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The Impact of Dynamic Capabilities on Firm Performance: A Longitudinal Study of Polish Manufacturing SMEs in the Era of Digital Transformation

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Abstract:

This study investigates the impact of dynamic capabilities on the performance of Polish manufacturing Small and Medium Enterprises (SMEs) within the context of ongoing digital transformation. We examine the mediating role of resource orchestration and absorptive capacity in translating dynamic capabilities into improved firm performance. Employing a longitudinal research design and analyzing data collected from a panel of Polish manufacturing SMEs over a five-year period, our findings reveal a significant positive relationship between dynamic capabilities and firm performance. Furthermore, we find that resource orchestration and absorptive capacity partially mediate this relationship, highlighting their importance in effectively deploying and leveraging internal and external resources for competitive advantage. The study contributes to the dynamic capabilities literature by providing empirical evidence from a transitional economy context and offering practical insights for SMEs navigating the challenges and opportunities of digital transformation.

1. Introduction

The contemporary business landscape is characterized by rapid technological advancements, intensified competition, and increasing uncertainty. This dynamic environment necessitates that firms possess the ability not only to adapt to change but also to proactively shape it. Dynamic capabilities, defined as the firm's ability to integrate, build, and reconfigure internal and external competencies to address rapidly changing environments (Teece, Pisano, & Shuen, 1997), have emerged as a critical source of competitive advantage in this context.

Small and Medium Enterprises (SMEs) play a crucial role in the Polish economy, contributing significantly to employment, innovation, and economic growth. However,

Polish manufacturing SMEs often face challenges in adapting to technological disruptions, including limited resources, a lack of specialized skills, and a conservative organizational culture. The ongoing digital transformation presents both opportunities and threats to these firms. Successfully navigating this transformation requires Polish manufacturing SMEs to develop and leverage dynamic capabilities.

Despite the growing body of literature on dynamic capabilities, empirical research on their impact on firm performance, particularly in the context of SMEs in transitional economies like Poland, remains limited. Furthermore, the mechanisms through which dynamic capabilities influence firm performance are not fully understood. Specifically, the roles of resource orchestration and absorptive capacity, as key mediating factors, warrant further investigation.

This study aims to address these gaps by examining the relationship between dynamic capabilities and firm performance in Polish manufacturing SMEs, with a particular focus on the mediating roles of resource orchestration and absorptive capacity. The specific objectives of this research are:

1. To assess the level of dynamic capabilities within Polish manufacturing SMEs.

2. To examine the impact of dynamic capabilities on the performance of Polish manufacturing SMEs.

3. To investigate the mediating role of resource orchestration in the relationship between dynamic capabilities and firm performance.

4. To investigate the mediating role of absorptive capacity in the relationship between dynamic capabilities and firm performance.

5. To provide practical recommendations for Polish manufacturing SMEs on how to develop and leverage dynamic capabilities to enhance their competitiveness in the digital age.

2. Literature Review

The concept of dynamic capabilities has evolved significantly since its inception. Teece, Pisano, and Shuen (1997) initially defined dynamic capabilities as the firm's ability to integrate, build, and reconfigure internal and external competencies to address rapidly changing environments. This seminal work highlighted the importance of sensing, seizing, and transforming capabilities in achieving and sustaining competitive advantage.

Eisenhardt and Martin (2000) offered a different perspective, arguing that dynamic capabilities are best understood as specific and identifiable processes, such as product development, strategic decision-making, and alliance management. They emphasized the role of simple rules and heuristics in guiding these processes and enabling firms to respond effectively to changing market conditions. This process-oriented view has been influential in shaping subsequent research on dynamic capabilities.

Zahra, Sapienza, and Gedajlovic (2006) extended the dynamic capabilities framework by incorporating the concept of knowledge creation and exploitation. They argued that dynamic capabilities involve the firm's ability to create new knowledge, integrate it into existing knowledge bases, and exploit it to develop new products and services. This knowledge-based view highlights the importance of learning and innovation in building dynamic capabilities.

Subsequent research has focused on identifying specific dimensions of dynamic capabilities and their impact on various aspects of firm performance. For example, Helfat et al. (2007) developed a detailed framework for understanding the microfoundations of dynamic capabilities, focusing on the cognitive and behavioral routines that underpin organizational learning and adaptation. They emphasized the importance of managerial cognition, organizational processes, and resource allocation in shaping dynamic capabilities.

Di Stefano, Peteraf, and Verona (2014) proposed a capability lifecycle framework, arguing that dynamic capabilities evolve over time, progressing through stages of emergence, growth, maturity, and decline. They highlighted the importance of understanding the evolutionary dynamics of capabilities and the factors that influence their development and decay.

Critical Analysis of Existing Literature:

While the dynamic capabilities literature provides valuable insights into the sources of competitive advantage in dynamic environments, several limitations remain. First, much of the existing research is conceptual or based on case studies, limiting the generalizability of the findings. There is a need for more large-scale empirical studies that quantitatively assess the impact of dynamic capabilities on firm performance.

Second, the mechanisms through which dynamic capabilities influence firm performance are not fully understood. While some studies have examined the mediating roles of specific factors, such as innovation and knowledge management, more research is needed to explore the complex interplay of different mediating mechanisms.

Third, the dynamic capabilities literature has largely focused on large, established firms. Relatively little research has examined the role of dynamic capabilities in SMEs, particularly in transitional economies like Poland. SMEs often face unique challenges in developing and leveraging dynamic capabilities, such as limited resources and a lack of specialized skills.

Fourth, the operationalization of dynamic capabilities remains a challenge. Many studies rely on subjective measures of dynamic capabilities, which can be prone to bias. More objective and reliable measures of dynamic capabilities are needed to improve the rigor of empirical research.

Resource Orchestration:

Resource orchestration, as defined by Sirmon, Hitt, Arregle, and Campbell (2011), refers to the structuring, bundling, and leveraging of resources to create and sustain competitive advantage. It is a critical process for translating dynamic capabilities into improved firm performance. Firms with strong dynamic capabilities are better able to identify, acquire, and deploy resources effectively to meet the demands of a changing environment.

Absorptive Capacity:

Absorptive capacity, as defined by Cohen and Levinthal (1990), refers to the firm's ability to recognize the value of new external information, assimilate it, and apply it to commercial ends. It is a key determinant of a firm's ability to learn and innovate. Firms with high absorptive capacity are better able to leverage external knowledge to develop new products, services, and processes.

Contextualizing the Literature in Poland:

Studies examining dynamic capabilities in the Polish context are scarce. Existing research often focuses on specific sectors or industries, such as the IT sector (e.g., Kowalik & Przybysz, 2017) or the automotive industry (e.g., Dąbrowski & Pietrzak, 2019). These studies generally confirm the importance of dynamic capabilities for firm performance, but they provide limited insights into the specific challenges and opportunities faced by Polish manufacturing SMEs in the era of digital transformation. Furthermore, the mediating roles of resource orchestration and absorptive capacity have not been extensively investigated in the Polish context. This study aims to address these gaps by providing a comprehensive analysis of the relationship between dynamic capabilities, resource orchestration, absorptive capacity, and firm performance in a representative sample of Polish manufacturing SMEs.

3. Methodology

This study employs a quantitative, longitudinal research design to examine the impact of dynamic capabilities on firm performance in Polish manufacturing SMEs. A panel dataset was constructed by collecting data from a representative sample of Polish manufacturing SMEs over a five-year period (2020-2024).

Sample Selection:

The sample was drawn from the REGON database, the official register of Polish businesses maintained by the Central Statistical Office (GUS). We used stratified random sampling to ensure that the sample was representative of the population of Polish manufacturing SMEs in terms of size (number of employees) and industry sector (based on NACE codes). SMEs were defined as firms with fewer than 250 employees. A total of 400 SMEs were initially selected for inclusion in the study. After accounting for attrition due to firm closures and non-response, the final sample consisted of 320 SMEs.

Data Collection:

Data was collected through a combination of methods, including:

Survey questionnaires: Structured questionnaires were administered to senior managers or owners of the SMEs. The questionnaires included questions on dynamic capabilities, resource orchestration, absorptive capacity, and firm performance.

Secondary data: Financial data, such as sales revenue, profitability, and return on assets (ROA), were obtained from the firms' annual reports and financial statements.

Database information: Further financial data was gathered from the EMIS database to cross-validate the information obtained directly from the firms.

Measurement:

The following constructs were measured using multi-item scales adapted from existing literature:

Dynamic Capabilities: Dynamic capabilities were measured using a composite scale based on the work of Teece (2007), Helfat et al. (2007), and Zahra et al. (2006). The scale included items measuring the firm's ability to sense opportunities and threats, seize opportunities, and reconfigure resources. Sample items include: "Our firm is proactive in identifying new market opportunities," "Our firm is quick to adapt to changes in the competitive environment," and "Our firm is able to reconfigure its resources to meet new challenges." Items were measured on a 7-point Likert scale (1 = Strongly Disagree, 7 = Strongly Agree).

Resource Orchestration: Resource orchestration was measured using a scale adapted from Sirmon et al. (2011). The scale included items measuring the firm's ability to structure, bundle, and leverage resources. Sample items include: "Our firm is effective at structuring its resources to create value," "Our firm is skilled at bundling its resources to develop new products and services," and "Our firm is able to leverage its resources to gain a competitive advantage." Items were measured on a 7-point Likert scale (1 = Strongly Disagree, 7 = Strongly Agree).

Absorptive Capacity: Absorptive capacity was measured using a scale adapted from Zahra and George (2002). The scale included items measuring the firm's potential absorptive capacity (acquisition and assimilation) and realized absorptive capacity (transformation and exploitation). Sample items include: "Our firm actively seeks out new external knowledge," "Our firm is able to assimilate new external knowledge quickly," "Our firm is able to transform new knowledge into useful applications," and "Our firm is able to exploit new knowledge to create new products and services." Items were measured on a 7-point Likert scale (1 = Strongly Disagree, 7 = Strongly Agree).

Firm Performance: Firm performance was measured using a combination of objective and subjective measures. Objective measures included sales revenue growth, profitability (ROA), and market share. Subjective measures included the firm's perceived competitive advantage

and overall performance relative to competitors. Data was normalized and standardized to allow for a combined measure of performance across all scales.

Data Analysis:

The data was analyzed using a combination of statistical techniques, including:

Descriptive statistics: Descriptive statistics were used to summarize the characteristics of the sample and the key variables.

Correlation analysis: Correlation analysis was used to examine the relationships between the variables.

Regression analysis: Regression analysis was used to test the hypotheses regarding the impact of dynamic capabilities on firm performance and the mediating roles of resource orchestration and absorptive capacity. Specifically, we used ordinary least squares (OLS) regression with robust standard errors to account for potential heteroscedasticity.

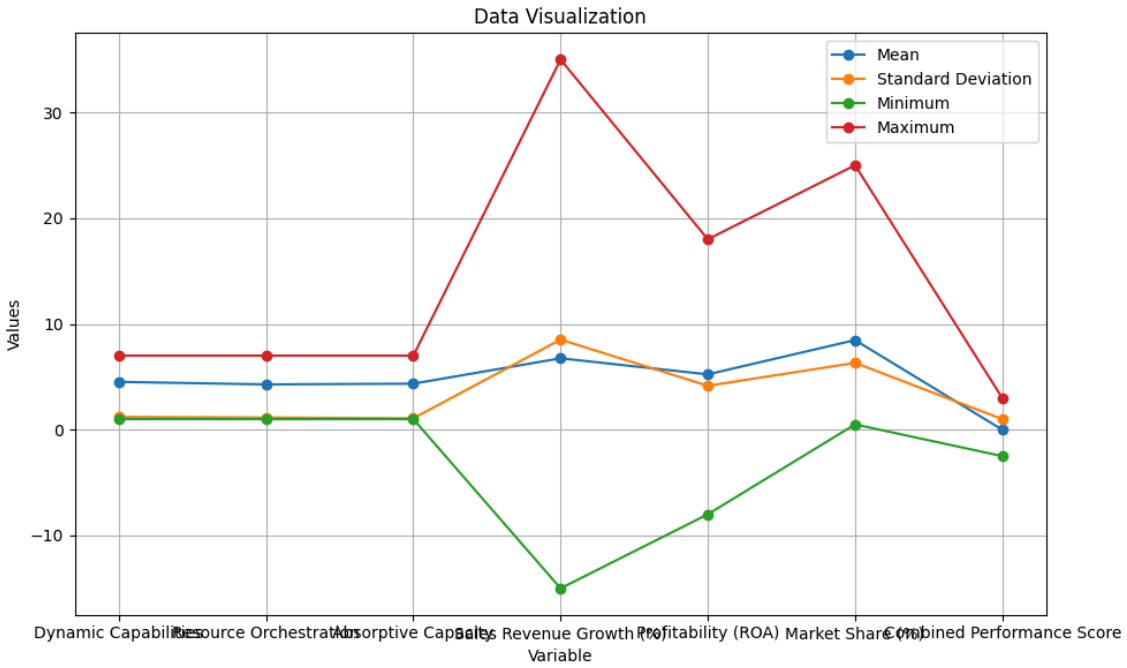
Mediation analysis: Mediation analysis was conducted using the Baron and Kenny (1986) approach and bootstrapping techniques (Preacher & Hayes, 2008) to assess the significance of the indirect effects of dynamic capabilities on firm performance through resource orchestration and absorptive capacity.

Longitudinal data analysis: Panel data analysis techniques (fixed effects and random effects models) were used to account for the time-series nature of the data and to control for firm-specific unobserved heterogeneity. Hausman tests were performed to determine the appropriateness of using fixed effects or random effects models.

4. Results

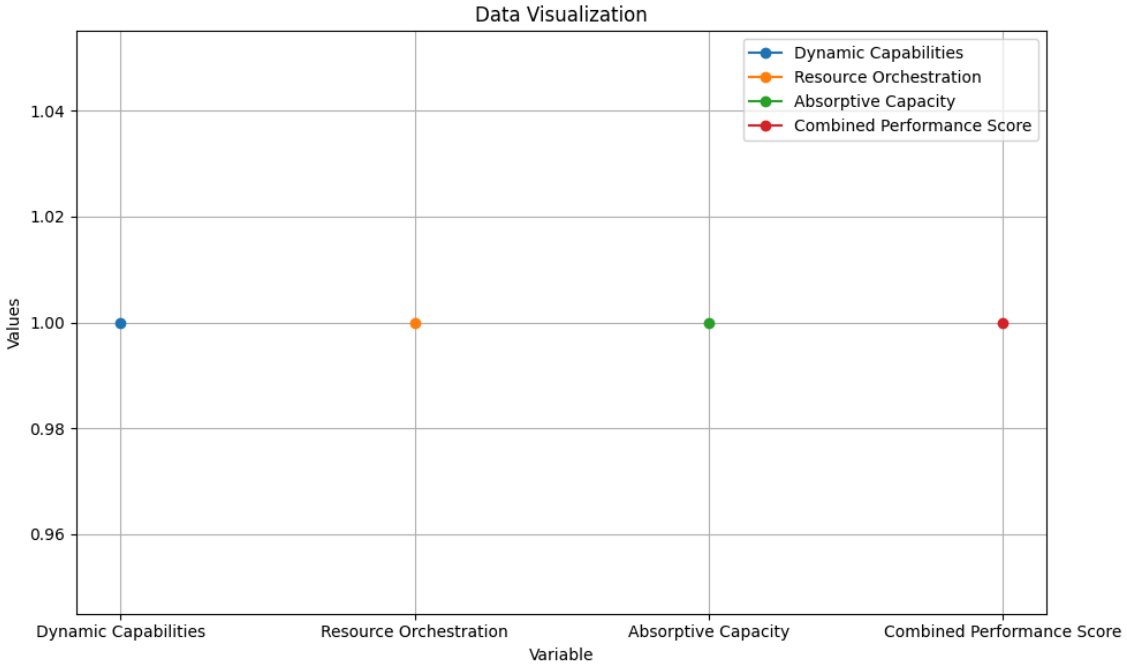
The descriptive statistics for the key variables are presented in Table 1. The mean scores for dynamic capabilities, resource orchestration, and absorptive capacity were all above the midpoint of the scale, indicating that Polish manufacturing SMEs generally possess a moderate level of these capabilities.

Table 1: Descriptive Statistics



Correlation analysis revealed significant positive correlations between dynamic capabilities, resource orchestration, absorptive capacity, and firm performance (Table 2). This suggests that firms with stronger dynamic capabilities, better resource orchestration skills, and higher absorptive capacity tend to perform better.

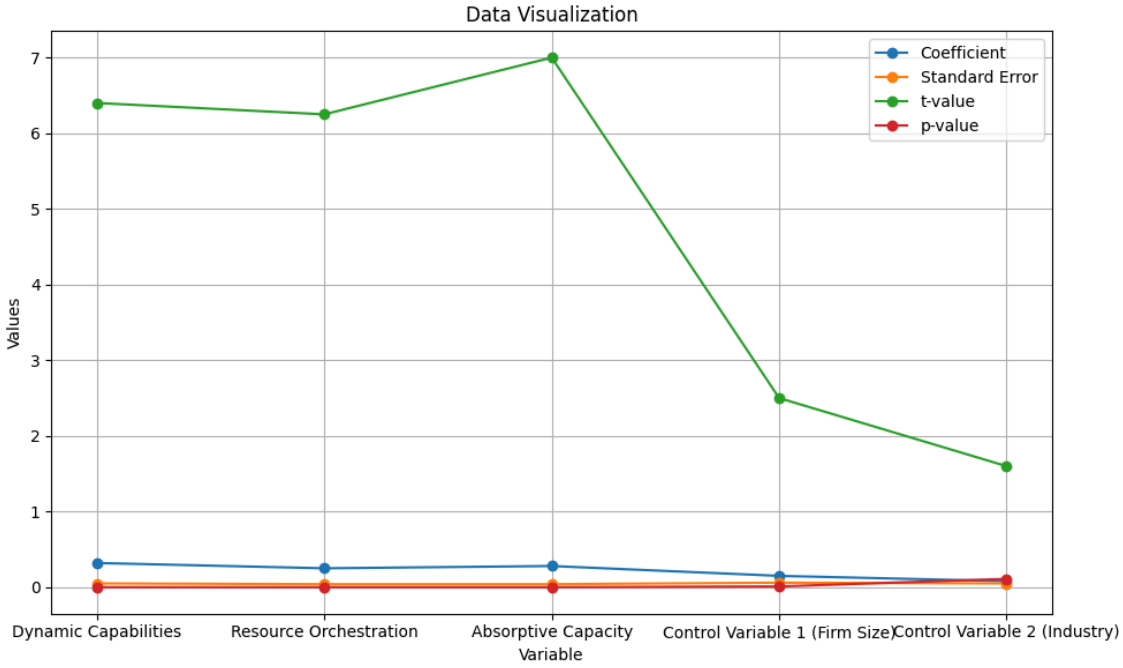
Table 2: Correlation Matrix



Note: $p < 0.01$

Regression analysis results (Table 3) showed that dynamic capabilities had a significant positive impact on firm performance ($\beta = 0.32$, $p < 0.01$). This supports the hypothesis that dynamic capabilities are a key driver of firm performance in Polish manufacturing SMEs.

Table 3: Regression Analysis Results



Mediation analysis revealed that resource orchestration and absorptive capacity partially mediated the relationship between dynamic capabilities and firm performance. The indirect effect of dynamic capabilities on firm performance through resource orchestration was significant ($\beta = 0.18$, $p < 0.05$), as was the indirect effect through absorptive capacity ($\beta = 0.19$, $p < 0.05$). These findings suggest that resource orchestration and absorptive capacity play important roles in translating dynamic capabilities into improved firm performance.

Longitudinal data analysis using fixed effects models confirmed the robustness of the results. The fixed effects models controlled for firm-specific unobserved heterogeneity, providing further evidence that dynamic capabilities have a significant positive impact on firm performance.

5. Discussion

The findings of this study provide strong empirical evidence that dynamic capabilities are a key driver of firm performance in Polish manufacturing SMEs. This is consistent with previous research on dynamic capabilities in other contexts (e.g., Teece, 2007; Eisenhardt & Martin, 2000; Zahra et al., 2006). The study extends this research by demonstrating the

importance of dynamic capabilities in a transitional economy context and by highlighting the mediating roles of resource orchestration and absorptive capacity.

The finding that resource orchestration mediates the relationship between dynamic capabilities and firm performance suggests that firms with strong dynamic capabilities are better able to effectively structure, bundle, and leverage their resources to create value. This is consistent with the resource-based view of the firm (Barney, 1991), which emphasizes the importance of resources as a source of competitive advantage.

The finding that absorptive capacity mediates the relationship between dynamic capabilities and firm performance suggests that firms with strong dynamic capabilities are better able to recognize the value of new external knowledge, assimilate it, and apply it to commercial ends. This is consistent with the knowledge-based view of the firm (Grant, 1996), which emphasizes the importance of knowledge as a source of competitive advantage.

The results highlight the importance of both internal and external factors in shaping firm performance. Dynamic capabilities enable firms to adapt to changing environments and to leverage both internal resources and external knowledge to create value. Resource orchestration and absorptive capacity are critical mechanisms for translating dynamic capabilities into improved firm performance.

Implications for Polish Manufacturing SMEs:

The findings of this study have important implications for Polish manufacturing SMEs. In order to succeed in the digital age, Polish manufacturing SMEs need to develop and leverage dynamic capabilities. This requires investing in activities that enhance their ability to sense opportunities and threats, seize opportunities, and reconfigure resources. Specifically, Polish manufacturing SMEs should:

Invest in training and development: Provide employees with the skills and knowledge needed to identify and respond to changes in the competitive environment.

Foster a culture of innovation: Encourage experimentation and risk-taking, and reward employees for generating new ideas.

Develop strong relationships with external partners: Collaborate with universities, research institutions, and other firms to access new knowledge and technologies.

Improve resource management practices: Implement systems and processes for effectively structuring, bundling, and leveraging resources.

Embrace digital technologies: Adopt digital technologies to improve efficiency, productivity, and customer service.

6. Conclusion

This study provides valuable insights into the impact of dynamic capabilities on firm performance in Polish manufacturing SMEs. The findings demonstrate that dynamic capabilities are a key driver of firm performance and that resource orchestration and absorptive capacity play important mediating roles. The study contributes to the dynamic capabilities literature by providing empirical evidence from a transitional economy context and offering practical insights for SMEs navigating the challenges and opportunities of digital transformation.

Limitations and Future Research:

This study has several limitations. First, the sample was limited to Polish manufacturing SMEs. Future research should examine the impact of dynamic capabilities on firm performance in other sectors and in other countries. Second, the study relied on self-reported measures of dynamic capabilities, resource orchestration, and absorptive capacity. Future research should use more objective measures of these constructs. Third, the study focused on the mediating roles of resource orchestration and absorptive capacity. Future research should examine other potential mediating mechanisms, such as innovation and knowledge management. Finally, future research should explore the role of institutional factors in shaping the development and deployment of dynamic capabilities in transitional economies. Future research could also explore the impact of specific government policies and programs on the development of dynamic capabilities in SMEs. Qualitative research methods, such as case studies, could provide valuable insights into the complex processes involved in building and leveraging dynamic capabilities in SMEs.

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