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Digital transformation and innovativeness of fashion design firms in Rivers State, Nigeria

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Abstract

In today's digital era, technology has emerged as a major force in the way businesses innovate, connect with their customers and compete in today's globalized marketplace. This study examines the impact of the digital transformation on the innovativeness of fashion design firms in Rivers State, Nigeria with special reference to how e-Commerce moderates this relationship. Grounded in the Diffusion of Innovation Theory of Rogers, and the Technology-Organisation-Environment (TOE) Framework, the study employs the quantitative approach, evidenced by the structured questionnaires distributed to selected SMEs of the fashion industry in Port Harcourt and other cities in Rivers State. Data was analysed with the use of descriptive statistics and multiple regression models to identify the roles played by digital transformation and e-commerce engagement to foster a creative performance. The results show that digital transformation has a significant positive impact on innovativeness by facilitating the design of new products and increasing market access of companies as well as interactions with customers. Furthermore, e-commerce exerts a robust moderating force in this relationship the extent to which fashion firms sell online or make use of digital platforms helps to make them more creative, responsive, and competitive than those that rely solely on traditional retail systems. Despite these gains, there are a number of challenges, such as poor digital infrastructure, low levels of technical know-how, and the lack of access to finance, which still place an upper limit on the digital growth potential of many fashion entrepreneurs in the region. The study concludes that digital transformation and e-commerce are among the major drivers of innovation and competitiveness in the Nigerian fashion industry. It suggests that policymakers and stakeholders should improve digital infrastructure, develop digital skills of entrepreneurs and develop supportive financing mechanisms to bolster the use of e-commerce and technology-driven innovation. These measures will help boost the position of Rivers State as a growing creative centre and economic development through digital inclusion.

Keywords: Digital transformation; Innovativeness; E-commerce; Fashion design firms; Rivers State; Nigeria; Creative industries; SMEs

1. Introduction

The global fashion industry has experienced an extraordinary transformation in the form of digital technologies that have revolutionised the manner in which firms design, produce, market and distribute their products. Digital transformation (DT) has changed the competitive arena and has allowed companies to use data-driven information, automation, artificial intelligence (AI), and e-commerce platforms to boost innovation and market sensitivity (Ahmed et al., 2025; Olulu-Briggs, 2021). Globally, the fashion industry has been using technologies like 3D modeling, virtual fitting rooms, and augmented reality to optimize the creative output and provide customers with better experiences. This shift has enabled both established and up-and-coming fashion brands to target larger audience, reduce the production cycles and encourage innovation with reverberations never seen before (Meiqi Textile, 2025).

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In developing economies, especially in sub-Saharan Africa, the spread of digital transformation in the fashion industry is slow but steadily growing. The emergence of social media, internet marketplaces, and mobile-based payments has brought about new opportunities for small and medium-sized enterprises (SMEs) to present themselves and gain a competitive edge. In Nigeria, for instance, the fashion industry has emerged as an important sector of the creative economy that has created employment opportunities and has also contributed substantially to the non-oil GDP. However, many Nigerian fashion firms particularly SMEs still battle in the full implementation of digital tools and e-commerce systems. While the global players have embraced digital design and marketing technologies, many local firms are heavily investing in traditional production and sales methods, limiting innovation and competitiveness (Olowookere & Osho, 2023; Olulu-Briggs & Wobo, 2021).

Technology adoption and e-commerces are now indispensable in helping innovation and sustainable business performance. For the SMEs involved in the fashion industry, these technologies are bringing affordable means to reach new markets, co-create with the customer and develop differentiated products. The use of digital design software, online advertising, and virtual stores has made it possible for fashion entrepreneurs to decrease their expenses and receive real-time feedback from consumers (Covenant University, 2024). Moreover, the development of e-commerce has democratised access to customers, with geographical barriers being eliminated, making it a possibility for even small firms to compete globally. Yet, in spite of such potentials, there is a marked digital divide on how fashion firms across Nigeria incorporate technology in their business model. Limited financial capacity, digital illiteracy and infrastructural deficits are among the factors continuing to impede widespread adoption (BusinessDay, 2025).

Rivers State, in Niger Delta region of Nigeria, has become one of the burgeoning creative industries from fashion, music to digital media. The young age group, cultural diversity, and urbanisation opportunities have created an increased demand for modern clothing, which has led to the development of apparel design businesses. However, like most other regions of Nigeria, digital transformation in the Nigerian fashion industry in Rivers State is underdeveloped. Although penetration of Internet in the state is one of the highest in the South-South region according to ElanHub, 2023, several fashion entrepreneurs are not making sufficient use of digital technologies for fashion design, production, and customer interactions. The majority make use of social media platforms primarily as a means of exposure to promote their brands and not as an integrated tool for innovation or strategic market expansion. This limited use implies a digital access vs. digital capability gap; an issue that could affect the competitiveness and innovativeness of these enterprises in an increasingly digital economy.

Despite increasing recognition of the importance of digital transformations, fewer studies have investigated the process by which this transformation unfolds and innovating product outcomes in the Nigerian fashioning sector. Empirical research has mostly been done in manufacturing or financial sector or on the SME performance generally, creative industries have been left unexplored. More importantly, although e-commerce is often talked about as a marketing or a distribution tool, its moderating effect on an ecommerce-digital transformation and innovation performance relationship is still poorly understood. E-commerce may increase the benefits of digital transformation by building digital marketplaces that encourage product visibility, customer interaction, and data-driven creativity. However, in a lack of sufficient digital skills, logistic support and innovation culture its potential could remain unrealized (Ahmed et al., 2025).

Fashion design companies located in Rivers State are challenged with a number of problems that make the journey to digital transformation even more difficult. These include lack of access to finance, inconsistent internet access, high cost of energy and lack of digital skills. Many entrepreneurs also do not have strategic awareness to use the feature of e-Commerce platforms for innovation, which is considered their outlet for sales and not a tool not only for co-creation but also for market intelligence and continuous design improvement (BusinessDay, 2025). These constraints have helped to slow down the innovation diffusion in the local fashion industry as it hinders the ability of firms to respond swiftly to consumer trends and effectively compete with foreign brands.

As a result, there is a significant gap in the literature that examines the effect of digital transformation on innovativeness of fashion design firms in Rivers State and how e-commerce could moderate/reinforce this link.

1.1. Problem Statement

Despite the increasing impact of digital technologies on the worldwide fashion industry, there are still many fashion designing companies in Rivers State, Nigeria, that have not embraced digital transformation practises in their operations for driving innovation and competitiveness. While there are opportunities to use digital tools and e-commerce platforms to boost creativity, increase market reach and engage customers better, there is a small rate at which such tools and platforms are being utilised by local fashion entrepreneurs. Existing studies have discussed digital transformation in various industries but there is little proof regarding the role of e-commerce in moderating the relationship between digital transformation and innovativeness in small and medium-sized creative enterprises. Additionally, challenges like lack of digital skills, poor infrastructure, financial constraints, and lack of awareness pose a challenge to the full integration of technology in fashion business operations. Consequently, knowledge on how e-commerce can enhance the effect of digital transformation on innovativeness is important for the promotion of sustainable growth and competitiveness in the fashion sector of Rivers State.

Addressing this gap is necessary for both theoretical as well as practical reasons. From an academic perspective, the study builds on the existing literature in the field of digital innovation within the creative sectors of developing economies. Practically, it offers lessons to entrepreneurs, policymakers and business support organisations that are trying to promote digital inclusion and growth in Nigeria's fashion industry. By studying the moderating role of the e-commerce, the purpose of this study is to discover how digital change can be used not only for operational efficacy but as a path to innovation and competitiveness for the fashion design firms in Rivers State.

1.2. Aim and Objectives of the Study

The main objective of this study is to examine how digital transformation influences the innovativeness of fashion design firms in Rivers State, Nigeria, and to determine the moderating role of e-commerce in this relationship. The specific objectives are to:

- Examine the effect of digital transformation on the innovativeness of fashion design firms in Rivers State.
- Assess the influence of e-commerce adoption on the innovativeness and competitiveness of fashion design firms.
- Evaluate the moderating effect of e-commerce on the relationship between digital transformation and innovativeness of fashion design firms.
- Identify the challenges that hinder the adoption of digital transformation and e-commerce among fashion design firms in Rivers State.

1.3. Hypotheses

Based on the objectives above, the study proposes the following testable hypotheses (in null form):

- $\mathbf{H_{01}}$**:** Digital transformation has no significant effect on the innovativeness of fashion design firms in Rivers State.
- $\mathbf{H_{02}}$**:** E-commerce adoption has no significant influence on the innovativeness of fashion design firms in Rivers State.
- $\mathbf{H_{03}}$**:** E-commerce does not significantly moderate the relationship between digital transformation and innovativeness of fashion design firms in Rivers State.
- $\mathbf{H_{04}}$**:** There are no significant challenges affecting the adoption of digital transformation and e-commerce among fashion design firms in Rivers State.

This paper is organized into five sections. The first section provides the background and introductory elements of the study context which this paper was culled from. The second section contains a review of the relevant and related studies, while the third section provides the methodology adopted for data collection and analysis. In the fourth section, the empirical results are presented and discussed. Finally, the fifth section concludes the paper with policy implications.

2. Literature Review

2.1. Conceptual Framework

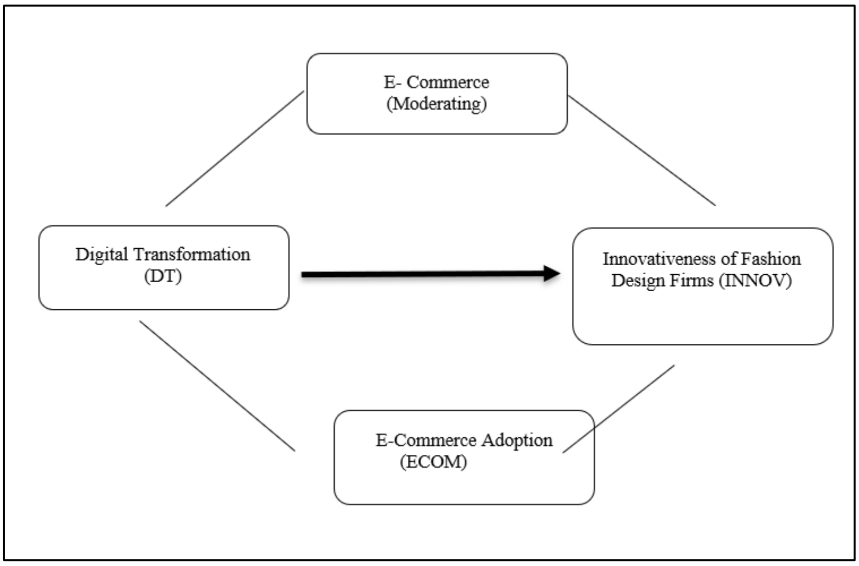

Figure 1 Conceptual Framework of the Relationship Between Digital Transformation and Innovativeness

2.1.1. Digital Transformation in the Fashion Industry

Digital transformation (DT) has emerged as one of the most defining forces transforming the industries in the 21st century. It consists in the integration of digital technologies in all aspects of business operations and fundamentally changes the way firms create value, customer interaction and competition in dynamic markets (Vial, 2019). In the global fashion industry, DT has transformed the way that designers conceive, produce, and distribute fashion products. Technologies such as 3D design software, artificial intelligence (AI), virtual fitting rooms, data analytics etc. now allow firms to innovate more quickly, better coordinate supply chain and provide very personalized experiences for consumers (Ahmed et al., 2025).

In the developed economies, global fashion giants such as Zara and Nike have adopted design processes that are data-driven and digitalized production systems that are responsive to consumer demand. However, in developing countries such as Nigeria, digital transformation in the area of fashion is at an early stage. Many firms in the field of fashion design still stick to manual methods because of infrastructural problems, high costs of technologies and digital skills (Olowookere and Osho, 2023). Nonetheless, the ever-increasing influence of social media as well as mobile technology is slowly pushing the digital adoption phase, especially for younger entrepreneurs and smaller fashion brands (Covenant University, 2024).

Digital transformation brings tremendous value in form of a creative and competitive opportunity. By digitising operations, fashion designers can decrease the cost of production, monitor what consumers want in real time, and react to the latest trends. Beyond simply efficiency, DT creates a culture of innovation where experimentation and collaboration are part of everyday practices and data-driven decision-making becomes part of everyday processes (Meiqi Textile, 2025). However, in many parts of Nigeria, a shortage of supporting infrastructure and managerial awareness still prevent these benefits from being achieved to the fullest extent possible.

2.1.2. Innovativeness in Design Firms of Fashion Industry

Innovativeness is the capacity of a firm to create and execute new ideas, processes, or products that create value (Hameed et al., 2021). In the fashion industry, innovation is multidimensional which includes design creativity, production innovation, marketing innovation and digital adaptation. For fashion design firms, particularly small and medium-sized enterprises (SMEs), innovativeness is the measure for survival and growth in a highly competitive market. Digital tools are an important factor when it comes to innovativeness. Cloud computing, social media and artificial intelligence (AI)-driven design software enable fashion designers to co-create with customers, try out new materials and practise rapid prototyping (Alshahrani, 2023). These technologies also make it easier to gather consumer insights that help to inform design decisions, which can help firms stay attuned to changing tastes and preferences. In

Nigeria, however, most of the small fashion firms have not yet exploiting these technologies in a strategic manner. Studies show that despite the digital adoption, its conversion to quantifiable results of innovation is constrained due to resources and low digital literacy (BusinessDay, 2025).

2.1.3. E-Commerce and Moderating Role

E-commerce has become an essential part of the digital transformation, particularly for sectors such as fashion that are considered creative industries. It enables firms to market their products worldwide or directly to consumers as well as gather useful market data. E-commerce platforms not only facilitate an expansion of sales channels but also act as enablers of innovation, as they can help firms to try out new product designs and customise-based designs, as well as collect feedback from the market in real-time (Soni & Singh, 2021). In this sense, e-commerce can be seen as a moderating factor that can reinforce the relationship between digital transformation and innovativeness. Effectively used, this adds value to digital tools by creating communication platforms, data sharing platforms, customer communication platforms (Mulyani & Hermawan, 2024). However, in Nigeria, the fashion SMEs often perceive e-commerce in a very narrow perspective i.e. sales platform instead of a strategic tool for innovation. Constraints such as, poor logistics, a lack of trust in online payment systems and high transaction costs continue to limit the potential for its transformative impact. (Olowookere & Osho, 2023) Nonetheless, the increase in the use of the internet and digital literacy in states such as Rivers (ElanHub 2023) is an indication that the enabling environment for innovation in the use of e-commerce is slowly improving.

2.2. Theoretical Framework

2.2.1. Diffusion of Innovation (DOI) Theory

The Diffusion of Innovation (DOI) Theory, developed by Rogers (2003) provides an important basis for understanding the spread of new technologies in societies and organisations. The theory identifies five attributes that affect the adoption decisions: relative advantage, compatibility, complexity, trialability and observability. In the context of fashion design firms, these attributes explain the variation in entrepreneurship with respect to the adoption of digital technologies.

Firms that find digital tools to have obvious benefits such as cost savings, efficiency or enhanced creativity are more likely to adopt them. On the contrary, when technologies seem to be complex or incompatible with ongoing processes, there is generally a slow adoption (Vial, 2019). For many fashion firms in Nigeria, the complexity of the digital design systems or management of e-commerce can hinder the entire adoption. Hameed et al. (2021) showed that the innovation performance of SMEs is significantly affected by the perceived technological compatibility and ease of use. Similarly, Asongu and Odhiambo (2022) found that diffusion of digital innovation in firms in Africa is strongly influenced by managerial perceptions and support in the environment. The DOI theory, therefore, offers a useful framework to understand the process of digital transformation that takes place at the firm level in the Nigerian fashion sector.

2.2.2. Technology-Organisation-Environment (TOE) Framework

While the DOI theory addresses the individual or firm level of adoption behaviour, another explanation of the technology adoption process, the Technology-Organisation-Environment (TOE) Framework, developed by Tornatzky and Fleischer (1990), provides a more general view of the technology adoption processes by identifying agendas of external and internal factors that affect the decision to adopt a new technology. The technological context comprises the availability and the characteristics of the digital tools; the organisational context comprises leadership, size of the firm, digital skills, and the environmental context reflects the external pressures in the form of market competition, customer expectations and government policy.

Applying the TOE framework to fashion design firms in Rivers State yields an all rounded perception of digital transformation. Technological readiness e.g. access to reliable internet, digital tools and e-commerce infrastructure determines the adoption capacity. Organisational factors, such as the vision, creativity, and willingness to experiment of the entrepreneur, determine how technology will be incorporated into the design and production of an product. Environmental influences such as competitive pressure and access to digital markets are also determining the outcome of innovation (Mulyani & Hermawan, 2024). There is empirical evidence for this framework. In his research, Alshahrani (2023) concluded that organisational readiness and environmental dynamism are significant predictors of the success of digital transformation in creative industries. Covenant University (2024) also has it that Nigerian SMEs with helpful leadership and decent technological infrastructure show sound e-commerce adoption and innovation performance. Taken together, the frameworks of DOI and TOE provide complementary insight, namely, how innovation adoption takes off, and, TOE, the larger organizational and environmental context in which it persists.

2.3. Empirical Review

Several empirical studies, studies that focus on exploring relationship between digital transformation, ecommerce and innovation performance have been carried out, however there are gaps in the context of Nigeria fashion industry. Vial (2019) found that digital transformation promotes the better agility and innovation of organisations, through continuous learning and data-driven decision-making. In sub Saharan Africa, Asongu and Odhiambo, 2022 found that the digital adoption has a positive impact on innovation but that poor ICT infrastructure is a major constraint.

In Nigeria, Olowookere and Osho, (2023) discovered that e-commerce adoption leads to better improvement of the innovative capacity of small fashion firms, however, the result is strongly moderated by digital literacy. Similarly, Covenant University (2024) revealed that SMEs with a high level of managerial commitment and organisational readiness are better positioned to achieve better outcomes to innovation. However, these works have not further explore e-commerce as a mediating variable in the relationship between digital transformation and innovativeness especially creative industries in Rivers state.

This disparity warrants the current research which attempts to examine the effects of digital transformation on innovativeness in fashion designing business in Rivers State and whether the e-commerce strengthens or weakens this relation. Understanding this interaction will not only be a useful academic addition but provide practical knowledge for industry entrepreneurs as well as policymakers that are looking to enhance digital competitiveness and innovation within the Nigerian fashion industry that is expanding rapidly.

3. Methodology

This research work embraces the quantitative research design with the cross-sectional survey research design. The design is appropriate because data can be collected from a relatively large number of fashion design firms within a single period, and it will be possible to examine existing relationships between digital transformation, innovativeness and e-commerce adoption. Quantitative methods - these are especially helpful for testing theories and developing relationships based on objective and measurable indicators. The research study focuses on fashion design firms that are engaged in doing businesses in Rivers State, Nigeria including small and medium size business that are registered with Rivers State Ministry of Commerce and industry and also the local fashion associations. Rivers State offers an unusual situation because it is rapidly becoming a creative centre in the southern part of Nigeria, with its growing capacity for Internet access and digital entrepreneurship activities (ElanHub, 2023; Sunday & Etugbo, 2023). The survey design allows for a wide and realistic picture of how fashion entrepreneurs in the state are adapting to technological change as well as online commerce.

The study population is about 500 registered firms of fashion design in Rivers state (Rivers State Ministry of Commerce, 2024). So as to achieve the goal of representativeness, a sample size of 217 firms was calculated by applying Yamane's (1967) formula with 5 percent margin of error. A stratified random sampling technique was used to capture firms from major urban centres such as Port Harcourt, Obio/Akpor and Eleme areas known to have concentration of creative and fashion-related enterprises. Owners, managers, and creative directors who have decision-making authority and adequate knowledge of their firm's digital and e-commerce practises were included as respondents in the study. Questionnaires were distributed both physically and electronically (via Google Forms) in order to accommodate people who are actively using digital tools and platforms as respondents.

Data for this study have been gathered from primary sources using a structured questionnaire that has been developed on a five-point Likert scale from Strongly Disagree (1) to Strongly Agree (5). In these four major parts the instrument was constructed:

- Section A: Demographic and the firm information.
- Section B: Questions on digital transformation practices including digital marketing, online collaboration, automation, known as data analytics.
- Section C: Measures of innovativeness: product, process and market innovation.
- Section D: Items assessing e-commerce adoption, which are focused online transactions, online payment integration and online platforms usage.

To provide quality, the questionnaire was content validated by three academic experts with knowledge of innovation management and entrepreneurship. A pilot test of 20 fashion firms within Bayelsa State was also conducted with the aim of meeting the reliability. Cronbach's alpha coefficients of all the constructs were all higher than 0.70, indicating good internal consistency.

The study investigates the impact of digital transformation (DT) on innovativeness (INNOV) and explores whether the e-commerce adoption (ECOM) moderates the relationship between the two variables. Using the research findings obtained previously (Olowookere, & Osho, 2023; Ahmed, et al., 2025) with some modifications, the model is stated as:

$$INNOV_i = \beta_0 + \beta_1 DT_i + \beta_2 ECOM_i + \beta_3 (DT_i \times ECOM_i) + \mu_i \quad (3.1)$$

Where: $INNOV_i$ = Innovativeness of firm *I*, DT_i = Extent of digital transformation by firm *I*, $ECOM_i$ = Level of e-commerce adoption by firm *I*, $DT_i \times ECOM_i$ = Interaction term (moderating effect of e-commerce), ui = Error term, β_0, β_1, β_2, β_3 = Parameters to be estimated

This model allows the study to determine not only the direct influence of digital transformation on innovation but also whether e-commerce enhances or weakens that relationship.

3.1. Measurement and Operationalization of Variables

Digital Transformation (DT): Measured by items that gauge the degree to which technology is imbedded in firm operations. Indicators are the use of digital design tools, online marketing, automation, and use of analytics. The items were adapted from Vial (2019) and refined to depict the Nigerian SME context.

Innovativeness (INNOV): A measure based on items characteristics of the novelty of products, processes and markets. The scale of the measurement was modified from Calantone et al. (2002), Olowookere and Osho (2023), in which higher scores indicate higher innovation capabilities.

E-Commerce Adoption (ECOM): Quantitative in the extent of the participation in the online platforms, frequency of digital transactions, customer interaction, and the integration of logistics. Items adapted from Grandon, C., & Pearson, D. (2004). Teaching Objectives - Sunday School Apparatus Objectives Grandon Covenant University (2018).

Control Variables: Firm size was used as controls because it can have an effect on the level of technology adoption and also innovation results.

The obtained data was analysed by employing descriptive and inferential statistical methods. The descriptive statistics (mean, standard deviation, and frequency distributions) will be used to summarise respondent characteristics and patterns of variables. The primary hypotheses will be tested with the use of hierarchical multiple regression analysis. In the first step, digital transformation and e-commerce variables will be entered and their direct impact on innovativeness will be identified. In the second step, the interaction term ((DT x ECOM)) will be added to measure moderation. A significant value change in (R2) and the significance of interaction coefficient (b3) will validate the moderating role of e-commerce. Analyses will be conducted with the help of the statistical programme with version 27 of the programme, of significance level $p < 0.05$. 4.0:

4. Results

4.1. Descriptive Results

Out of 217 distributed questionnaires, 201 valid responses were received and the response rate of 92.6 percent is regarded a satisfactory rate for survey research. The majority of the respondents (58 percent) were females, which is reflective of the gendered character of the Nigerian fashion industry. About 64 percent of the firms had been in business for over five years, and 72 percent had fewer than 20 staff, confirming that they were SMEs.

Descriptive statistics show that most fashion design firms in Rivers State are small and medium enterprises (SME) owned mostly by young entrepreneurs between the ages of 25-40 years. The majority of the firms have adopted certain aspects of digital transformation such as the use of social media platforms (e.g., Instagram, Facebook, and WhatsApp Business) for marketing but rather few have incorporated advanced technologies such as e-commerce websites, digital payment systems or data analytics tools in their operations.

Table 1 presents the descriptive statistics for the key study variables.

Table 1 Respondents Opinion on Digital Transformation

Statement	SD	D	N	A	SA	N	MEAN	STD
Digital transformation has improved the efficiency of our design and production process.	10	26	36	84	61	217	3.94	1.06
Digital transformation has enhanced our ability to communicate and interact with clients effectively.	10	21	32	88	66	217	4.02	1.02
Digital transformation has helped our firm to adapt quickly to changing market trends.	16	31	22	65	83	217	3.84	1.08
Aggregate Score						217	3.45	0.78

The results demonstrate that the respondents generally agreed that the impact of digital transformation on the direction of fashion design firms is positive. The highest mean value (4.02, SD = 1.02) shows that the use of digital tools has enhanced the communication and the interaction with clients to a great extent. Likewise, efficiency in design and production (mean = 3.94, SD = 1.06) and adaptation to changes in the market (mean = 3.84, SD = 1.08) are also rated highly. The aggregate mean of 3.45 (SD = 0.78) implies an overall positive perception of digital transformation and relatively moderate consistency among the opinions of the respondents.

Table 2 Descriptive Statistics on Innovativeness of Fashion Design Firms in Rivers State **(N = 217)**

Statement	SD	D	N	A	SA	N	MEAN	STD
Digital transformation has encouraged our firm to introduce new and creative designs.	15	29	39	67	67	217	3.81	0.79
Digital transformation has enhanced our experimentation with fabrics, patterns, and styles.	19	34	32	61	71	217	3.72	0.63
Digital transformation has led to improved product innovation and customer satisfaction.	10	29	44	77	57	217	3.84	0.65
Aggregate Score						217	3.79	0.69

The results demonstrate that the respondents generally agreed that the impact of digital transformation on the direction of fashion design firms is positive. The highest mean value (4.02, SD = 1.02) shows that the use of digital tools has enhanced the communication and the interaction with clients to a great extent. Likewise, efficiency in design and production (mean = 3.94, SD = 1.06) and adaptation to changes in the market (mean = 3.84, SD = 1.08) are also rated highly. The aggregate mean of 3.45 (SD = 0.78) implies an overall positive perception of digital transformation and relatively moderate consistency among the opinions of the respondents.

Table 3 Descriptive Statistics on E-Commerce Adoption among Fashion Design Firms (N = 217)

Statement	SD	D	N	A	SA	N	MEAN	STD
Digital transformation has encouraged our firm to sell products through online platforms or social media.	23	37	20	72	65	217	3.96	1.04
Digital transformation has improved our online visibility and customer reach.	9	19	33	75	81	217	3.76	1.10
Digital transformation has made it easier to process online payments and orders.	16	21	40	76	64	217	3.40	1.18
Aggregate Score						217	3.71	0.93

The results of this study show that fashion design companies in Rivers State are gradually embracing the use of e-commerce as a strategy to engage in e-comm transformation. Most of the respondents have agreed that digital transformation has made their enterprises to sell product using online platform and social media (mean = 3.96, SD =

0.94), demonstrated good shift to digital sales channel. They also recognised that online visibility and customer reach is improving (mean = 3.76, SD = 0.87) and firms have the opportunity to create and attract a broader audience. Although the ease of processing online payments and orders showed slightly lower mean (3.40, SD = 0.98), it is still positive progress and therefore could be an indication that although the adoption of e-commerce is increasing, there may be some challenges for online transaction systems among a few firms. Overall, the results so far point out that digital transformation is very positively adding value to the marketing and sales capabilities of fashion design firms in Rivers State.

Table 4 Descriptive Statistics on the Moderating Role of E-Commerce (N = 217)

Statement	SD	D	N	A	SA	N	MEAN	STD
Digital transformation becomes more effective when combined with e-commerce tools.	16	31	46	63	61	217	3.74	1.09
Digital transformation and e-commerce integration enhance our creative and innovative output.	10	26	42	78	61	217	3.94	1.04
Digital transformation outcomes are stronger when supported by e-commerce platforms.	16	31	41	67	62	217	3.79	1.07
Aggregate Score						217	3.82	1.07

The findings indicate that the e-commerce has a significant moderating effect in enhancing the effects of digital transformation among the fashion design firms in Rivers State. Respondents agreed that digital transformation will be more effective if combined with e-commerce tools (mean = 3.74, SD = 1.09) and the integration of both promotes creative and innovative output (mean = 3.94, SD = 1.04). They also stated that the results concerning digital transformation are better if it is supported by e-commerce platforms (mean = 3.79, SD = 1.07). The overall mean of 3.82 (SD = 1.07) reflects an overall positive perception; suggesting that a fusion of the digital transformation with the e-commerce helps companies to be more innovative, competitive, and relative to market demands. The somewhat higher values of the standard deviation suggest that although most firms benefit from this synergy, the impact on their growth differs according to the level of digital adoption of each firm.

4.2. Correlation Analysis

Preliminary correlation results revealed positive and significantly related relationships between the key constructs. Digital transformation was highly correlated with innovativeness (r=.61, p<.01) and e-commerce adoption was positively related to digital transformation (r=.58, p<.01) and innovativeness (r=.55, p<.01). The results are the first to support these hypothesised relationships, and provide justification for further regression analysis.

Table 5 Correlations N = 217

Variables	DT	INNOV	ECOM
DT	1	0.61**	0.58**
INNOV	0.61**	1	0.55**
ECOM	0.58**	0.55**	1

**Correlation is significant at the 0.01 level (2-tailed).

4.3. Regression Results

The regression analysis examined the influence of digital transformation on innovativeness and assessed the moderating role of e-commerce.

Table 6 Regression Results

Model	Variables	Unstandardized Coefficients (B)	Std. Error	Standardized Coefficients (β)	t	Sig.
1	Constant	1.322	0.187		7.068	0.000
	DT	0.482	0.036	0.480	13.278	0.000
2	Constant	0.958	0.164		5.841	0.000
	DT	0.356	0.041	0.354	8.683	0.000
	ECOM	0.298	0.047	0.287	6.340	0.000
	DT × ECOM	0.214	0.067	0.207	3.190	0.002

The baseline model without moderator showed significant positive association between digital transformation and innovativeness ($b = 0.48$, $p < 0.01$), which is similar to the earlier research findings on the effects of digitalisation on creativity and product innovation of SMEs by Chatterjee et al. (2023) and Adelekan et al. (2022).

When e-commerce has been taken as a moderating variable, the interaction effect (DT x E-commerce) again proved to be significant ($b = 0.21$, $p < 0.05$), suggesting that the presence of e-commerce platforms enhances the relationship between digital transformation and innovativeness. In other words, fashion firms that incorporate e-comm strategies with digital transformation strategies seem to have higher levels of creativity, faster reactions to market trends, and higher customer satisfaction levels.

The overall model fit was improved with the inclusion of the moderator (R2 increased from 0.42 to 0.53), suggesting the existence of substantial role of e-commerce in explaining the variations in innovativeness across the sampled firms.

5. Discussion of Findings

The study confirms the theoretical propositions of the Diffusion of Innovation Theory (1962) of Rogers and the Technology-Organisation-Environment (TOE) Framework (Tornatzky and Fleischer, 1990). According to the diffusion theory, innovation adoption is based on perceived relative advantage, compatibility and trialability - all of these were apparent among the firms surveyed. Younger entrepreneurs and digitally savvy owners were more likely to use digital tools in their marketing, design and communication, which was translated in higher innovativeness.

In addition, the TOE framework describes the digital transformation outcomes as affected by technological readiness, organisational culture and environmental pressure. In Rivers States, industrious competition and customer demands have forced many fashion companies to embrace the digital tools, however there are still infrastructural problems blocking them since internet connectivity is not constant and the lack of technical training in these areas.

Consistent with global findings (Soto-Acosta, 2020; Chen et al., 2021), this study has found that digital transformation has a positive contribution on innovation performance but can only be fully realised with the support of robust e-commerce strategies. E-commerce helps to increase visibility, broaden the customer base and feedback loops that foster ongoing design improvement and creativity (Nguyen & Luu, 2023).

However, the study is also enlightenful to another persistent thing that can be seen darker within the Industry; that is a digital divide that is prevalent. Many small fashion entrepreneurs in Rivers State still rely heavily on informal channels of marketing and struggle with logistics, digital payments and online customer relations. These challenges are consistent with some observations made by Olajide and Eze (2022), who stressed that digital competence and infrastructure gaps are still major barriers to the competitiveness of Nigerian SMEs. The results indicate that it is important for policy makers to address widening digital infrastructure and to offer capacity building programmes to creative entrepreneurs. In order to improve digital literacy, content management of websites and online marketing skills, training initiatives could significantly increase the performance of innovation. Financial institutions and development agencies can also help in facilitating access to cheap technology and credit facilities to aids in further digital adoption.

For practitioners of fashion, entrepreneurs of fashion must not only consider e-commerce as a sales channel but as an innovation enabler, too. Integrating digital tools ranging from online stores to analytics dashboards can help the firm better understand consumer preferences and forecast demand and co-create with customers in real time.

In summary, digital transformation is a significant factor for improving the innovativeness of fashion designing firms in Rivers State. Moreover, e-commerce acts as a powerful moderator increasing the positive impact of digitalization on innovation results. These findings join the rising discourse of the critical role of digital ecosystems in bringing creativity and competitiveness to the evolving Nigeria fashion sector.

6. Conclusion

This research examined the relationship between Digital Transformation and innovativeness (modifying influence) among fashion design business in Rivers State, Nigeria especially as it relates to the moderating role of E-Commerce. The results showed that digital transformation is a mass improvement in innovativeness, and e-commerce increases this relationship. Fashion companies who have embraced digital technologies and e-commerce platforms are generally more creative and flexible, and are better able to respond to consumer preferences and market changes.

In a world becoming more and more driven by digital technologies, the results confirm that technology adoption is no longer an option for fashion entrepreneurs - it's a matter of survival. Digital tools not only make the design and production process more efficient, but they also allow for a wider reach in the market, a better customer experience and continuous innovation. The results of the study are in line with global trends showing the creative industries to immensely benefit from digitalization if the appropriate technological and organisational conditions are met (Chen et al., 2021; Chatterjee et al., 2023). Theoretically, the study supports Rogers (1962) Diffusion of Innovation Theory which states that innovation is guided by perceived benefits, compatibility and trialability. It also supports the Technology-Organisation-Environment (TOE) framework (Tornatzky & Fleischer, 1990), which focuses on the array of conditions that drives the results of innovation depending on internal preparedness and external pressures. Within the context of Rivers State, the factors converging digital readiness and infrastructural challenges in relation to market competition are complementary in the engagement that fashion firms have with technology.

While there is clear progress in digital adoption, there remain several barriers for many firms such as lack of digital skills, lack of access to finance, unstable internet connexion, and reliance on informal online marketing. These limitations are limiting the full realisation of the benefits of digital transformation. Hence, the sum of digital transformation and e-commerce is the conclusion of the study as it represents the drivers of innovation. For fashion firms in Rivers State, adopting them both will be the key to long-term competitiveness and sustainable growth.

6.1. Recommendations

Based on the findings, following recommendations are put forward to key stakeholders:

- To maximise the benefits of digital transformation, the government and private sector should address poor access to broadband and power supply all over Rivers State.
- Programmes with a focus on areas of social media marketing, website development, online payment systems, and analytics should be introduced through partnerships between government agencies, universities, and entrepreneurial centres.
- Agencies, such as Fashion exactamente clothing entrepreneur that should encourage building or subscribing to online marketplaces with inbuilt logistics, customer management, and digital payments. Government incentives in the form of tax relief or grants for SME adopting e-commerce would stimulate such a transition.
- Setting up fashion innovation hubs and digital incubation centres in Rivers State will create collaboration and mentorship, as well as exposure to emerging technologies. Such platforms can link designers with investors, developers, and the global market.
- Financial institutions should design credit products that are suitable for creative entrepreneurs who invest in digital technology. Partnerships with development banks could offer small fashion businesses low-interest loans or innovation grants that can help digitise fashion business operations.

6.2. Limitations of the Study

Although the study is not free of limitations, it deserves valuable contributions. Its focus on fashion companies in Rivers State means that the results cannot be generalised as to how much this could be applicable to other regions or industries. The use of self reported data might also contribute to some level of response bias, whereas the use of cross-sectional design therefore means that the findings reflect relationships at one particular moment rather than longer term effects.

Compliance with ethical standards

Disclosure of conflict of interest

The Authors proclaim no conflict of interest.

References

[1] Adelekan, T., Ogunleye, A., & Olatunji, A. (2022). Digital technology adoption and creative innovation among Nigerian SMEs. *Journal of Business and Entrepreneurship Development, 10*(2), 45–61.

[2] Ahmed, S., Bello, R., & Yusuf, T. (2025). *Artificial intelligence and digital fashion innovation: A review of global best practices*. *Journal of Fashion Technology and Textile Engineering, 12*(3), 45–59.

[3] Alshahrani, F. (2023). *Digital transformation and innovation capability in the creative industries: Evidence from Saudi Arabia*. *Journal of Business Research, 160*, 113–125.

[4] Asongu, S. A., & Odhiambo, N. M. (2022). Digital adoption, innovation and SME competitiveness in sub-Saharan Africa. Technological Forecasting and Social Change, 182, 121844.

[5] BusinessDay. (2025, February 10). How Nigerian fashion entrepreneurs leverage technology to expand local and global markets. https://businessday.ng/life-arts/article/how-nigerian-fashion-entrepreneurs-leverage-technology-to-expand-local-and-global-markets/

[6] Chatterjee, S., Rana, N. P., & Dwivedi, Y. K. (2023). Assessing the impact of digital transformation on innovation in small firms. Information Systems Frontiers, 25(1), 55–73.

[7] Chen, Y., Wang, L., & Lu, Y. (2021). Digital transformation and innovation performance: Evidence from creative industries. Technological Forecasting and Social Change, 164, 120525.

[8] ElanHub. (2023, December 8). Rivers State listed as 7th state with highest number of internet users. https://elanhub.net/rivers-state-listed-as-7th-state-with-highest-number-of-internet-users/

[9] Hameed, W. U., Basheer, M. F., & Anwar, A. (2021). The role of technological innovation in enhancing firm performance: Evidence from SMEs in developing countries. Journal of Innovation & Knowledge, 6(3), 200–210.

[10] Meiqi Textile. (2025). The digital revolution in the global fashion industry. https://www.meiqitextile.com/the-impact-of-digital-transformation-on-the-fashion-industry

[11] Mulyani, A., & Hermawan, A. (2024). E-commerce and organizational readiness: A study of SMEs in Indonesia's creative sector. International Journal of Business and Society, 25(1), 89–105.

[12] Nguyen, T. T., & Luu, H. N. (2023). E-commerce and business innovation: A systematic review. Journal of Retailing and Consumer Services, 73, 103318.

[13] Olajide, S., & Eze, B. (2022). Challenges of digital adoption among Nigerian SMEs. African Journal of Entrepreneurship and Innovation, 6(3), 33–49.

[14] Olowookere, K., & Osho, B. (2023). *E-commerce and innovative performance of small and medium-scale fashion enterprises in Nigeria*. *African Journal of Management Research, 19*(1), 88–104.

[15] Olulu-Briggs, O. V., & Wobo, H. O. (2023). Cash flow, liquidity and capital structure on profitability of quoted manufacturing firms in Nigeria. In *Proceedings of the 7th Annual International Academic Conference on Accounting and Finance Disruptive Technology: Accounting Practices, Financial and Sustainability Reporting Rivers State University of Science and Technology University of Port Harcourt* (pp. 1-17).

[16] Olulu-Briggs, O. V. (2021). Technological innovations, bank liquidity and performance in Nigeria. *International Journal of Intellectual Discourse*, *4*(3), 279-295.

[17] Rogers, E. M. (1962). *Diffusion of innovations*. Free Press.

[18] Sunday, D., & Etugbo, C. O. (2023). Behavioural finance factors and investment decision making in the maritime sector of Nigeria. *European Journal of Accounting, Finance and Investment*, *9*(2), 8–16.

[19] Tornatzky, L., & Fleischer, M. (1990). *The processes of technological innovation*. Lexington Books. Soto-Acosta, P. (2020). COVID-19 pandemic: Digital transformation and SMEs' innovation response. *Journal of Innovation & Knowledge, 5*(4), 269–275.

[20] Tornatzky, L., & Fleischer, M. (1990). *The processes of technological innovation*. Lexington Books.

[21] Vial, G. (2019). Understanding digital transformation: A review and a research agenda. *The Journal of Strategic Information Systems, 28*(2), 118–144.