

Structured Innovation as a Driver of Collective Transformation in Traditional Industrial Clusters

Diana Freitas¹, Teresa Dieguez¹ and Oscarina Conceição^{1,2}

¹Polytechnic University of Cávado and Ave, Barcelos, Portugal

²Applied Management Research Unit (UNIAG), Barcelos, Portugal and ISCTE - Instituto Universitário de Lisboa, DINÂMIA'CET, Lisbon, Portugal

a20907@alunos.ipca.pt

tdieguez@ipca.pt

oonceicao@ipca.pt

Abstract: Innovation has become a critical driver of competitiveness in traditional manufacturing industries, yet its role remains insufficiently understood in mature industrial clusters. This study examines how structured innovation practices influence firm performance and contribute to broader transformation dynamics in the textile and clothing sector of Portugal's Vale do Ave region. Adopting a qualitative multiple case study approach, the research draws on semi-structured interviews with senior managers from five firms at different levels of innovation maturity. Through the Innovation Scoring framework, it analyses how innovation is organised, embedded, and managed across firms. The findings reveal significant heterogeneity. Firms with institutionalized and strategically aligned innovation demonstrate stronger capabilities in integrating innovation with strategy, fostering supportive organisational cultures, and engaging in external collaboration. These capabilities enhance adaptability and lead to superior performance. In contrast, less mature firms rely on reactive, ad hoc practices and struggle to structure innovation and assess its impact. The study shows that innovation maturity appears to mediate the relationship between innovation practices and performance, conceptualizing it as an operational expression of dynamic capabilities. It also highlights the importance of multidimensional innovation measurement and offers relevant implications for managers and policymakers aiming to strengthen competitiveness in traditional industries.

Keywords: Innovation Management, Industrial Clusters, Regional Innovation, Traditional Manufacturing, Textile Industry

1. Introduction

In a volatile, competitive, and knowledge-intensive global economy, innovation has become a critical driver of firm competitiveness, adaptability, and long-term performance (OECD, 2005; Teece, 2025; Çil, 2026). It extends beyond product and technological novelty to a dynamic organisational capability enabling firms to sense opportunities and reconfigure resources (Teece, 2025), thereby sustaining value creation and competitive advantage (Bessant & Tidd, 2016; Statar et al., 2026). This is particularly relevant in traditional manufacturing sectors, such as textiles and apparel, where globalization, digitalization, and shifting consumer expectations demand continuous upgrading. Even in low- and medium-technology industries, innovation increasingly encompasses products, processes, design, and business models (Glock, 2025; Rosa et al., 2025; O'Brien, 2026), often unfolding through iterative, experience-based, and institutionally embedded processes that support internationalization (Han, et al., 2026).

Contemporary perspectives frame innovation as a systemic and collaborative process involving multiple actors within open innovation ecosystems (Nambisan et al., 2019; Chesbrough, 2024; Nan & Huang, 2025). Firms embedded in such ecosystems benefit from enhanced knowledge flows, reduced uncertainty, and accelerated innovation outcomes (Autio et al., 2018). However, innovation's multidimensional nature, namely spanning tangible outputs and intangible capabilities, renders its measurement complex (Adams et al., 2016; Hidayat & Pok, 2025), often exceeding traditional indicators such as R&D expenditure or patents (Taherdoost, 2024). This has led to the emergence of more comprehensive approaches, including innovation maturity models, which assess capabilities, processes, and organisational conditions (Adams et al., 2016; Hidayat & Pok, 2025).

Among these, the Innovation Scoring framework developed by COTEC Portugal (2023) provides a multidimensional assessment of firms' innovation across strategy, organisation, processes, and impact, forming the analytical basis of this study. Focusing on the textile and clothing cluster of Vale do Ave, a historically significant, export-oriented industrial region facing intensified global pressures, the research examines how innovation practices and maturity levels relate to firm performance. While prior literature confirms a positive innovation–performance link (Rajapathirana & Hui, 2018; Henao-García & Cardona Montoya, 2024), empirical evidence in traditional sectors remains limited, particularly regarding structured maturity frameworks.

This study addresses this gap by analysing firms' innovation strategies, assessing their maturity, and exploring their relationship with business performance. It contributes by advancing empirical understanding of innovation in low-technology contexts, applying a multidimensional maturity perspective, and offering managerial and policy insights on institutionalizing and systematizing innovation management.

2. Literature Review

2.1 Innovation as a Strategic and Dynamic Capability

The concept of innovation has a long history as a primary engine of growth and competitiveness (Schumpeter, 1934; Hamdouna & Khmelyarchuk, 2025). It has moved from a conceptualization of technological change and product innovation to a more sophisticated conceptualization that accounts for the organisational processes, business models and strategic renewal (OECD, 2005; Bessant & Tidd, 2016). More recently, innovation in the context of dynamic capabilities, in which the firm integrates, builds and reconfigures internal and external capabilities in response to rapidly changing situations, is used in this context (Teece, 2025; Zhou et al., 2026). From this perspective, innovation must be viewed not merely as output but as an ongoing process that sustains adaptation, renewal and long-term success of organisations. Especially in turbulent and competitive markets, where firms must sense the chance, take advantage of it, and reconfigure their resource base, such a perspective is relevant (Al-Husain et al., 2025), as emphasised in the literature, organisations that have developed a robust innovation capability can maintain a competitive advantage and counter uncertainty as a result of their organisational structures and capabilities. Consistent with this view, innovation is also strongly associated with organisational learning processes, knowledge creation, and new competencies (Migdadi, 2022; Alhidayatullah, 2025). These features reinforce the view that innovation is a systemic and multidimensional phenomenon embedded within the firm's strategic and operational activities.

2.2 Innovation in Traditional and Low-tech Industries

While innovation is often associated with high-technology enterprises, a growing amount of literature indicates its role in traditional and low-tech industries (e.g., textiles and clothing) (Spithoven & Van Crieelingen, 2026; Wani, 2026). In such sectors, innovation is less science-based and more practice-driven with reliance on incremental improvements, design, process optimization, and close interaction with customers and suppliers (Piana & Brustolin, 2023). Instead of radical technological breakthroughs, firms innovate by recombining existing knowledge and iteratively improving products and processes. Such innovation is often embedded within organisational routines and tacit knowledge, so it is less apparent but also important for competitiveness (O'Brien, 2026). That is, traditional industries need more complex analytic approaches than traditional proxies that signify innovation, like R&D funding or patents. Also, regional industrial clusters, like the Vale do Ave, play a critical role in supporting innovation in these sectors. It is because these clusters enable the exchange of knowledge, collaboration, and specialization that a society learns and that it forms collective skills and competes (Kowalski, 2022). As discussed above for the textile and clothing industry, innovation is critical to compete across the globe, cater for changing consumer preferences, and address growing concerns for sustainability (Todeschini et al, 2017). In fact, this industry relies on continuous innovation to sustain its market share and longevity.

2.3 Open Innovation and Innovation Ecosystems

The old view of innovation as internally driven had gradually been exchanged for the new idea of open innovation and how external knowledge flows and collaborative networks are implicated (Chesbrough, 2024). From that view, firms innovate not just through internal research and development (R&D) activities but also by engaging with knowledge from the external environment, such as relationships with customers, suppliers, universities, and research institutions. This transition indicates the increasing complexity of innovation and the need for the use of multiple capacities and assets (Chesbrough, 2024). This concept is directly tied to innovation ecosystems, which are the linked actors, institutions, and relationships that complement and amplify innovation (Autio et al., 2018; Nambisan et al., 2019; Peçanha & Ferreira, 2025). In these ecosystems, value creation can be traced through interactions and complementarities between several actors. Indeed, firms located in strong innovation ecosystems appear to have the potential to become more innovative, less uncertain, and faster at commercializing innovation (Sewenet et al., 2026). This is especially important for SMEs and companies in traditional industries where they typically do not possess in-house capabilities and rely heavily on cooperation from external collaboration. Within the case of the textile sector in Vale do Ave, the presence of industrial networks, technological centers, and institutional support mechanisms serves to support that collaborative

innovation processes play an important role, as proposed in the paper through an exploration of external partners.

2.4 Measuring Innovation: Challenges and Multidimensional Approaches

And it remains difficult to quantify innovation as it is intangible, complex, and non-linear by nature, despite its importance (Gault, 2018; Alhidayatullah, 2025). Traditional indicators, like R&D budgets and patent numbers, can yield a limited understanding of innovation ventures and neglect organisational, strategic, or process elements (Taherdoost, 2024). As discussed in the literature, innovation is a composite that encompasses outputs, processes, capabilities, and contextual variables, forcing us to develop more holistic and multidimensional measurement frameworks (Alhidayatullah, 2025). This, in turn, has prompted the emergence of alternative methodological approaches which concentrate on the qualitative domain including organisational culture, learning, and knowledge management. In this way, the paper highlights the challenges of measuring innovation especially because it is qualitative and multifaceted, and single indicator capable of fully capturing it. With these challenges in mind, innovation maturity models have come to the fore as a way for measuring organisations' innovation capabilities. Such models enable organisations to assess their development in several areas of development, identify gaps, and enable improvement as a continuous process.

2.5 Innovation Maturity and the Innovation Scoring Model

The concepts of innovation maturity models are useful frameworks for providing a structured understanding of how firms create and manage innovation. These models build upon these factors to reflect a full breadth of knowledge encompassing innovation capabilities and performance across various measures: strategy, organisation, processes, and outcomes. For instance, the Innovation Scoring model by COTEC Portugal allows businesses to evaluate how mature they are in their innovation process using a multi-dimensional analysis (COTEC Portugal, 2023). The model incorporates strategic alignment, organisational structures, knowledge management, and the impact of innovation activities as parts of innovation management. The model serves as both a diagnostic and benchmarking tool, and in the paper, it is developed to measure the Innovation Score for industry practitioners to find the strengths, weaknesses, and possibilities for improving the innovation processes. Notably, this method is consistent with the innovation measurement literature as it does not consider that innovation performance can be measured by a single indicator but rather needs to be explored across multiple organisational dimensions (Alhidayatullah, 2025). In addition, the idea of innovation maturity is related to the differentiation between institutionalized innovation (i.e., innovation that is firmly entrenched in strategy and processes) and ad hoc innovation, which is more reactive and disorganised (Abreu, 2024). The paper illustrates the difference, indicating that firms with more institutionalized innovation practices experience better performance results.

3. Methodology

3.1 Research Design

This research adopts a qualitative exploratory research design to study the complex and situation-specific issues, such as innovation practices and their association with business performance (Yin, 2018). The qualitative method is commonly employed in innovation research because it can provide a nuanced picture of organisational processes, managerial views, and situational dimensions that are sometimes a challenge to retrieve with quantitative measures (Lê & Schmid, 2022). Consistent with this view, the objective of the current research is to investigate how innovation is structured, perceived, and implemented within firms, not to test certain hypotheses. The study adopts a multiple case study design and examines companies from the textile and clothing sector based in the Vale do Ave sub-region. Case studies are especially suitable for considering contemporary phenomena within their real-life context, where the boundaries between a phenomenon and a context are unclear (Yin, 2018). Data were collected through semi-structured interviews conducted using a pre-structured questionnaire. This questionnaire script was divided into five sections: i) Strategy (environmental analysis, strategic planning and innovation culture); ii) Organisation (innovation structure, human capital and skills); iii) RDI processes (generation and management of innovation projects); iv) Enablers (external cooperation, funding and knowledge management); and v) Impact (market and sustainability).

3.2 Sample and Data Collection

The empirical analysis is based on a multiple case study design involving five firms operating in the textile and clothing sector in the Vale do Ave sub-region. The firms were selected using a purposive sampling strategy (Obilor, 2023), based on their relevance within the industry, their level of internationalization, and their engagement with innovation practices. This approach enables the identification of information-rich cases and allows for meaningful comparison across different organisational contexts.

For confidentiality and analytical consistency, the firms are anonymized and referred to as A1, A2, A3, A4, and A5 throughout the study. These firms correspond to well-established companies in the Portuguese textile sector and represent different profiles in terms of size, organisational structure, and innovation maturity.

A1 and A2 are large, internationally oriented firms with long industrial trajectories and strong technological capabilities. A3 and A4 are medium-sized companies characterized by high technical specialization and a strong focus on incremental and process-based innovation. A5 represents a smaller firm oriented towards product differentiation and niche markets, illustrating the diversity of organisational structures and innovation strategies within the cluster.

Interview data were analysed using qualitative content analysis.

The interviews were conducted online between September and November 2025, and information on the interviewees is summarized in Table 1.

Table 1: Firms and Interviewee's function on company

Firm	Interviewee's Function on Company
A1	Process Engineer – Head of R&D
A2	Head of R&D – Technical Management and Materials Sub-division
A3	Administrator
A4	Product Manager, in the research and development team.
A5	Head of Department

Source: own elaboration

4. Results

4.1 Innovation as a Strategic Driver of Competitiveness

The findings consistently indicate that innovation is perceived as a central strategic driver of competitiveness, growth, and differentiation across all firms.

This perception emerges clearly from the interviews, where firms emphasise the necessity of innovation in a highly competitive and globalized market:

“Innovation is essential to maintain competitiveness in the textile sector” (A1)

“Without innovation, it becomes very difficult to keep up with market and customer demands” (A2)

“Innovation allows us to grow and differentiate from competitors” (A3)

These insights confirm that innovation is not viewed merely as a reactive mechanism, but as a proactive strategic tool, supporting growth, differentiation, and internationalization, as also identified in the paper findings.

4.2 Heterogeneity in Innovation Maturity: Institutionalized vs *ad hoc* Innovation

A key result is the existence of two distinct patterns of innovation:

4.2.1 Institutionalized Innovation

Firms with higher innovation maturity demonstrate structured and strategic approaches:

“Innovation is integrated into the company's strategy” (A1)

“There is clear planning and monitoring of innovation activities” (A2)

“Innovation is not occasional; it is part of how we operate” (A3)

4.2.2 Ad hoc Innovation

Less mature firms rely on reactive and unstructured approaches:

“Innovation often arises as a response to market demands” (A4)

“There is not always a structured plan for innovation” (A5)

“We innovate, when necessary, not as part of a long-term strategy” (A4)

The research confirms that firms with lower innovation maturity tend to respond to external pressures without prior planning or anticipation.

Furthermore, firms with institutionalized innovation achieve superior results in:

- Operational Efficiency
- Value Creation
- Adaptability.

4.3 Organisational Culture and Leadership as Enablers of Innovation

The findings highlight that innovation is strongly shaped by organisational culture and leadership commitment.

Firms with higher maturity consistently report:

“Leadership plays a key role in promoting innovation” (A1)

“Innovation is embedded in our organisational culture” (A2)

“Employees are encouraged to contribute ideas and improvements” (A3)

In contrast, firms with lower maturity face internal barriers:

“It is still difficult to involve the whole organisation in innovation processes” (A4)

“Innovation is not yet fully integrated across departments” (A5)

The study supports this distinction, showing that firms such as A1 and A2 exhibit strong leadership involvement, structured processes, and innovation-oriented cultures.

4.4 Collaboration and External Relationships

The results reveal that innovation is supported by external collaboration, although its level of formalization varies.

Firms report engaging with multiple external actors:

“We collaborate with partners and suppliers to develop new solutions” (A2)

“Customer relationships are fundamental for innovation” (A3)

“External knowledge plays an important role in our innovation processes” (A1)

However, collaboration is not always strategically structured:

“Collaboration exists, but it is not always formalized or managed strategically” (A4)

The paper also highlights the importance of interorganisational cooperation and knowledge exchange, particularly in more mature firms

4.5 Challenges in Measuring Innovation

A highly consistent finding across all firms concerns the difficulty in measuring innovation outcomes.

Firms emphasise the intangible and long-term nature of innovation:

“It is difficult to measure the real impact of innovation activities” (A4)

“Innovation results are not immediate” (A2)

“We often struggle to quantify innovation outcomes” (A5)

This challenge is explicitly identified in the paper, which highlights the difficulty of measuring innovation due to its intangible and multidimensional nature

5. Discussion

5.1 Innovation Maturity as a Manifestation of Dynamic Capabilities

The distinction between institutionalized and ad hoc innovation reflects differences in firms’ dynamic capabilities (Teece, 2025).

Firms with higher innovation maturity demonstrate:

“Innovation is integrated into strategy and daily operations” (A1)

“We continuously adapt our processes to market changes” (A2)

These characteristics reflect the ability to:

- Sense Opportunities
- Seize Them
- Reconfigure Resources

By contrast, firms with ad hoc innovation lack these capabilities:

“Innovation is mostly driven by external pressure rather than internal planning” (A4)

Key contribution: Innovation maturity can be understood as an operational manifestation of dynamic capabilities in traditional industries.

5.2 Innovation in Traditional Industries: Beyond R&D

The findings reinforce that innovation in the textile sector is primarily:

- Incremental
- Process-oriented
- Experience-based

“Innovation often comes from continuous improvements in processes” (A2)

“Small improvements make a big difference over time” (A3)

This aligns with Spithoven and Van Crielingen (2026), who argue that innovation in low-tech industries is often embedded in routines rather than driven by radical technological change.

Insight: Innovation in traditional industries is less visible but equally strategic.

5.3 Open Innovation: a Partial Transition

The importance of external collaboration reflects a shift toward open innovation (Chesbrough, 2024).

“Innovation depends a lot on collaboration with external partners” (A1)

“Customers and suppliers play a key role in innovation” (A2)

However, the data also reveals limitations:

“These collaborations are not always managed in a structured way” (A4)

Interpretation: Firms are transitioning toward open innovation, although many remain in an intermediate stage of maturity.

5.4 Organizational Culture as a Determinant of Innovation

The findings strongly support the role of organisational culture as a key enabler of innovation (Dobni, 2008).

“Innovation depends heavily on how the organisation is structured internally” (A3)

“Without employee involvement, innovation becomes very difficult” (A5)

Key insight: Innovation is not only a capability; it is a cultural condition.

5.5 Measuring Innovation: Bridging the Gap

The empirical evidence confirms the limitations of traditional innovation metrics:

“Innovation is difficult to measure in objective terms” (A4)

This supports the literature (Alhidayatullah, 2025), which highlights the multidimensional nature of innovation.

In this context, the Innovation Scoring model emerges as a relevant contribution, providing:

- a structured assessment framework
- multidimensional evaluation
- support for decision-making

5.6 Innovation Maturity as a Mediator of Performance

The findings refine the relationship between innovation and firm performance.

Rather than suggesting a direct relationship, the results indicate that performance outcomes depend on the degree to which innovation is structured, strategically aligned, and embedded within organisational processes.

Firms with higher levels of innovation maturity demonstrate more institutionalized innovation practices, stronger strategic alignment, and better integration of innovation into daily operations. These characteristics contribute to greater adaptability, operational efficiency, and value creation, leading to superior performance outcomes.

By contrast, firms with less mature innovation systems tend to rely on reactive and ad hoc approaches, limiting their ability to anticipate market changes, systematically manage innovation activities, and evaluate their impact.

These findings suggest that innovation maturity plays an important mediating role between innovation practices and business performance. In this sense, innovation maturity can be understood as a mechanism through which innovation capabilities are transformed into sustained organisational outcomes.

6. Conclusion

This study analysed the relationship between innovation practices and business performance in firms operating in the textile and clothing sector of the Vale do Ave region, using the Innovation Scoring model as an analytical framework.

The findings demonstrate that innovation is widely perceived as a strategic driver of competitiveness, supporting firms not only in maintaining market position, but also in fostering growth, differentiation, and internationalization. However, the study also shows that innovation alone does not automatically lead to superior performance. More importantly, firm performance appears to depend on how innovation is structured, managed, and integrated into organisational strategy and daily operations.

A central contribution of the study lies in the distinction identified between institutionalized and ad hoc innovation practices. Firms with more mature and structured innovation systems, embedded in strategic planning, organisational culture, and operational processes, demonstrate greater adaptability, stronger value creation, and higher operational efficiency. In contrast, firms relying on reactive and less formalized innovation approaches face greater difficulties in anticipating market changes and evaluating innovation outcomes.

The findings also highlight the importance of organisational culture, leadership commitment, and external collaboration as critical enablers of innovation. In addition, the study reinforces the challenges associated with measuring innovation due to its intangible and multidimensional nature, supporting the relevance of holistic frameworks such as the Innovation Scoring model.

From a theoretical perspective, the research suggests that innovation maturity can be understood as an operational manifestation of dynamic capabilities in traditional industries. The results further indicate that

innovation maturity may act as a mediating mechanism between innovation practices and business performance.

Overall, the study contributes to the understanding of innovation management in traditional manufacturing sectors and highlights the importance of structured innovation practices for strengthening competitiveness in industrial clusters. Future research may extend these findings through quantitative approaches, comparative sector analyses, or longitudinal studies exploring the evolution of innovation maturity over time.

Acknowledgement

This work was supported by national funds through FCT/MCTES (PIDDAC): UID/04752 – Applied Management Research Unit (UNIAG).

Ethics Declaration

This study did not require ethical clearance for the research referred to in this paper.

AI Declaration

The authors utilized Grammarly, an AI-based writing assistant, solely to enhance language clarity, grammar, and style. All conceptual contributions, analyses, and conclusions presented in this manuscript are entirely the responsibility of the authors.

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