

-RESEARCH ARTICLE-

DIGITAL TRANSFORMATION AND CUSTOMER LOYALTY IN E-COMMERCE: EXAMINING THE MEDIATING ROLE OF CUSTOMER SATISFACTION THROUGH TRUST AND PERSONALIZATION

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—Abstract—

This study examines the influence of digital transformation (DT) on customer loyalty (CL) within the Saudi Arabian retail context by integrating the effects of artificial intelligence driven personalisation, secure digital platforms, and customer trust on consumer behaviour in an increasingly competitive e-commerce environment. A mixed-methods research design was adopted, combining partial least squares structural equation modelling applied to survey responses collected from 280 consumers in Saudi Arabia with a thematic analysis of 28 in-depth qualitative interviews. The empirical findings indicate statistically significant positive associations between DT, perceived personalisation, and CL, while customer satisfaction (CS) functions as a mediating mechanism linking digitally enabled experiences to CL. Insights derived from the qualitative analysis offer practical value by enhancing understanding of how consumers perceive and interpret digital functionalities, transactional security, and personalised experiences, and how these factors shape enduring relationships with online retailers.

Keywords: Consumer Behaviour, Customer Satisfaction, Customer Trust, Perceived Personalization, Customer Loyalty, Digital Transformation, E-Commerce

INTRODUCTION

Organisations seeking to secure a sustainable competitive position consistently strive to capture a larger share of the market. Achieving this objective requires a continuous process of developing and refining products, services, and operational processes in response to evolving customer expectations. Within this context, DT has emerged as a critical strategic priority across multiple industries as firms attempt to maintain

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competitiveness (Theiri & Alareeni, 2023). In the retail sector, this shift has been particularly pronounced within e-commerce, where interactions between customers and firms are increasingly mediated through digital channels. DT refers to the integration of disruptive technologies such as AI, big data, and automation into organisational processes, fundamentally reshaping how firms engage with consumers (Kraus et al., 2021). These technologies expand consumer choice, simplify purchasing processes, and enable higher levels of Perceived Personalization (PP), thereby reshaping consumer behaviour and strengthening CL (Shankar et al., 2022; Sharma et al., 2023).

Consumers operating in digital markets also demonstrate innovative purchasing patterns, as buying decisions are frequently driven by a combination of functional and experiential benefits. Consequently, CL, understood as a consumer's intention to repurchase from a particular brand, has acquired a more fluid and dynamic meaning in e-commerce environments characterised by rapid transactions. Given the relatively low switching costs and intense competition in digital markets, CL is shaped not only by price and product performance but also by a wider range of experiential and relational factors. Recent empirical evidence suggests that the effective integration of digital tools, including interactive applications and AI-based personalised recommendations, enhances CL by fostering stronger engagement and higher levels of satisfaction (Zhang & Wang, 2023). As a result, retailers increasingly prioritise the provision of secure and personalised digital experiences to support long-term customer retention. Prior research further indicates that digital loyalty is closely linked to consumers' perceptions of the quality of their online experiences, underscoring the need for firms to invest in customer-oriented technologies that can evolve alongside shifting digital expectations (Pappas et al., 2023).

A further dimension of DT is PP, which reflects consumers' perceptions that products, services, and digital interactions are tailored to their individual needs and preferences (Arora et al., 2008; Carl et al., 2024). AI-enabled personalisation and advanced data analytics play a central role in shaping online shopping experiences and, in turn, influencing CL. Prior studies demonstrate that brands offering customised and personally relevant experiences tend to cultivate stronger emotional attachment and more enduring loyalty. However, excessive or poorly targeted personalisation may result in information overload, thereby undermining CT and CS. Accordingly, organisations must carefully balance the depth of customisation with consumer comfort, while continuously leveraging data-driven insights to refine and optimise personalisation strategies (Shankar et al., 2022).

CT represents another key antecedent of CL within e-commerce settings. As emphasised in Trust-Commitment Theory, CT facilitates long-term relational commitment by reducing perceived risk and reinforcing confidence in the brand (Morgan & Hunt, 1994). In digital retail contexts, trust is cultivated through the

provision of secure payment systems, transparent data practices, and reliable service quality, all of which contribute to sustained loyalty. The growing reliance on automated and AI-driven retail formats further heightens the importance of trust-related considerations. (Petcharat et al., 2023) highlight security and transparency as defining features of these formats that directly shape consumer trust in brands. Consequently, digital innovation in online retail must be accompanied by robust trust-enhancing mechanisms, as consumers are unlikely to maintain loyalty if they perceive their personal information to be inadequately protected (Sujood et al., 2024).

Although existing studies have largely concentrated on short-term consumer experiences within digital relationships (Jiang & Stylos, 2021), relatively limited attention has been devoted to examining the long-term effects of DT, PP, and CT on CL through CS (Arora et al., 2008; Jiang & Stylos, 2021). In the conceptual framework underpinning this study, CS serves as the intervening mechanism linking these constructs to consumer loyalty. CS, defined as the extent to which consumer expectations are fulfilled, operates as a critical conduit between digital experiences and sustained brand commitment. Previous research has underscored the central role of CS in fostering long-term loyalty by enabling seamless integration between digital and physical retail journeys. Elevated levels of PP and CT among online shoppers enhance CS, which subsequently strengthens confidence in, and loyalty towards, e-commerce platforms. The importance of CS has been documented across diverse sectors, including banking (Osei et al., 2023; Shang & Niu, 2023), healthcare (Dal Mas et al., 2023; Santarsiero et al., 2023), tourism (Ratna et al., 2024), and manufacturing (Battistoni et al., 2023; Sui et al., 2024). Nevertheless, the present study confines its focus to online retailing in order to develop a more precise understanding of how DT, CT, and PP influence CL through CS.

The primary objective of this study is to examine the relationships between DT, CT, and PP, and their effects on CS and CL within e-commerce contexts. Specifically, the study empirically tests the direct association between DT and CL, alongside the indirect effects of CT and PP on long-term CL. Additionally, it seeks to establish the mediating role of CS in the relationships linking DT, CT, and PP to CL. This study contributes to the existing body of knowledge in several important ways. First, it offers a comprehensive perspective on the long-term implications of digital strategies for CL by explicitly incorporating mediating factors such as CT and CS. Second, by responding to calls for more integrative frameworks, the study addresses a notable gap in the literature by jointly examining DT, PP, and CT within a unified model of loyalty formation. Third, there remains a scarcity of empirical research that directly tests these interrelationships within a single framework, particularly in the context of online retailing, rendering the present study a timely and meaningful contribution to digital retail scholarship. From a practical standpoint, the findings offer valuable guidance for retailers seeking to enhance customer engagement, optimise digital platforms, and

strengthen loyalty in an increasingly competitive online marketplace (Shankar et al., 2022).

LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

The present study is theoretically anchored in the technology acceptance model (TAM) (Davis, 1989), which posits that perceived usefulness and ease of use are the primary drivers underlying individuals' adoption of technological systems. Within this framework, DT is conceptualised as a deliberate and systematic deployment of digital technologies aimed at restructuring organisational processes and enhancing customer experiences. In retail settings, DT commonly involves the integration of AI, big data, and automation to deliver personalised offerings, ensure secure payment mechanisms, and facilitate smooth and consistent customer interactions across digital touchpoints (Kraus et al., 2021). Extant research further extends this perspective by illustrating how DT supports the development of omnichannel and so-called phygital retail models, wherein physical and digital environments are combined to create a unified customer experience that strengthens engagement and retention. The growing reliance on AI for anticipating customer needs and delivering personalised shopping journeys further underscores the pivotal role of DT in shaping e-commerce behaviour (Shankar et al., 2022). From a TAM perspective, such digital initiatives derive their effectiveness from their perceived usefulness and ease of use, which in turn influence satisfaction and intentions toward continued usage. As retailers increasingly embed these digital tools throughout the customer journey, the ongoing enhancement of digital offerings becomes essential for sustaining competitive advantage in dynamic online markets (Zhang & Wang, 2023). Therefore, the following hypothesis was proposed for this research:

H1: *Digital transformation (DT) has a positive effect on customer loyalty (CL).*

DT does not operate as the sole determinant of CS and online CL. CT constitutes an additional and critical factor shaping both CS and loyalty in digital retail environments. CT reflects the set of beliefs consumers develop regarding an online retailer's reliability, security, and integrity. Prior research demonstrates that trust exerts a positive influence on consumers' intentions to repurchase from a brand (Gefen, 2002), a relationship that has become increasingly salient given widespread concerns related to privacy and data protection in contemporary e-commerce contexts. According to the core assumptions of Trust-Commitment Theory, CT reduces perceived risk and fosters commitment, thereby strengthening relational continuity between consumers and firms (Morgan & Hunt, 1994). Empirical evidence further indicates that enhanced privacy safeguards and robust data security infrastructures contribute to the development of CT, which subsequently reinforces CL (Petcharat et al., 2023). In contrast, perceptions of inadequate security or unreliable service provision undermine CT and lead to adverse loyalty outcomes (Quach et al., 2022). From a long-term perspective, the sustainability of e-commerce systems is

therefore contingent upon maintaining high levels of CT among users (Bandara et al., 2021). Consistent with this theoretical logic, the present research proposes the following hypothesis:

H2: *Customer trust (CT) positively influences customer loyalty (CL).*

PP refers to the extent to which a brand's products, services, and communications are perceived by customers as being aligned with their individual preferences and specific needs. Advances in AI and big data analytics have positioned PP as a central driver of CS and CL in digital environments (Arora et al., 2008). From a TAM perspective, personalisation can be interpreted as a value-enhancing feature, as it increases perceived usefulness by delivering more relevant, efficient, and customised online experiences. Nevertheless, personalisation does not universally generate positive outcomes. When personalised content is perceived as intrusive, excessive, or poorly targeted, it may provoke irritation and erode CT rather than enhance it. Personalisation mechanisms, including targeted promotional offers, AI-based recommendation systems, and customised customer service interactions, have the potential to enrich the overall shopping experience by increasing its relevance and enjoyment. When implemented in a manner that corresponds with customer expectations, elevated levels of PP are associated with higher CS and stronger CL (Li et al., 2024). Conversely, personalisation initiatives that lack relevance or appear invasive can undermine CT, highlighting the importance of achieving an appropriate balance in the design and management of personalised digital strategies. Customers who perceive personalisation as meaningful and supportive of their shopping goals are more likely to develop favourable attitudes towards the brand and demonstrate enduring loyalty, as they value the tailored nature of their digital journey (Tosun & Tosun, 2024). In line with this reasoning, the present study proposes the following hypothesis:

H3: *Perceived personalization (PP) significantly affects customer loyalty (CL).*

Consumers' engagement with products, services, and transactional processes generates evaluations of specific attributes associated with these offerings, which in turn shape broader brand-related attitudes. Satisfaction, as one such attitudinal outcome, is defined as the degree to which consumers' expectations are either confirmed or disconfirmed by their experiences (Malki et al., 2024). CS holds a pivotal role in digital retail because it directly contributes to fostering enduring consumer loyalty (Malki et al., 2024). In the context of e-commerce, CS is influenced by multiple experiential and functional factors, including intuitive website navigation, seamless and integrated digital interactions, perceived security of transactions, and the overall quality of the shopping experience (Shankar et al., 2022; Tran & Chang, 2024). Integrating the theoretical lenses of TAM and Trust-Commitment Theory, DT, CT, and PP can be conceptualised as critical antecedents that shape consumers' perceptions of usefulness, usability, and risk, which

subsequently inform satisfaction evaluations and foster loyalty behaviours. Building on this rationale, the study advances the following hypotheses:

H4: *Digital transformation (DT) positively affects customer satisfaction (CS).*

H5: *Customer satisfaction (CS) positively affects customer loyalty (CL).*

H6: *Customer trust (CT) positively affects customer satisfaction (CS).*

H7: *Perceived personalization (PP) positively affects customer satisfaction (CS).*

The study further revealed that CS serves as a mediating mechanism linking each antecedent—DT, CT, and PP—to CL. These results align with prior research, which positions CS as a key intermediary between a firm's digitally mediated interactions and the development of loyalty (Zariman et al., 2022). In this context, CS operates as a positive evaluative construct: when digital systems are perceived as easy to use, they generate favourable experiences that translate into higher satisfaction levels. Consequently, DT, CT, and PP enhance CS, which subsequently strengthens CL.

Consumer responses to marketing and digital engagement initiatives manifest as either product acceptance or rejection, depending on their experiential perceptions. CL reflects a behavioural disposition characterised by repeat purchasing and positive word-of-mouth for brands that consumers trust and relate to. In contemporary e-commerce, CL encompasses not only repurchase intentions and transactional behaviours but also the quality of digital experiences, interactive engagement, and perceived brand trust. Empirical evidence suggests that brands delivering superior digital experiences, trust signals, and personalisation features are more successful in cultivating and maintaining long-term CL in competitive online markets. Firms that prioritise trust-building and tailored experiences are therefore more likely to secure a competitive advantage in fostering loyalty. Sustained success in e-commerce necessitates continuous refinement of offerings to meet evolving customer expectations and reinforce loyalty. Trust-Commitment Theory underscores the critical role of CT in establishing enduring relationships with digital consumers (Morgan & Hunt, 1994), while TAM provides a framework for understanding how consumers assess the usability and value of digital systems and their features. By positioning CS as a mediating construct, this study extends the explanatory capacity of both TAM and Trust-Commitment Theory, examining how DT, CT, and PP collectively influence CS, which in turn drives CL. In line with this integrated theoretical perspective, the following hypotheses are proposed:

H8: *Customer satisfaction (CS) mediates the relationship between digital transformation (DT) and customer loyalty (CL).*

H9: *Customer satisfaction (CS) mediates the relationship between customer trust (CT) and customer loyalty (CL).*

H10: *Customer satisfaction (CS) mediates the relationship between perceived personalization (PP) and customer loyalty (CL).*

Drawing on the preceding literature, this study proposes the following theoretical framework, illustrated in Figure 1.

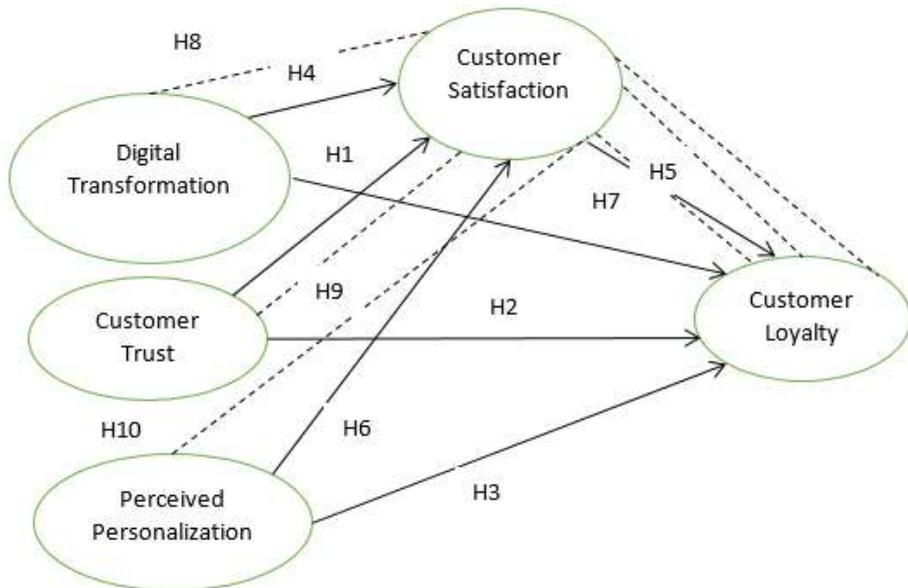


Figure 1: Hypothesized Theoretical Framework (Authors' Own)

RESEARCH METHODOLOGY

This study investigates the impact of DT on consumer behaviour and CL within the Saudi Arabian e-commerce sector. Saudi Arabia was selected due to its high rate of e-commerce adoption and its prominent national agenda promoting DT as a strategic component of economic diversification. A mixed-methods research design was employed to capture detailed individual-level insights while also obtaining statistically generalisable patterns across the key variables under investigation.

Mixed-Methods Design

A concurrent triangulation design was adopted in this study to examine the relationships among DT, CT, PP, CS, and CL. Within this approach, qualitative and quantitative data were collected and analysed simultaneously, with findings compared and integrated to inform interpretation. Triangulation facilitates cross-validation, enhancing the robustness of the results. The qualitative component captures individual consumer experiences, providing insight into the underlying reasons for particular behaviours. In parallel, the quantitative component enables the assessment of hypothesised relationships through statistical analysis. By combining these strands, this triangulation approach strengthens the validity of the findings and allows for the interpretation of convergent, complementary, and clarifying evidence.

Sampling Strategy

Qualitative Sampling: Purposive Sampling

A purposive sampling strategy was employed for the qualitative component, with participants selected based on their experience in e-commerce. Eligibility criteria required participants to have engaged in online shopping within the 12 months preceding the study, ensuring the capture of recent consumer behaviours. A total of 28 semi-structured interviews were conducted with participants located in Jeddah, Saudi Arabia. To obtain diverse insights, participants were drawn from multiple product categories, including fashion, electronics, luxury goods, and household appliances. This approach contributes to the broader understanding of how DT influences CT, PP, CS, and CL across varied e-commerce contexts. Recruitment was conducted through e-commerce online forums, customer review websites, and partner e-commerce platforms active within the KSA. All interviews were conducted virtually via Zoom and Microsoft Teams, each lasting approximately 45–60 minutes. A semi-structured interview guide ensured a consistent set of core questions for all participants while allowing for follow-up probing to explore responses in depth. Data collection continued until thematic saturation was achieved, with no new themes emerging from additional interviews. All sessions were audio-recorded with participants' consent and transcribed verbatim. Peer debriefing was conducted to support theme development and enhance the trustworthiness of the qualitative analysis.

Quantitative Sampling: Stratified Random Sampling

For the quantitative component, a stratified random sampling approach was employed to ensure national-level representativeness. Stratification was applied to preserve proportional representation across key demographic subgroups, including age, gender, and income. The final sample consisted of 280 valid responses, drawn from a total of 550 customers within an e-seller panel, yielding a response rate of 51%. The sampling frame was compiled from multiple e-seller databases, and participants were randomly contacted via online channels such as e-mails and advertisements. The sample size satisfies PLS-SEM requirements, as it exceeds the minimum threshold of ten times the number of items and surpasses the recommended benchmark of 100 participants for models with multiple predictors. To enhance the clarity and reliability of the survey instrument, a preliminary pre-test was conducted with a small group of respondents prior to the main data collection. Feedback from this pre-test was used to refine the questionnaire, improving clarity, cohesion, and ease of comprehension.

Survey Instruments

Validated survey instruments were employed to measure the key constructs in the quantitative component, utilising established scales from prior research:

1. Digital Transformation (DT)
2. Customer Trust (CT)
3. Perceived Personalization (PP)
4. Customer Satisfaction (CS)
5. Customer Loyalty (CL)

Each construct was evaluated using multi-item Likert-type scales derived from established empirical studies, thereby ensuring robust content validity and facilitating comparability with prior research. The corresponding items and their original sources are documented within the questionnaire and can be included in an appendix if mandated by the journal.

Data Collection Procedures

Qualitative Data Collection

Semi-structured interviews were conducted to obtain detailed, context-rich insights into consumer experiences within e-commerce. An interview guide was employed to ensure consistency across sessions while allowing participants the flexibility to discuss their individual experiences in depth. All interviews were audio-recorded with participants' consent, transcribed verbatim, and verified for accuracy and completeness prior to coding and analysis.

Quantitative Data Collection

The online survey was administered to provide respondents with both desktop and mobile access. The questionnaire included measures of DT, CT, PP, CS, and CL, aligned with the study's proposed hypotheses. To minimise social desirability and common method biases, respondents were informed that there were no right or wrong answers and that only aggregated data would be reported. Participants were also assured of anonymity and confidentiality, with data protection measures such as secure storage and restricted access implemented. The study adhered to the institution's ethical guidelines. Participation in both interviews and the survey was voluntary, and prior informed consent was obtained from all participants before data collection.

Data Analysis Approach

Qualitative and quantitative data were analysed separately and subsequently triangulated to derive comprehensive insights.

Qualitative Analysis

Thematic analysis was employed to identify, code, and interpret patterns within the qualitative data. Following initial coding, categories and themes were iteratively refined

and reviewed to ensure they accurately reflected participants' experiences and perspectives. Peer debriefing was undertaken to evaluate and challenge coding decisions and theme interpretations, thereby enhancing the trustworthiness of the analysis.

Quantitative Analysis

The quantitative data were analysed using Partial Least Squares Structural Equation Modelling (PLS-SEM), a suitable technique for handling relatively complex models with small-to-moderate sample sizes. PLS-SEM was chosen due to its robustness against violations of normality and its applicability in prediction-oriented, exploratory research. The analysis commenced with evaluation of the measurement model, assessing reliability as well as convergent and discriminant validity, prior to testing the structural model and examining the hypothesised relationships among DT, CT, PP, CS, and CL. Several diagnostic checks were performed to ensure data quality and validity:

1. Endogeneity tests were conducted to confirm the independence of explanatory variables.
2. Multicollinearity was assessed using Variance Inflation Factor (VIF) values to verify the absence of problematic collinearity.
3. Common Method Bias (CMB) was evaluated through Harman's single-factor test, complemented by procedural remedies such as assuring respondent anonymity and separating key sections within the questionnaire.
4. Bootstrapping with 5,000 resamples was applied to generate stable parameter estimates and assess the significance of direct and indirect effects.

The PLS-SEM approach thus facilitated the testing of hypothesised relationships among DT, CT, PP, CS, and CL, providing statistical validation for the proposed research model, while qualitative findings were used to contextualise and interpret these results.

RESULTS

This section presents the findings from both the qualitative and quantitative analyses. It includes the demographic characteristics of survey respondents and interview participants, the themes identified from the interviews, and the SEM results derived from the quantitative data. Additionally, all assessments of reliability, validity, and potential biases are reported to support the evaluation of the proposed hypotheses.

Profile of Sample

The demographic characteristics of participants who completed the quantitative survey are summarised in [Table 1](#). Most respondents were aged between 24 and 30 years (51%), and the sample was predominantly male (58%). Most participants held a

bachelor’s degree (54%), and 51% reported an annual income ranging from SAR 10,001 to SAR 20,000. Regarding online shopping behaviour, participants demonstrated relatively high engagement, with 55% making purchases online two to three times per month. Overall, the sample represents a young, relatively well-educated group of consumers who are actively engaged in online shopping, aligning with the profile of digitally oriented customers in Saudi Arabia.

Table 1: Demographic Details of Respondents

Demographics	Frequency	Percentage
Age, Years		
24-30	144	51%
31-37	104	37%
38-44	25	9%
45 and Above	7	3%
Gender		
Male	161	58%
Female	119	42%
Education		
Matric/ Intermediate	102	36%
BS	150	54%
Masters	28	10%
Income Level (Annual SAR)		
Below 10,000	99	35%
10,001 to 20,000	143	51%
20,001 to 40,000	30	11%
40,001 and Above	8	3%
Online Shopping		
Once in a Month	92	33%
2-3 Times in a Month	154	55%
Quarterly	35	12%

Qualitative Data: Interviewee Information and Thematic Analysis

Interviewee Information

Interviewee details are presented in [Table 2](#) to provide context for the qualitative findings. The information includes each participant’s age, e-commerce experience, industry sector, and average monthly online expenditure. The sample was purposefully selected to ensure a balanced representation of experiences relevant to e-commerce, including variations in product categories and spending levels. This diversity facilitates a more nuanced understanding of how DT, CT, PP, and CS function across varying e-commerce contexts.

Table 2: Interviewee Information

Age	E-Commerce Experience (Years)	Industry Sector	Average Monthly Spending (SAR)
38	8	Luxury Goods	1,875–2,625
40	10	Fashion	938–1,313
33	8	Home Appliances	1,125–1,500
36	10	Technology	1,125–1,875
42	14	Electronics	938–1,500
47	18	Clothing	1,125–1,875
31	6	Home & Living	938–1,500
42	12	Grocery	563–938
37	9	Education	375–750
50	18	Food & Beverage	375–750
44	15	Automotive	938–1,500
46	20	Education	563–1,125
35	10	Health & Wellness	750–1,125
48	16	Technology	1,500–2,250
29	7	Electronics	1,125–1,875
45	15	Home Appliances	1,500–2,250
34	10	Health Products	563–938
27	5	Clothing	563–1,125
32	7	Sports Equipment	1,125–1,688
38	12	Fashion	938–1,313
40	13	Electronics	1,313–1,688
35	10	Fashion	750–1,500
31	5	Technology	1,125–1,500
28	6	Electronics	750–1,125
41	14	Retail	1,500–2,250
39	12	Grocery	750–1,125
29	6	Luxury Goods	1,875–3,000
33	8	Food & Beverage	563–1,125

Thematic Analysis of Qualitative Data

Thematic analysis of the interview transcripts revealed four principal themes: DT, CT, PP, and the impact of CS on CL. Representative participant quotes were selected to exemplify key points within each theme and to enhance the rigor of the findings.

Theme 1: Perception of Digital Transformation

Respondents highlighted an increasing dependence on AI-driven product recommendations, mobile shopping applications, and secure payment systems in shaping their online shopping experiences. One participant stated, “Online shopping has become more convenient and personalized. With AI recommendations, I can quickly find what I need.” Several respondents also emphasised the advantages of integrated applications and real-time order tracking, indicating that these features enhance

perceived usefulness and ease of use, thereby promoting repeated engagement with specific platforms.

Theme 2: Trust in E-Commerce Platforms

Trust in digital transactions emerged as a recurrent theme among participants. Concerns centred primarily on payment security and data protection. One participant remarked, “I would choose a site to shop on based on whether I know my payment information will be safe. Trust is the name of the game when it comes to online shopping.” Several interviewees noted that prior negative experiences, such as fraud or delayed deliveries, reduced their willingness to engage with certain platforms. These insights underscore that trust is fragile and can be quickly undermined if security measures or reliable product and service delivery are not maintained.

Theme 3: Importance of Personalized Shopping Experiences

Respondents indicated that personalised recommendations and offers enhance satisfaction with their shopping experiences and influence repurchase intentions. One participant noted, “I always return to the same websites because they know what I like. The recommendations are spot on.” However, some interviewees expressed concerns regarding the intrusiveness of certain personalised features, suggesting that personalisation is positively received when it is perceived as useful and relevant, but can be counterproductive if it is seen as intrusive or overstepping personal boundaries.

Theme 4: Role of Customer Satisfaction in Loyalty

Consumers emphasised their preference for online platforms that provide intuitive navigation, prompt delivery, and responsive customer service. One participant stated, “I am loyal to sites that make the whole process easy and fast. If I have a problem, I want it to be solved quickly.” Interviewees also frequently associated positive experiences with their willingness to recommend the platforms to others, indicating that CS may mediate the relationship between digital service quality and long-term CL. Collectively, these themes correspond closely with the conceptual model, demonstrating how perceived digital capabilities, CT, PP, and CS interact to shape loyalty-related behaviours.

Quantitative Analysis

PLS-SEM (Partial Least Squares Structural Equation Modelling) was employed to analyse the quantitative data. Prior to evaluating the structural paths, the measurement model was assessed for internal consistency, as well as convergent and discriminant validity.

Reliability and Validity Analysis

Construct reliability and validity were confirmed using multiple criteria.

- 1. Internal Consistency:** As shown in Table 3, Cronbach’s alpha and Composite Reliability (CR) values for all constructs exceeded the recommended minimum of 0.70, demonstrating strong reliability.
- 2. Convergent Validity:** As shown in Table 3, Average Variance Extracted (AVE) values for each construct surpassed 0.50, indicating that the latent variables account for the majority of variance in their respective indicators.
- 3. Discriminant Validity:** As shown in Table 4, the Fornell-Larcker criterion was satisfied, with the square root of AVE (highlighted on the diagonal in bold) exceeding correlations with other constructs.

Table 3: Reliability and Validity of Measurement Model

Construct	No. of Items	Cronbach’s Alpha	Composite Reliability (CR)	Average Variance Extracted (AVE)
Digital Transformation	7	0.847	0.882	0.641
Customer Trust	6	0.855	0.889	0.652
Perceived Personalization	5	0.835	0.868	0.618
Customer Satisfaction	5	0.829	0.861	0.612
Customer Loyalty	7	0.864	0.902	0.654

Notes: Cronbach’s Alpha, Composite Reliability (CR), and Average Variance Extracted (AVE) values indicate strong internal consistency and convergent validity for all constructs.

Table 4: Correlation, Discriminant Validity, and Model Fit Indices

Construct	Mean	S.D.	DT	CT	PP	CS	CL
Digital Transformation	5.40	0.76	0.79	0.591**	0.651**	0.623**	0.634**
Customer Trust	4.97	0.73	0.61	0.75	0.545**	0.623**	0.661**
Perceived Personalization	4.81	0.74	0.58	0.62	0.71	0.652**	0.641**
Customer Satisfaction	4.75	0.77	0.65	0.67	0.76	0.69	0.596**
Customer Loyalty	4.84	0.75	0.69	0.71	0.65	0.59	0.73
Model Fit Indices	Range	Obtained					
χ^2/df	5.00	2.910					
RMSEA	0.08	0.062					
NFI	0.90	0.935					
CFI	0.90	0.931					
GFI	0.90	0.933					

Notes: S.D. = Standard Deviation; ** denotes statistically significant correlations; bold diagonal values represent discriminant validity. The reported model fit indices demonstrate that the model adequately fits the data.

Diagnostic Tests

Endogeneity Test

Instrumental variable techniques, along with the inclusion of relevant control variables, were employed to assess potential endogeneity. The findings indicate that the explanatory variables are exogenous, suggesting that endogeneity does not pose a significant risk of biasing the estimated relationships.

Multicollinearity Test

As Sown in [Table 5](#), VIF values for all constructs were below the commonly accepted threshold of 5, indicating that multicollinearity is not an issue.

Table 5: Multicollinearity Test Results (VIF Values)

Variable	VIF
Digital Transformation	1.92
Customer Trust	1.85
Perceived Personalization	1.97
Customer Satisfaction	1.88
Customer Loyalty	2.10

Common Method Bias (CMB)

The results of Harman's single-factor test indicated that no single factor accounted for more than 50% of the variance, suggesting that common method bias was minimal. This statistical evidence aligns with the procedural remedies described in the Methodology section, including assurances of participant anonymity and the separation of items into distinct sections.

Distributional Assumptions

Skewness and kurtosis analyses indicated minor deviations from normality, which remained within acceptable limits for PLS-SEM. Bootstrapping with 5,000 resamples was performed to generate robust standard errors and confidence intervals for the parameter estimates.

Structural Equation Modelling

The structural model results indicate that DT, CT, PP, and CS are all significantly associated with CL. [Table 6](#) presents the path coefficients for these relationships, confirming support for all hypothesised direct effects. The standardised path coefficients, ranging approximately from 0.38 to 0.48, indicate relatively strong effects of DT, CT, and PP on both CS and CL in this context. Alongside acceptable model fit indices and diagnostic assessments, these findings underscore the substantive explanatory power of the proposed model for understanding CS and CL within the Saudi

e-commerce environment.

Table 6: Structural Model Path Coefficients

Path	Standardized Coefficient (β)	Unstandardized Coefficient	S.E.	T-Value	P-Value	Decision
Digital Transformation → CL	0.423**	0.78	0.078	5.423	< 0.001	Supported
Customer Trust → CL	0.402**	0.73	0.073	5.507	< 0.001	Supported
Perceived Personalization → CL	0.378**	0.68	0.068	5.559	< 0.001	Supported
Customer Satisfaction → CL	0.409**	0.62	0.062	6.597	< 0.001	Supported
Digital Transformation → CS	0.460**	0.69	0.069	6.479	< 0.001	Supported
Customer Trust → CS	0.410**	0.71	0.071	6.479	< 0.001	Supported
Perceived Personalization → CS	0.480**	0.79	0.079	6.479	< 0.001	Supported

Notes: ** and *** denote statistically significant values. Both the standardised and unstandardised coefficients, together with the corresponding t-values and p-values, indicate the significance of the relationships between the examined variables.

Mediation Analysis

Mediation analysis was conducted to examine whether CS mediates the relationships between DT, CT, PP, and CL. Table 7 presents the indirect effects along with their corresponding significance levels. The model fit indices for the mediation model ($\chi^2/df = 2.83$, RMSEA = 0.063, CFI = 0.952, GFI = 0.954, NFI = 0.936) indicate a strong overall fit, confirming that CS mediates the relationships between DT, CT, and PP with CL. These findings highlight the critical role of CS as a mediating factor, demonstrating how digital capabilities, trust, and personalization collectively influence the development of long-term loyalty in Saudi Arabia’s e-commerce sector.

Table 7: Mediation Results for Hypotheses H8, H9, and H10

Path	Estimates	S.E.	Z-Score	P-Value	Decision
Digital Transformation → CS → CL	0.39**	0.072	2.60	< 0.001	Supported
Customer Trust → CS → CL	0.42**	0.075	2.58	< 0.001	Supported
Perceived Personalization → CS → CL	0.46**	0.071	2.63	< 0.001	Supported

Note: **, *** = Significant Values.

DISCUSSION

The theoretical foundation of this study is grounded in TAM. The research aimed to examine the impact of DT, CT, and PP on CL, with CS serving as a mediating variable. The findings demonstrate that all variables exert statistically significant effects on consumer behaviour in the Saudi retail sector. Specifically, firms prioritising digital

tools—such as CRM systems, data security measures, and hyper-personalization—were more likely to retain customers over extended periods. The integration of qualitative and quantitative approaches further strengthened the robustness of the results and provided a more detailed understanding of the current significance of DT.

The qualitative findings broadly corroborate the quantitative outcomes. Themes of digitisation, trust, and personalisation were consistently highlighted, with participants emphasising the value of customised product recommendations and secure checkout processes as drivers of engagement and repeat purchases. Conversely, some participants expressed concern about data misuse and security, highlighting that positive online experiences depend on sustained transparency and consumer control. Quantitative results partially reveal the critical role of DT on CL ($\beta_1 = 0.423$, $p < 0.01$), confirming that firms emphasising DT can create sustained value and competitive advantage in a digital retail environment that is increasingly real-time and pervasive. This finding aligns with global trends in digitisation, including AI-powered chatbots, automated checkout systems, and real-time customer support, which enhance the TAM constructs of perceived usefulness and ease of use. The overlap between online and offline shopping further emphasises the need for seamless and flexible customer service operations. The substantial effect of DT is also influenced by contextual factors specific to Saudi Arabia, such as advanced infrastructure and high smartphone penetration, which could be further explored through comparative studies.

The study also contributes by examining the significant effects of CT and PP on CL. CT was positively associated with CL ($\beta_2 = 0.402$, $p < 0.01$), highlighting the importance for businesses to implement stringent security measures and transparent data privacy policies. Ensuring safe transactions and protecting consumer privacy are critical for building trust, particularly in digital purchases where direct human interaction is limited (Petcharat et al., 2023). Similarly, PP was found to significantly influence CL ($\beta_3 = 0.378$, $p < 0.01$). Consumers tend to demonstrate loyalty when they perceive personalised experiences, consistent with prior research linking personalisation to long-term loyalty. Within TAM, personalisation enhances perceived usefulness by facilitating more relevant and efficient exchanges. However, qualitative findings also indicate that over-personalisation or poorly targeted personalisation can cause information overload and privacy concerns, potentially undermining trust. Retailers must therefore carefully differentiate personalisation strategies and communicate data usage practices effectively.

Overall, these results indicate that DT, CT, and PP are robust and generalisable determinants of CL in e-commerce settings. Leveraging these factors enables firms to improve customer retention, strengthen differentiation, and foster long-term relationships. The study contributes theoretically by proposing a taxonomy of relevant concepts and linking the main drivers of consumer behaviour through a conceptual

model in which CS functions as a significant mediating pathway. These findings provide a foundation for future research on digital loyalty across different cultural contexts and industry sectors, while also offering practical insights for practitioners navigating the rapidly evolving digital retail landscape.

IMPLICATIONS OF RESEARCH

This research advances the academic understanding of digital transformation, e-commerce, and CL within the retail and consumer services sectors in Saudi Arabia. It builds on prior studies by empirically validating the influence of AI-driven personalization, mobile technologies, and secure digital platforms on CL. Whereas previous research largely emphasised the operational efficiency of digital tools, this study shifts focus to their role in promoting sustained consumer engagement and long-term loyalty, thereby broadening the conceptualisation of DT in retailing. This approach provides a clearer understanding of how technology contributes to enhanced consumer experiences and stronger brand attachment (Zhang & Wang, 2023). From a theoretical standpoint, the study extends Trust-Commitment Theory by empirically establishing CT as a precursor of loyalty in e-commerce transactions (Morgan & Hunt, 1994). It aligns with prior work highlighting transaction security and data protection as mechanisms for trust-building, particularly in contexts where cybersecurity is perceived as a significant market risk (Kawa & Zdrenka, 2024). The findings further demonstrate that trust in privacy-protecting and secure digital systems is essential for cultivating long-term customer relationships, reinforcing that loyalty is an outcome of trust (Petcharat et al., 2023).

The study also underscores the mediating role of CS between DT and CL, offering a nuanced perspective on how digital transformation influences brand commitment. These findings are consistent with prior research that identifies satisfaction as enhancing consumer–brand relationships and promoting loyalty (Camilleri & Filieri, 2023). Unlike much of the existing literature, which examines these constructs in isolation, this research integrates them within a comprehensive end-to-end model. The results confirm that CS acts as a reinforcing driver, amplifying the impact of firms’ digital initiatives and highlighting the importance of systematically measuring and enhancing satisfaction to maximise the effectiveness of digital investments. In addition to theoretical contributions, the study provides practical implications for organisations operating within Saudi Arabia’s e-commerce sector. The KSA, as a member of the Gulf Cooperation Council (GCC), is among the most progressive countries in terms of regional collaboration on digitalisation, cybersecurity, and economic diversification beyond petroleum (Elrahmani et al., 2021; Khan & Al-Ghamdi, 2023). At a regional level, DT can support innovation, adaptation, and more personalised customer engagement, while also contributing to economic development and consumer well-being.

The findings indicate that organisations should invest in digital services, particularly AI-enabled personalisation tools and secure payment technologies. Consumers value tailored experiences and require confidence in the security of digital platforms to maintain long-term relationships. Localised digital solutions addressing security concerns can provide a key source of competitive advantage (Cachero-Martínez & Vázquez-Casielles, 2021). Furthermore, companies must actively manage cybersecurity risks through robust data privacy and security policies. Transparent and effective cybersecurity practices strengthen consumer trust and enhance market positioning in Saudi Arabia's increasingly digitised environment. Finally, in light of CS's mediating role between DT and CL, firms should continuously enhance the overall customer experience. Delivering a seamless, integrated, and highly personalised shopping experience will be essential for differentiating in a competitive digital marketplace and converting digital investments into sustained long-term loyalty.

LIMITATIONS AND FUTURE DIRECTIONS

The present study is subject to several limitations that should be considered in future research. Firstly, the sample is confined to Saudi Arabia, which restricts the generalisability of the findings. Future studies could extend the analysis to other regions, including Western, Asian, and emerging economies, to examine whether the identified relationships hold across diverse cultural, regulatory, and economic contexts. Secondly, the research specifically focused on DT, PP, and CT within the e-commerce setting. While these constructs capture key aspects of digital engagement, other digital attributes—such as blockchain-based payment systems, virtual or augmented reality, and ongoing advancements in AI—may also influence CL and warrant investigation in future studies, particularly in rapidly evolving digital environments. Thirdly, the cross-sectional design of this study limits the ability to draw causal inferences and constrains understanding of the dynamic formation of CL over time. Longitudinal research could provide richer insights into how CL evolves in response to sustained digital innovation and changing consumer behaviours. Furthermore, reliance on self-reported survey data introduces potential biases, including social desirability and common method variance, despite the procedural and statistical controls applied. Future research could address these limitations by incorporating multi-source data, such as behavioural or transactional records, or by employing experimental or longitudinal designs to strengthen causal inference and mitigate method-related concerns.

CONCLUSION

This research systematically examines factors influencing the relationship between DT and CL in Saudi Arabia, addressing a gap in the literature by emphasising the roles of AI-driven personalization, secure digital platforms, and CT. Findings show that organisations investing strategically in digital innovations and data security are better equipped to meet evolving consumer expectations and sustain competitiveness. Beyond

DT, both CT and PP have significant direct effects on CL, while CS is critical for long-term loyalty. The study highlights the need for firms to enhance online experiences through personalised recommendations, intuitive interfaces, and secure transactions. Theoretically, the research extends existing models by integrating DT, CT, PP, and CS into a comprehensive framework for understanding CL, offering a nuanced view of consumer behaviour in digital markets. Practically, it provides actionable insights for managers, stressing investments in AI engagement tools, robust cybersecurity, and seamless omnichannel experiences to retain customer loyalty. Future research could explore emerging technologies such as blockchain, virtual reality, and advanced AI, and expand to Western, Asian, and other emerging markets to examine cross-cultural and socio-economic influences on digital engagement and loyalty.

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