Proceedings of the Design Society, Volume 5: ICED25
https://doi.org/10.1017/pds.2025.10121

Customer engagement, digitalization, and business performance: a model for digital startups

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ABSTRACT: Customer engagement is crucial for success and innovation in digital businesses, but its impact on digital startups, particularly on business performance, is underexplored. This study investigates the relationship between customer-related digitalization factors, engagement, and business performance. Using a cross-sectional survey and Partial Least Squares Structural Equation Modeling, data from 125 startups were analyzed. The findings reveal that digitalization factors, encompassing Data Security, Transparency, Consumer Reviews, and Effective Communication, significantly impact customer engagement and digital business performance. Additionally, customer engagement mediates the relationship between digitalization factors and digital business performance, highlighting its critical role in fostering customer loyalty, communication, and co-creation.

KEYWORDS: customer centricity, digital business, technology, entrepreneurship, innovation

1. Introduction

Advancements in digital technologies have reshaped businesses (Klein & Todesco, 2021). In certain industries (e.g., music) and among major digital companies (Netflix), digital technologies have completely transformed market dynamics (Soto-Acosta, 2020). Traditional companies, in response, have tried to accelerate their digitalization paces, adapting their business models to embrace an ambidexterity strategy that combines physical and digital capabilities (Soto-Acosta, 2020).

A notable phenomenon associated with digitalization is the proliferation of startups, which are critical in driving economic development, particularly in industries such as technology, health, and finance (Startup Genome, 2020). Many startups leverage digital technologies to implement novel business models that enhance resource use and efficiency. In these cases, digital technologies trigger fundamental changes in business and generate revenues (Verhoef et al., 2019).

Digital technologies have also influenced the relationship between companies and their customers (Crittenden et al., 2019; Klein & Todesco, 2021). These technologies enable companies to reach and engage many customers through social media and digital communication channels (Crittenden et al., 2019), creating opportunities for building closer relationships with them (Ansong & Boateng, 2019; Grover & Kohli, 2013).

Customer engagement (CE) is crucial for digital businesses (Klein & Todesco, 2021). CE is defined as the behavioral manifestations of customers toward a brand or firm that go beyond purchasing, driven by motivational factors (Van Doorn et al., 2010). It encompasses ongoing communication between companies and their customers, amplifying customers' physical, psychological, and emotional investments in the company or brand (Brodie et al., 2011). Given its significance, CE is linked to various marketing outcomes, including customer satisfaction (Youssef et al., 2018), loyalty (Bakhtieva, 2020; Crittenden et al., 2019; Garg et al., 2020), customer rapport (Chen et al., 2018), and the acquisition of new customers.

https://doi.org/10.1017/pds.2025.10121 Published online by Cambridge University Press

In digital businesses, fostering CE has become a strategic priority and a critical driver of long-term success (Brodie et al., 2011). Digital startups should craft and implement strategies to effectively connect with and engage their customers in the virtual realm. For example, leveraging data-driven insights and utilizing diverse communication channels can help create personalized experiences that strengthen customer relationships (Verhoef et al., 2019).

While the entrepreneurship literature has explored various aspects of digital business dynamics, such as digital entrepreneurship development (Jafari-Sadeghi et al., 2021; Ladeira et al., 2019), it has yet to examine the role of CE in digital businesses comprehensively. Specifically, there is a lack of a consolidated understanding of how digital startups perceive and address the impact of CE. From a design perspective, this gap aligns with the importance of creating customer-centric digital solutions that enhance engagement and business performance.

This study aims to empirically assess the relationship between customer-related digitalization factors (DIF), CE, and digital business performance (DBP). A structural model was developed to depict the interactions between DIF, CE, and DBP. Furthermore, the mediating role of CE was analyzed. Data was collected through a cross-sectional survey of 125 Brazilian digital startups and evaluated using Partial Least Squares Structural Equation Modeling (PLS-SEM). Brazilian startups are notable for their emphasis on digitalization and customer-centric strategies, which they leverage to achieve market differentiation (da Rosa et al., 2017).

This study's contributions are twofold. First, it advances existing research by emphasizing a customer-centric perspective in digitalizing business models, shedding light on how digital startups can leverage customer engagement to enhance their business strategies. Second, it highlights the mediating role of CE in the relationship between digitalization and digital business performance, offering new insights into how CE influences the outcomes of digital transformation.

This paper is structured as follows: Section 2 outlines the research hypotheses and presents the conceptual model. Section 3 describes the research methodology, followed by the presentation of results in Section 4. Section 5 discusses the findings, and Section 6 offers a conclusion of this study.

2. Hypothesis development

2.1. Digitalization and business performance

The literature presents different customer-related digitalization factors that influence CE and shape the dynamics of digital businesses within the entrepreneurship context. Four key factors that impact the relationship between CE and digital business are outlined in Table 1. Essentially, companies should tailor their strategies and practices based on these factors to foster long-term relationships with customers.

Table 1. Customer-related digitalization factors

Factor	Description	Source
Data security	It refers to data protection during storage and ensuring its secure deletion when necessary. Compliance with regulations to protect sensitive data fulfills legal requirements and enhances the relationship between customers and businesses by demonstrating respect for customers' rights.	(Abou-Elgheit 2013; Ansong & Boateng, 2019; Fischer-Hübner et al., 2009; Liu et al., 2015; Susanto et al. 2018; Verhoef et al. 2019)
Transparency	It involves disclosing to customers how their data will be utilized, including any additional functions not previously disclosed. Businesses can benefit from three main types of data: customer profiles on social media, web browsing behavior, and sensitive personal information.	(Ansong & Boateng, 2019; Athanasopoulou et al. 2016; Baird & Raghu 2015; Fischer-Hübner et al., 2009; Konya-Baumbach et al. 2019; Liu et al., 2015)

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Table 1. Continued.

Factor	Description	Source
Customer review	Customers review solutions or recommend them to other potential customers. Companies should empower their market reputation through customer reviews, which can be either active (e.g., word-of-mouth to relatives and friends) or passive (e.g., rating companies through social media).	(Abou-Elgheit 2013; Fischer-Hübner et al., 2009; Konya-Baumbach et al. 2019; Schulz et al., 2019; Susanto et al. 2018)
Effective communication	Information is exchanged between customers and companies using different communication channels. Facilitating communication among different customer groups is integral to the value proposition of digital businesses, enabling the exchange and creation of value.	(Freitas Junior et al., 2017; Grover & Kohli, 2013; Schulz et al., 2019)

DIF has significantly influenced how companies retain, co-create, and communicate with their customers. However, anecdotal evidence suggests that many businesses still encounter what is known as the "digitalization paradox" (Gebauer et al., 2020; Guo et al., 2023). This paradox refers to a situation where companies invest heavily in digitalization and digital offerings but struggle to achieve the anticipated revenue growth despite the well-documented potential of digital technologies to drive growth (Guo et al., 2023). Several studies (e.g., Gebauer et al., 2020; Guo et al., 2023) have highlighted this issue, attributing it to challenges in managing business models and a lack of customer-centricity as primary contributing factors. Therefore, to explore the impact of customer-related digitalization factors on digital business performance, we propose the following hypothesis:

H1 - Customer-related Digitalization Factors (DIF) positively impact Digital Business Performance (DBP).

2.2. Digitalization and customer engagement

While improving CE through digital technologies is widely regarded as a key component of a customer-centric strategy, the impact of DIF on CE remains underexplored (Sashi, 2020). To investigate the influence of DIF on CE, we propose the following hypothesis:

H2 - Customer-related Digitalization Factors (DIF) positively impact Customer Engagement (ENG) in Digital Businesses.

2.3. Customer engagement and digital business performance

Literature suggests CE significantly influences financial and non-financial business performance (Chen et al., 2018; Santini et al., 2020). CE is even more critical for maintaining competitiveness in digital businesses, as it directly impacts firm performance, behavioral intentions, and word-of-mouth (Santini et al., 2020). Additionally, CE reflects the co-creation process between providers and customers, which has financial implications for the organization and its customers (Brodie et al., 2011). While the performance outcomes of CE have been explored in the literature, this study focuses on the potential mediating role of CE between DIF and DBP. As highlighted earlier, it is crucial to clarify the impact of DIF on DBP (Gebauer et al., 2020; Guo et al., 2023). This investigation extends the existing research by considering CE as a mediator in this relationship. To provide empirical evidence on the interplay between DIF, CE, and DBP, we propose the following hypotheses:

H3 - Customer Engagement (ENG) positively impacts Digital Business Performance (DBP).

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H4 - Customer Engagement (ENG) mediates the relationship between Digitalization Factors (DIF) and Digital Business Performance (DBP).

3. Research methodology

3.1. Data collection and sample

We conducted a survey following the procedures Forza (2002) and Malhotra and Grover (1998) suggested. Brazilian digital startups were selected for this study due to their significant role in innovation and growth within the Brazilian market (Carrilo, 2020). We analyzed reports of active startups and innovation ecosystems in Brazil to identify potential participants, compiling contact information for 968 startups. We then sent invitation emails to these startups, utilizing the Qualtrics platform to distribute the survey link over five months, with reminder emails to increase response rates.

After excluding incomplete or inconsistent responses, 125 valid responses were retained, meeting the sample size requirements of three methods: (1) a sample size ten times greater than the number of internal correlations (Hair Jr et al., 2016), (2) the minimum R-squared method (Hair Jr et al., 2016; Kock & Hadaya, 2018), and (3) the inverse square root method (Kock & Hadaya, 2018), confirming the adequacy of the sample for analysis.

The survey questionnaire was divided into two sections. The first section included multiple-choice questions designed to characterize digital startups. The startups in our sample spanned 15 sectors, including healthcare (26.40%), information technology (IT) (18.40%), and energy (9.60%). Most respondents held senior management (65.60%) or director (24%) positions, making them key informants. And 60% of the startups operated in the Business-to-Business (B2B) market.

The second section of the questionnaire focused on the proposed conceptual model. Respondents rated their agreement using an eleven-point Likert scale, ranging from 0 ("strongly disagree") to 10 ("strongly agree"), as recommended by Wu & Leung (2017).

To ensure the quality of the measure, we followed the guidelines of Sarstedt et al. (2019), using an extensive theoretical background and seeking expert feedback. Specifically, two rounds of validation were conducted. Seven specialists - four from academia and three from industry - reviewed the questionnaire for (i) the content of the theory-related questions and (ii) the clarity of wording and item purpose to ensure respondents could easily comprehend each question. Based on their feedback, we made improvements and conducted a pilot test with five digital startups to validate the questionnaire further.

3.2. Operationalization of variables

Construct scales were developed following Hinkin's (1988) recommendations. Multiple measurement items were considered for each research construct and selected based on the relevant literature. The independent construct, DIF, is a higher-order construct comprising four first-order constructs: data security (DS), transparency (TR), customer review (CR), and effective communication (EC), as outlined in Section 2.1. The dependent construct, DBP, is a first-order reflective construct that comprises six items based on different performance measurements. Similarly, the mediating variable, "engagement" (ENG), is also a first-order construct, referring to loyalty (or retention), communication, and co-creation. Table 2 provides the manifested variables associated with each construct.

Table 2. Constructs and variables

Construct	Variable	Source
Data Security (DS)	DS is fundamental to providing my digital solution DS impacts my customers' engagement. DS of my solution is recognized as excellent for my customers. My startup considers DS in its operation. My startup has a policy to control and exclude data. My startup provides DS's guarantees.	Abou-Elgheit (2013), Ansong & Boateng (2019), Fischer-Hübner et al. (2009), Konya-Baumbach et al. (2019), Liu et al. (2015), Susanto et al. (2018),

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Table 2. Continued.

Construct	Variable	Source
Transparency (TR)	TR is fundamental to providing my digital solution. TR impacts my customers' engagement. TR of my solution is recognized as excellent for my customers. My customers have concerns about data utilization and disclosure. Since the beginning, my startup has clarified which data is needed and for what purposes. My startup offers compensation politics as an incentive for data sharing.	Ansong & Boateng, 2019, Athanasopoulou et al. (2016), Baird & Raghu (2015), Fischer-Hübner et al. (2009), Konya-Baumbach et al. (2019), Liu et al. (2015)
Customer Review (CR)	CR is fundamental to providing my digital solution CR impacts my customers' engagement. CR of my solution is recognized as excellent for my customers. My startup follows social media indicators. My startup considers that social media indicators affect its image in the market. My startup considers that consumer reviews affect its image in the market.	Ciasullo et al. (2020), Fischer-Hübner et al. (2009), Konya-Baumbach et al. (2019), Schulz et al. (2019), Susanto et al. (2018)
Effective Communication (EC)	EC is fundamental to providing my digital solution. EC impact my customers' engagement. EC of my solution is recognized as excellent for my customers. My startup considers that its current communication channels are enough. My startup answers' velocity is considered appropriate. My customers' experience with the startup communication channels is considered good.	(Ciasullo et al., 2020; Grover & Kohli, 2013; Schulz et al., 2019)
Digital Business Performance (DBP)	The profit of my startup is considered satisfactory compared to my competitors. The market share of my startup is considered satisfactory compared to my competitors. The number of customers at my startup is considered satisfactory compared to my competitors. The sales growth percentage of my startup is considered satisfactory compared to my competitors. The recurring sales percentage of my startup is considered satisfactory compared to my competitors. Cancelation or loss of customers is a percentage of my startup that is considered satisfactory compared to my competitors.	Dangelico (2017), Dias et al. (2021), Feng et al. (2018), Tjahjadi et al. (2020)
Engagement (ENG)	I am satisfied with my level of engagement considering customers' loyalty (or retention) Considering my communication with customers, I am satisfied with my level of engagement. I am satisfied with my level of engagement in considering suggestions for improvement to my customers' solutions.	Bakhtieva (2020), Chen et al. (2018), Crittenden et al. (2019), Garg et al. (2020)

3.3. Data analysis

We used PLS-SEM for quantitative data analysis due to its suitability for handling non-parametric statistics and small samples, providing accurate insights into the relationships among the constructs (Hair Jr et al., 2011, 2019). PLS-SEM is widely accepted in various research areas, including marketing and business (Hair Jr et al., 2014).

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Data analysis followed the two steps outlined by Hair et al. (2019) and Hair Jr et al. (2016), supported by SmartPLS© software (Ringle et al., 2015). We assessed the measurement model for reliability and validity in the first step. In the second step, we evaluated the structural model using parameters such as collinearity (VIF), determination coefficient (R^2), effect size (f^2), and predictive relevance (Q^2) (Hair Jr et al., 2016). Hypotheses were validated or refuted based on path coefficients and significance levels (Hair Jr et al., 2016).

3.4. Reliability and validity

We assessed the measurement model for reliability and validity. For reliability, we evaluated item consistency using Composite Reliability, with values ranging from 0.819 to 0.899, surpassing the recommended threshold of 0.70 (Hair et al., 2011, 2019; Hair Jr et al., 2016). For convergent validity, we examined outer loadings, and the Average Variance Extracted (AVE) (Fornell & Larcker, 1981). Most outer loadings exceeded the 0.70 threshold, and those between 0.40 and 0.70 were acceptable as they did not affect the final AVE value (Hair et al., 2019; Hair Jr et al., 2016). Additionally, AVE values exceeded 0.50, indicating good convergent validity (Table 3).

Table 3. Reliability, convergent validity, and divergent validity

	DS	TR	CR	EC	DIF	ENG	DBP
DS	**0.720**						
TR	0.545	**0.726**					
CR	0.228	0.430	**0.751**				
EC	0.436	0.407	0.227	**0.734**			
DIF					**0.731**		
ENG					0.216	**0.865**	
DBP					0.420	0.335	**0.722**
CR	0.840	0.843	0.885	0.847	0.819	0.899	0.864
AVE	0.518	0.527	0.565	0.539	0.534	0.748	0.521

Note 1: The diagonal contains the AVE square root, higher than the correlation among variables.

Discriminant validity refers to the extent to which a construct is distinct from other constructs (Hair Jr et al., 2016). We assessed this using two criteria: Fornell and Larcker's criterion (1981), which compares the square root of AVE with the correlations of latent variables, and the HTMT (Heterotrait-monotrait ratio) criterion, which should be below 0.85 (Hair et al., 2019). In our study, the square root of AVE values exceeded the correlations (Table 3), and all HTMT values were below 0.85 (Table 4), confirming the discriminant validity of our model.

Table 4. HTMT's criterion analysis

	DS	TR	CR	DIF	DBP
TR	0.704				
CR	0.284	0.525			
EC	0.498	0.543	0.342		
ENG				0.268	0.402
DBP				0.533	

4. Results

We evaluated the structural model using the two-stage disjoint procedure for second-order constructs, as Sarstedt et al. (2019) recommended. The results are presented in Figure 1 and Table 5. The first step involved checking for collinearity by analyzing the inner variance inflation factor (VIF) values for the predictor constructs that form the DIF construct (Hair Jr et al., 2016). As shown in Table 5, all VIF values are below the conservative threshold of 3.0 (Hair et al., 2019), indicating that our model is free from collinearity issues.

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We assessed the model's predictive capacity and the constructs' relationships (Hair Jr et al., 2016). According to Cohen (1988), the determination coefficient (R^2) values indicate the predictive strength of the model: substantial ($R^2 > 0.26$), moderate ($0.13 < R^2 < 0.25$), and weak ($R^2 < 0.12$) for social sciences. Table 5 shows a moderate influence of DIF on the exogenous construct DBP ($R^2 = 23.9\%$, R^2 Adj = 22.6%). However, our model has limitations in predicting the behavior of the ENG construct ($R^2 = 0.047$), suggesting that other unexamined variables may influence the variance of ENG.

In addition to R^2 values, we also examined the effect size (f^2) and predictive relevance (Q^2). The effect size values in our model range from 0.049 to 0.166, with values above 0.02 considered medium and those above 0.15 considered high (Hair Jr et al., 2016). For Q^2, values greater than zero indicate predictive relevance (Hair et al., 2011, 2019). We obtained Q^2 values of 0.107 for DBP and 0.029 for ENG, with an omission distance of seven, confirming that our model demonstrates predictive relevance.

The path coefficients and corresponding significance levels (p-values) were calculated using a bootstrapping procedure with 5,000 subsamples (Hair et al., 2016). The results, presented in Table 5, confirm the validation of the following hypotheses: *H1: DIF → DBP* (β = 0.364, p-value = 0.000); *H2: DIF → ENG* (β = 0.216, p-value = 0.013); and *H3: ENG → DBP* (β = 0.256, p-value = 0.003). Additionally, the indirect mediating effect of customer engagement (ENG) on the relationship between DIF and DBP was assessed and confirmed (β = 0.055, p-value = 0.100). Both the direct and indirect effects of DIF on DBP are significantly positive, suggesting mediation of CE in the relationship between DIF and DBP.

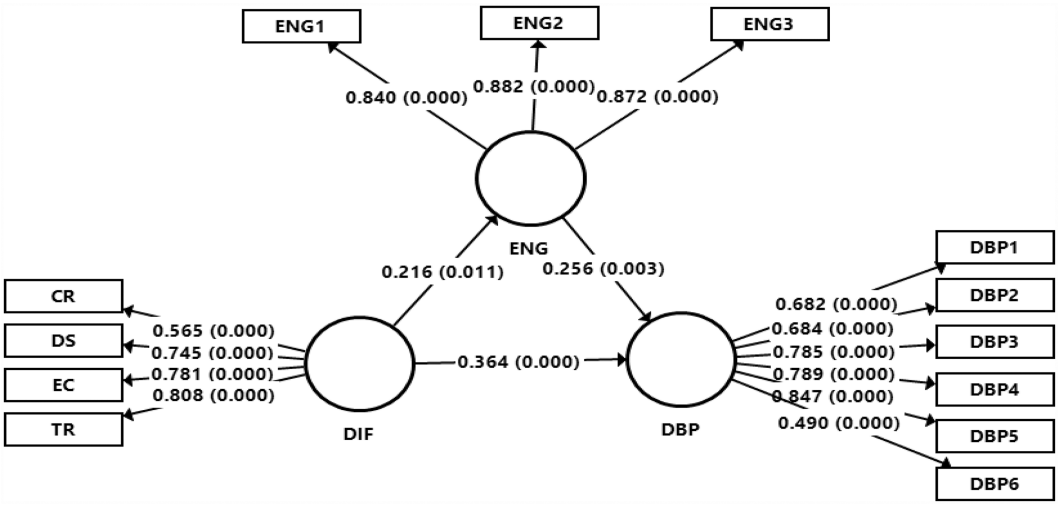


Figure 1. Structural model

Table 5. Hypotheses Analysis

Hypothesis	f^2	VIF	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	p-values	R^2	R^2 Adj.	Result
H1: DIF -> DBP	0.166	1.049	0.364	0.373	0.085	4.304	0.000	0.239	0.226	***Supported***
H2: DIF -> ENG	0.049	1.000	0.216	0.237	0.087	2.475	0.013	0.047	0.039	***Supported***
H3: ENG -> DBP	0.082	1.049	0.256	0.267	0.088	2.922	0.003			***Supported***
Mediation: **H4:** DIF -> ENG -> DBP			0.055	0.064	0.034	1.647	0.100			***Supported***

Note 1: mediation effect is supported by a significance level of 10%.

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5. Discussion

Our study confirms that Data Security, Transparency, Customer Review, and Effective Communication are interrelated and form the higher-order construct of DIF. This finding extends previous research that has examined individual digitalization factors and their impact on DBP, offering an integrative perspective that provides deeper insights into the mechanisms by which DIF influences DBP. Building on previous studies emphasizing the technological and organizational aspects of digitalization and digital transformation (e.g., Verhoef et al., 2019), our study contributes to the existing literature by focusing on customer-related digitalization factors.

Our results indicate that DIF directly and positively impacts DBP, suggesting that these factors should be carefully considered in digital business models and effectively implemented in business processes associated with technological infrastructure to ensure successful digital business outcomes. Furthermore, DIF positively affects CE, as confirmed by hypothesis H2 (Table 5). When digitalization factors are implemented with a customer-centric approach, they enhance customer engagement. For instance, Data Security and Transparency, while primarily legal requirements are perceived by customers as signals of trust and concern for their data protection. Similarly, Customer Review and Effective Communication, common in digital businesses, can significantly boost performance by fostering a customer-centric approach.

Another notable finding from our study is the mediating role of CE, with a significance level of 10% ($\beta = 0.055$, p-value = 0.100). CE has been primarily associated with loyalty, communication, and co-creation. In the context of digital startups, CE plays a crucial role in bridging digitalization and business performance. Particularly in digital startups, CE is even more vital and nuanced than in traditional businesses. While literature supports the positive impact of CE on performance (Chen et al., 2018; Garg et al., 2020), our study uniquely validates its mediating role in the relationship between digitalization and business performance. CE manifests in customers' emotional connection and proactive involvement with digital businesses. When digitalization drives CE, customers are more likely to contribute positively to the company, enhancing performance.

The higher the implementation level of digitalization factors (Data Security, Transparency, Customer Review, and Effective Communication), the better the business performance, particularly in sales and customer acquisition. The study proposes this virtuous cycle: as digitalization factors increase, customer satisfaction rises, leading to greater engagement, more suggestions, and new customers, improving performance. Thus, leveraging digitalization factors from the CE perspective boosts business performance by enhancing the customer experience and fostering new customer acquisition.

6. Conclusion

This study empirically assesses the positive relationship between DIF, CE, and DBP. The relationship was evaluated using a conceptual model and a cross-sectional survey of 125 Brazilian digital startups, analyzed through Partial Least Squares Structural Equation Modeling (PLS-SEM).

The study offers two main theoretical contributions. First, it advances the understanding of the interplay between digitalization and CE by demonstrating that digitalization factors positively impact business performance when viewed from a customer-centric perspective. Second, the study provides a theoretical model identifying positive and significant relationships between DIF, CE, and DBP. This conceptual model is a foundation for future research in digital business and CE.

From a practical perspective, this study offers valuable insights for digital startups. It positions customer engagement as a key driver of market and financial success, which can elevate DBP, aligning with the virtuous circle identified in this study. Based on our findings, digital startups should prioritize customer relationships, particularly through social media engagement.

Furthermore, this study contributes to the field of design by highlighting the importance of customer-centric digital strategies. The findings underscore the role of design in shaping digital interactions, optimizing user experiences, and structuring business models that foster engagement and performance. By integrating digitalization and CE, this study provides a framework for designing more effective, scalable, and sustainable digital business strategies.

While this study makes important contributions, it also presents limitations that could be explored in future research. First, our sample is limited to Brazilian startups, so the findings may not be generalizable to all types of businesses, especially traditional companies. Future studies could test the conceptual model in other sectors or businesses undergoing digital transformation. Second, the validated conceptual model serves as an initial proposal, and further research could refine and expand upon the variables not covered in this study. Third,

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while our study uses quantitative data, qualitative approaches could offer deeper insights into the relationship between digitalization and customer engagement in digital business contexts. Lastly, the study is based on Brazilian startups, and future research could compare startups from different countries to identify cross-cultural differences.

Acknowledgments

The authors would like to sincerely thank the Higher Education Personnel Improvement Coordination (CAPES) and the National Council for Scientific and Technological Development (CNPq), from Brazil, for their financial support of this research.

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