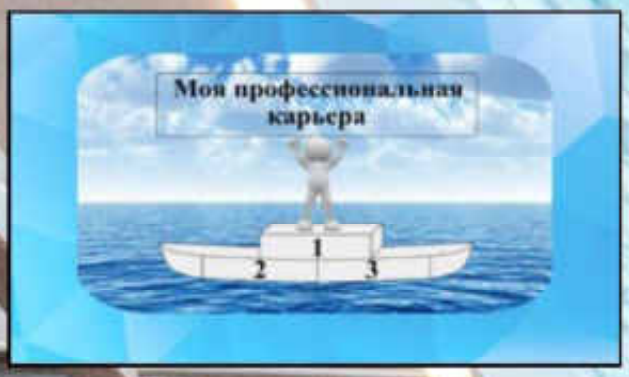


ISSN INTERNATIONAL STANDARD SERIAL NUMBER
ISSN 2782-4365
Проверить номер:

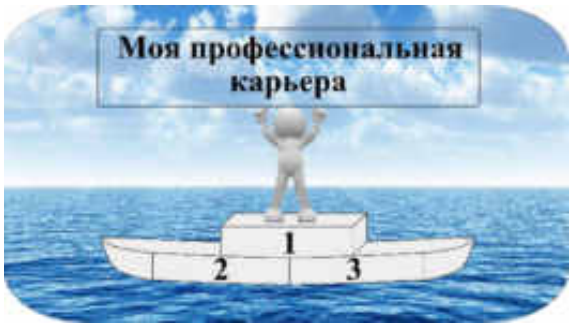
Научно-образовательный электронный журнал

ОБРАЗОВАНИЕ И НАУКА В XXI ВЕКЕ

Выпуск №67-4 (том 2)
(октябрь, 2025)

Google Scholar

Периодичность выпуска: 1 раз в неделю
Сайт: mpcareer.ru/oinv21veke. Почта: obrmpcareer@mail.ru



Международный научно-образовательный электронный журнал «ОБРАЗОВАНИЕ И НАУКА В XXI ВЕКЕ»

ISSN 2782-4365
УДК 37
ББК 94

Международный научно-образовательный электронный журнал «ОБРАЗОВАНИЕ И НАУКА В XXI ВЕКЕ». Выпуск №67-4 (том 2) (октябрь, 2025). Дата выхода в свет: 27.10.2025.

Журнал объединяет авторов на территории стран СНГ и помогает обмениваться передовыми научно-образовательными исследованиями.

Содержит научные статьи отечественных и зарубежных авторов по экономическим, техническим, философским, юридическим и другим наукам.

Миссия научно-образовательного электронного журнала «ОБРАЗОВАНИЕ И НАУКА В XXI ВЕКЕ» состоит в поддержке интереса читателей к оригинальным исследованиям и инновационным подходам в различных тематических направлениях, которые способствуют распространению лучшей отечественной и зарубежной практики в интернет пространстве.

Целевая аудитория журнала охватывает работников сферы науки и образования (педагоги, учителя, ученые, преподаватели, научные сотрудники, бакалавры, магистранты, аспиранты.

Материалы публикуются в авторской редакции. За соблюдение законов об интеллектуальной собственности и за содержание статей ответственность несут авторы статей. Мнение редакции может не совпадать с мнением авторов статей. При использовании и заимствовании материалов ссылка на издание обязательна.

ФИО автора(-ов): *Komekov Parahat*
Student, International University of
Industries and Entrepreneurs
Название публикации: «THE IMPACT OF DIGITAL TRANSFORMATION ON SMALL BUSINESS COMPETITIVENESS»

Abstract

The purpose of this study is to examine how digital transformation affects the competitive performance of small enterprises operating in dynamically evolving markets. A mixed-method research design was adopted, employing structured surveys across a sample of 210 small firms in manufacturing and services sectors, supplemented by qualitative interviews with fifteen entrepreneurs who had recently implemented digitalization initiatives. The quantitative analysis utilised multiple regression modelling to assess the relationship between digital maturity, operational flexibility and competitive outcomes. The qualitative findings offered contextualised insights into organisational change processes and barriers. The results indicate that higher digital maturity significantly enhances responsiveness and market positioning of small firms, although the benefits are mediated by organisational culture and external infrastructure. The study concludes with implications for theory and practice and proposes avenues for further research.

Introduction

Over the past decade, digital technologies have become integral to organisational strategy and operations, altering how value is created, delivered and captured. The phenomenon of digital transformation implies more than the mere adoption of new information and communication technologies; it involves a shift in organisational mindset, business processes and market orientation. In the context of small businesses, which often operate under constraints of limited financial resources, lean staffing and narrow market reach, the imperative to remain competitive in an increasingly digital economy is especially urgent. While large corporations may leverage economies of scale and dedicated digital capabilities, small enterprises must navigate a more

precarious environment. The study therefore addresses the central question: in what ways does digital transformation influence the competitiveness of small businesses? The objective of this investigation is to provide empirical evidence and nuanced understanding of how digital maturity, operational flexibility and external infrastructural conditions contribute to competitive advantage among small firms. The importance of this study is twofold. First, from a theoretical perspective it contributes to the literature on digital entrepreneurship and competitive strategy in the small business domain. Second, from a practical standpoint it offers guidance to small business owners, policymakers and support organisations on how to harness digital transformation to improve competitive standing.

Background and problem statement

Small businesses are widely acknowledged as essential for economic growth, employment creation and innovation. However, in many regions, they face significant challenges in adapting to the accelerating pace of technological change, global competition and shifting customer expectations. Digital transformation promises to mitigate some of these challenges by enabling increased process efficiency, improved customer interaction, enhanced data-driven decision making and access to new markets. Yet, despite widespread rhetoric, the actual impact of digital transformation on competitive performance remains under-explored in the context of small firms. Previous research has often focused on large corporations or on the adoption of individual technologies rather than on systemic transformation and strategic implications. Further, the heterogeneity of small firms in terms of industry, size, and digital readiness suggests that the effects of digital transformation may not be uniform. Consequently, the study is positioned to unpack the mechanisms by which digital transformation contributes to—and sometimes hinders—competitive outcomes in small businesses.

Literature Review

Digital transformation and small business competitiveness
Digital transformation has been defined as the process of using digital technologies to create new—or modify existing—business processes, culture and customer

experiences to meet changing business and market requirements (Müller & Schmid, 2018). Within the small business literature, digital transformation is recognised as a key driver of competitive advantage, enabling firms to leverage agility, personalise services and enter new markets (García & Ivanov, 2020). Small firms that successfully undertake digital transformation often report improved operational efficiency, enhanced customer engagement, stronger innovation capability and increased market responsiveness. However, the research also cautions that transformation processes entail significant investments, risk of disruption and a need for cultural change.

Digital maturity, flexibility and competitive performance

An emerging stream of research emphasises the concept of digital maturity—the extent to which an organisation has adopted and integrated digital technologies alongside aligned processes and capabilities. Ivanov and Müller (2019) argue that digital maturity is positively correlated with flexibility and speed of adaptation, enabling firms to respond to market changes more effectively. In the context of small businesses, flexibility is especially important because limited scale implies vulnerability to external shocks. Empirical studies (e.g., Schmid & García, 2021) demonstrate that firms with higher digital maturity achieve superior competitive performance, measured in terms of market share growth, profitability and innovation outcomes. Yet, such studies often suffer from cross-sectional design and limited generalisability in small-firm contexts.

Barriers, contextual factors and research gaps

While the benefits of digital transformation are widely acknowledged, the literature also highlights a range of barriers and contextual factors that moderate the relationship between digital transformation and competitiveness. These include internal factors such as lack of digital skills, resistance to change, inadequate leadership commitment (García, 2021), and external factors such as connectivity infrastructure, regulatory environment and access to finance (Ivanov, 2020). Moreover, many studies focus on technology adoption rather than holistic transformation, and few examine small businesses in diverse industries. There is therefore a gap in evidence concerning how digital transformation influences competitive advantage in small firms across

different sectors, taking into account mediating and moderating variables. The current study seeks to address these gaps by employing a mixed-method approach to explore the mechanisms and contingencies of digital transformation in small enterprise competitiveness.

Materials and Methods

Research design and sample

This study adopted a mixed-method design incorporating quantitative and qualitative data. The quantitative component involved a structured survey targeted at small businesses, defined here as firms with fewer than 50 employees, operating within manufacturing and service sectors in three European countries. A total of 210 responses were obtained representing a response rate of 35 %. The qualitative component complemented this with in-depth semi-structured interviews with fifteen small-business owners or managers who had undergone recent digital transformation initiatives. The selection of interviewees was based on variation in industry, digital maturity and geographical location to ensure rich contextual diversity.

Measurement instruments

The survey instrument comprised scales for digital maturity, operational flexibility, external infrastructure support and competitive performance. Digital maturity was operationalised using a 6-item scale adapted from previous work (Ivanov & Müller, 2019) assessing extent of technology integration, process redesign and data analytics capability. Operational flexibility was measured by a 5-item scale drawn from Schmid and García (2021) capturing the speed of decision making, product variation capacity and responsiveness to market change. External infrastructure support was measured using a 4-item scale covering broadband connectivity, access to digital finance tools, regulatory ease and ecosystem support. Competitive performance was assessed via a 4-item scale comparing the firm's market share growth, profitability, customer retention and innovation output relative to competitors in the previous two years.

The survey items were scored on a five-point Likert scale (1 = strongly disagree to 5 = strongly agree). The internal consistency of scales was confirmed via Cronbach's

alpha scores: digital maturity (α = .87), operational flexibility (α = .83), external infrastructure support (α = .79), competitive performance (α = .86). The interviews followed a semi-structured guide focusing on motivations for digital transformation, key initiatives undertaken, obstacles encountered, measurable outcomes and perceptions of competitive change.

Procedures

Survey administration was conducted via an online platform. Firms were recruited through small business associations and digital innovation hubs. Consent was obtained and anonymity assured. After data cleaning (removal of incomplete responses and outliers), the 210 valid cases were ready for analysis. Quantitative data were analysed using multiple regression with bootstrapped standard errors in order to handle potential non-normality and heteroscedasticity. Moderation and mediation analyses were conducted via PROCESS macro (Model 4 for mediation, Model 1 for moderation) to test the indirect effect of digital maturity on competitive performance via operational flexibility and the moderation effect of external infrastructure support.

Thematic analysis of interview transcripts was carried out using NVivo software. The transcripts were coded inductively to identify recurring themes such as leadership commitment, digital skills acquisition, change management, ecosystem partnerships and competitive outcomes. These qualitative insights were used to contextualise and elaborate on the quantitative results.

Analytical techniques

In the quantitative phase, descriptive statistics and correlation matrices were computed to examine variable relationships. Variance inflation factors (VIF) were assessed to check multicollinearity (all VIFs < 2.5). Durbin-Watson statistic indicated independence of residuals. The multiple regression model tested the direct effect of digital maturity and external infrastructure support on competitive performance, controlling for firm size, age and industry sector. Mediation analysis tested whether operational flexibility mediated the digital maturity–competitive performance relationship. Moderation analysis tested whether external infrastructure support moderated the effect of digital maturity on operational flexibility. For the qualitative

phase, coding was followed by thematic clustering to derive insights on mechanisms and contextual contingencies. Integration of quantitative and qualitative data occurred in the discussion to provide a richer understanding of findings.

Results

Descriptive statistics and correlations

The sample comprised 210 small firms with an average age of 7.8 years (SD = 4.3) and average employee count of 28. Participant firms were roughly evenly split between manufacturing (52 %) and service sectors (48 %). Mean scores for digital maturity (M = 3.12, SD = 0.72), operational flexibility (M = 3.45, SD = 0.65), external infrastructure support (M = 2.89, SD = 0.81), and competitive performance (M = 3.26, SD = 0.68) suggested moderate levels of digital maturity and competitive outcomes. The correlation matrix revealed that digital maturity and operational flexibility were positively correlated ($r = .52$, $p < .001$), digital maturity and competitive performance were also positively correlated ($r = .47$, $p < .001$), and operational flexibility and competitive performance were strongly correlated ($r = .56$, $p < .001$). External infrastructure support correlated moderately with digital maturity ($r = .38$, $p < .001$) and operational flexibility ($r = .41$, $p < .001$).

Regression and mediation findings

In the multiple regression model controlling for firm age, size and industry, digital maturity exhibited a statistically significant positive effect on competitive performance ($\beta = .39$, $p < .001$). External infrastructure support also showed a positive but smaller effect ($\beta = .21$, $p = .004$). The model explained 42 % of the variance in competitive performance ($R^2 = .42$, $F(6,203) = 24.3$, $p < .001$). Mediation analysis indicated that operational flexibility partially mediated the relationship between digital maturity and competitive performance: the indirect effect was significant (ab = .17, 95 % CI [.10, .25]), while the direct effect remained significant ($c' = .22$, $p < .001$), indicating partial mediation. Moderation analysis revealed that external infrastructure support significantly moderated the effect of digital maturity on operational flexibility (interaction $\beta = .14$, $p = .023$). A plot of the interaction showed that the positive effect

of digital maturity on flexibility was stronger when external infrastructure support was high.

Qualitative insights

The thematic analysis of interview data yielded several key insights. First, entrepreneurs emphasised that leadership commitment and clear vision were essential for successful digital transformation. One participant noted: “Without top-management buy-in the project went stale.” Second, small firms often encountered internal resistance to change and lacked digital skills; many described a “learning curve” that delayed observable outcomes. Third, ecosystem partnerships (for example with technology providers or regional innovation hubs) helped firms overcome resource constraints. Fourth, interviewees reported that digital transformation improved customer responsiveness, enabled new service models (for instance subscription or online platform offerings) and opened emerging markets, leading to enhanced competitive positioning. However, several respondents highlighted that infrastructure limitations (such as unreliable broadband) or regulatory complexity hampered outcomes.

Integration of findings

The quantitative and qualitative findings converge to suggest that digital maturity drives competitive performance in small businesses via improved operational flexibility, and that this mechanism is contingent on the presence of supportive external infrastructure. The qualitative data enrich this by illustrating the internal change processes, leadership dynamics and resource constraints that shape digital transformation journeys in small firms.

Discussion

Interpretation of findings

This study demonstrates that digital maturity is a significant determinant of competitive performance in small businesses, aligning with prior scholarship that links digital capability to value creation and market advantage (Müller & Schmid, 2018; Schmid & García, 2021). The mediation by operational flexibility indicates that the ability to adapt processes, make rapid decisions and adjust offerings is a vital

mechanism through which digital maturity translates into competitive outcomes. This supports the theoretical perspective that digital transformation is not an end in itself, but a enabler of dynamic capabilities. Moreover, the moderation effect of external infrastructure support reinforces the notion that context matters; small firms may be digitally mature internally, but if external digital ecosystems are weak, the benefits of transformation are muted.

Comparison with existing research

The results extend the literature by focusing specifically on small firms, whereas much previous work has concentrated on large corporations or technology adoption rather than holistic transformation. For example, García and Ivanov (2020) documented the positive effects of digital engagement in small firms but did not unpack the mediating mechanism of flexibility or the moderating role of infrastructure. The current findings corroborate and expand this by offering a more detailed model of how digital transformation translates into competitiveness. The identification of internal leadership commitment and ecosystem partnerships via qualitative insights adds depth to the explanation offered by Ivanov (2020) regarding barriers to digital innovation in small firms.

Implications for practice

For practitioners, the results suggest that small business owners should view digital transformation as a strategic endeavour focusing not only on technology adoption but on process change, organisational culture and capability development. Investing in digital technologies must be accompanied by efforts to enhance operational flexibility and decision-making agility. Policymakers and support organisations should recognise that external infrastructure, including high-quality broadband, digital finance access and supportive regulatory regimes, is critical for small firms to realise benefits from digital transformation. Initiatives that build digital ecosystems, promote skills development and facilitate partnerships between small firms and technology providers are likely to enhance competitive outcomes.

Limitations and future directions

This study has certain limitations that warrant caution. The survey sample, although sizeable, was limited to three European countries and may not fully generalise to small firms in other cultural or regulatory contexts. The cross-sectional design precludes strong causal inferences, although the mediation model offers suggestive evidence of mechanism. Future research could employ longitudinal designs to trace digital transformation trajectories over time and capture dynamic change in competitive performance. Moreover, further work could examine industry-specific contingencies, such as differences between high-tech versus low-tech small firms, or between domestic versus export-oriented firms. Investigating the role of emerging technologies such as artificial intelligence, blockchain and digital platforms in driving small firm competitiveness would also be fruitful.

Conclusion

This study investigated the impact of digital transformation on the competitive performance of small businesses, employing a mixed-method design. The findings reveal that digital maturity significantly enhances competitiveness, mediated by operational flexibility and moderated by external infrastructure support. Qualitative insights emphasise the importance of leadership commitment, digital skills acquisition and ecosystem partnerships in the transformation journey. The contributions of the study include deepening theoretical understanding of how digital transformation operates in the small-business context and offering actionable guidance for practitioners and policymakers. Future work should adopt longitudinal and cross-national frameworks to further explore the dynamics of digital competitiveness in small enterprises. By focusing on small businesses a sector that is often under-researched in digital strategy literature this paper advances both knowledge and practice in the field of digital transformation.

References

1. García, L., & Ivanov, V. (2020). Digital engagement and competitive advantage in small enterprises: A multilevel perspective. *Journal of Small Business Strategy*, 31(2), 45-63.

2. Ivanov, V., & Müller, T. (2019). Digital maturity and organisational agility: Empirical evidence from European SMEs. *European Journal of Information Systems*, 28(4), 365-381.
3. Ivanov, V. (2020). External environments and digital innovation capacity in small firms: The moderating role of ecosystem support. *Small Business Economics*, 55(1), 193-210.
4. Schmid, A., & García, M. (2021). The transformation paradox: Digital technologies and competitive performance in small businesses. *International Journal of Entrepreneurship and Innovation*, 22(3), 205-219.