C., Xu, Y., & Ling, H. (2019). Creativity in IS usage and workgroup performance: The mediating role of ambidextrous usage. Computers in Human Behavior, 99, 1-11.
[10] Mou, J., Cui, Y., & Kurcz, K. (2020). Trust, risk and alternative website quality in B-buyer acceptance of cross-border E-commerce. Journal of Global Information Management, 28(1), 167-188.
[11] Nambisan, S., Lyytinen, K., Majchrzak, A., & Song, M. (2017). Digital innovation management: Reinventing innovation management research in a digital world. MIS Quarterly, 41(1), 223-238.
[12] Nambisan, S., Wright, M., & Feldman, M. (2019). The digital transformation of innovation and entrepreneurship: Progress, challenges and key themes. Research Policy, 48(8), 103773.
[13] Teece, D. J. (2007). Explicating dynamic capabilities: The nature and microfoundations of (sustainable) enterprise performance. Strategic Management Journal, 28(13), 1319-1350.
[14] Teece, D. J., Pisano, G., & Shuen, A. (1997). Dynamic capabilities and strategic management. Strategic Management Journal, 18(7), 509-533.
[15] Venkatraman, N., & Ramanujam, V. (1986). Measurement of business performance in strategy research: A comparison of approaches. Academy of Management Review, 11(4), 801-814.
[16] Zhu, K., & Kraemer, K. L. (2005). Post-adoption variations in usage and value of e-business by organizations: Cross-country evidence from the retail industry. Information Systems Research, 16(1), 61-84.
[17] Zhu, K., Kraemer, K. L., & Xu, S. (2006). The process of innovation assimilation by firms in different countries: A technology diffusion perspective on e-business. Management Science, 52(10), 1557-1576.

Appendix A: Survey Instrument

The survey instrument consisted of the following sections:

1. Company Demographics
2. E-commerce Adoption (5 items)
3. Digital Marketing Implementation (6 items)
4. Supply Chain Digitization (7 items)
5. Organizational Performance a. Financial Performance (4 items) b. Market Performance (4 items) c. Operational Efficiency (4 items)

All items were measured on a 7-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree).

Appendix B: Additional Statistical Analyses

Table B1: Confirmatory Factor Analysis Results

Construct	Item	Factor Loading	CR	AVE
E-commerce Adoption	EC1	0.84	0.91	0.70
	EC2	0.87		
	EC3	0.82		

	EC4	0.79		
	EC5	0.85		
Digital Marketing	DM1	0.81	0.93	0.68
	DM2	0.86		
	DM3	0.83		
	DM4	0.79		
	DM5	0.84		
	DM6	0.82		
Supply Chain Digitization	SC1	0.77	0.92	0.62
	SC2	0.81		
	SC3	0.79		
	SC4	0.82		
	SC5	0.76		
	SC6	0.80		
	SC7	0.78		

Note: CR = Composite Reliability; AVE = Average Variance Extracted

Figure B1: Structural Model with Standardized Path Coefficients

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