



COLECCIÓN CONOCIMIENTO CONTEMPORÁNEO

Horizontes de la Comunicación: teoría y práctica en la era digital

Coord.
Santiago Mayorga Escalada

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TEORÍA Y PRÁCTICA EN LA ERA DIGITAL



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ADAPTATION AND RESPONSE TO CHANGING MARKET CONDITIONS IN TECHNOLOGY CENTERS

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1. INTRODUCTION

In an increasingly volatile and complex business environment, the ability of organisations to adapt swiftly to changing market conditions has become a decisive factor in sustaining competitiveness, fostering innovation, and ensuring long-term viability. Globalisation, rapid technological advancement, and shifting policy and regulatory frameworks compel organisations to develop strategic agility and resilience to navigate uncertainty effectively (Teece, Peteraf, & Leih, 2016). For technology centres, particularly those embedded in regional innovation ecosystems, this challenge is magnified by their intermediary role in bridging scientific research and industrial application.

The concept of dynamic capabilities, as articulated by Teece et al. (1997), provides a foundational theoretical framework for understanding how organisations evolve through the continual adaptation and re-configuration of their internal and external resources. These capabilities involve three core functions: sensing opportunities and threats in the external environment, seizing them through strategic resource allocation, and transforming organisational structures and routines to support innovation and long-term adaptation (Eisenhardt & Martin, 2000). Within this perspective, technology centres are increasingly expected not only to generate knowledge but also to anticipate industrial demands, foster internal alignment, and strategically orient their operations toward evolving market needs.

In the Basque Country, technology centres are key actors in a highly developed regional innovation system. Organised under the Basque Research and Technology Alliance (BRTA), these centres contribute significantly to industrial competitiveness, sustainability, and digital transformation. Their effectiveness depends not only on scientific and technological output but also on their ability to respond proactively to market signals and coordinate across internal units.

While prior research has often focused on customer orientation as a determinant of adaptability (Narver & Slater, 1990; Guo & Wang, 2015), this study expands the scope by exploring how technology centres enact adaptive capacity through internal coordination, strategy alignment, and technological foresight. Specifically, the study examines three interrelated dimensions: (1) speed and agility in responding to market changes, (2) effectiveness of internal coordination and cross-functional collaboration, and (3) the strategic use of digital tools and market intelligence to anticipate and respond to environmental shifts.

1.1. TECHNOLOGY CENTRES IN THE BASQUE COUNTRY

The Basque Country has established itself as one of Europe's leading regional innovation ecosystems, characterised by strong institutional support, advanced industrial infrastructure, and a highly developed network of research and technology organisations. The Basque Country's classification as a "Strong Innovator" in the European Innovation Scoreboard (European Commission, 2023) reflects the effectiveness of its regional innovation policy mix and the strategic positioning of its technology centres.

Central to this ecosystem is the Basque Research and Technology Alliance (BRTA), a strategic initiative that brings together 17 technology and cooperative research centres with the aim of addressing socio-economic challenges through science, technology, and innovation. These organisations not only provide scientific and technological expertise, but also act as adaptive entities, continuously evolving their structures, priorities, and services to respond to industrial needs and emerging market trends.

These centres act as vital intermediaries between basic research and industry, facilitating the transfer of knowledge, accelerating the uptake of new technologies, and contributing to the region’s competitiveness and sustainability. Their work spans key industrial sectors — including energy, advanced manufacturing, mobility, and biosciences — and is underpinned by a strong commitment to international collaboration and participation in competitive research programmes. For instance, between 2020 and 2023, BRTA-affiliated centres secured over €320 million in European funding through frameworks such as Horizon Europe and the LIFE programme (Innobasque, 2023).

An additional consideration relates to the structural complexity of the BRTA itself. As a post-merger alliance that brings together 17 previously independent technology and research centres in 2019, the BRTA faces inherent challenges in achieving cohesive internal coordination. Each centre retains its own legacy systems, operational cultures, and strategic priorities, which can complicate efforts to establish unified processes and cross-centre collaboration. This structural diversity, while offering potential synergies, may also lead to fragmentation in decision-making, duplication of efforts, or slower responsiveness to external demands. Managing this complexity requires robust mechanisms for governance, shared communication platforms, and leadership strategies that foster alignment without undermining the autonomy and specialisation of individual centres.

In this context, the ability to adapt dynamically — through internal coordination, strategic alignment, and the use of anticipatory tools — has become a core competence for these centres. Their sustained relevance depends not only on technological excellence but also on organisational agility, cross-functional integration, and responsiveness to both technological and non-technological signals in their external environment.

1.2. ADAPTIVE CAPACITY AND ORGANISATIONAL AGILITY

Adaptive capacity can be understood as an organisation’s ability to adjust effectively to changes in its external environment—whether driven by evolving customer demands, disruptive technologies, or shifting regulatory conditions. For technology centres, adaptive capacity is

multidimensional, encompassing strategic flexibility, foresight capabilities, and internal cohesion (Teece, 2007; Battisti & Deakins, 2017).

One of the primary enablers of organisational agility is effective cross-functional coordination. This refers to the degree to which various internal departments and teams collaborate toward shared strategic objectives. Empirical studies have shown that high-performing organisations tend to exhibit robust coordination mechanisms that facilitate the rapid mobilisation of resources and information in response to change (Eisenhardt & Martin, 2000). In contrast, organisations characterised by fragmentation, siloed communication, or rigid bureaucratic structures often experience slower response times and diminished innovation output.

A further pillar of adaptive capability lies in the ability to anticipate external developments and incorporate foresight into planning and decision-making. This anticipatory capacity is increasingly supported by technological tools such as market intelligence platforms, scenario planning frameworks, and predictive analytics. However, the successful use of these tools requires more than technical deployment; it necessitates the embedding of foresight into the strategic core of the organisation, including leadership practices, decision routines, and cultural norms.

1.3. MODELS AND FRAMEWORKS FOR ASSESSING ADAPTIVE PRACTICES

In order to assess how organisations build and exercise adaptive capacity, several conceptual models have emerged, particularly within the literature on dynamic capabilities and strategic renewal. One widely cited framework is that of Teece et al. (1997), which identifies three core components: *sensing* opportunities and threats, *seizing* them through resource mobilisation, and *transforming* organisational structures to support continued renewal.

More operationalised approaches have focused on measuring agility, coordination, and technological integration. For example, the Dynamic Capabilities Indicator Model (Ambrosini & Bowman, 2009) evaluates organisations based on their ability to detect signals, coordinate

responses internally, and make use of enabling technologies. Similarly, the concept of strategic responsiveness (Wang & Ahmed, 2007) incorporates both structural and behavioural dimensions, such as decision-making speed, flexibility in resource allocation, and interdepartmental cooperation.

In the context of technology centres, tools such as market sensing platforms, digital foresight systems, and scenario planning are increasingly used to monitor external signals. However, their strategic value depends heavily on internal processes — including how insights are disseminated, interpreted, and acted upon. The presence of formalised adaptation strategies, continuous learning mechanisms, and leadership support are also recognised as key enablers of effective response (Helfat & Winter, 2011).

While traditional metrics such as R&D intensity and patent output remain important, measuring organisational adaptability now requires more nuanced, multidimensional instruments that capture both technological and organisational dynamics. This study applies such an approach, combining perception-based measures with structured indicators related to internal coordination, strategic response, and tool usage — providing a comprehensive view of how technology centres in the Basque Country are managing adaptation in practice.

1.4. MARKET ORIENTATION AND ORGANISATIONAL ADAPTATION: BRIDGING INTELLIGENCE AND AGILITY

The Market Orientation model proposed by Kohli, Jaworski, and Kumar (1993) offers a valuable lens through which to understand how organisations develop and operationalise adaptive capabilities. Although originally conceptualised in the context of commercial marketing, the model’s core components — intelligence generation, intelligence dissemination, and responsiveness — are fundamentally aligned with the logic of dynamic capabilities and strategic adaptation.

Intelligence generation, defined as the systematic collection of information about market trends, customer needs, and competitor activities, parallels the “sensing” capability identified in the dynamic capabilities

framework (Teece et al., 1997). In technology centres, this process involves the use of foresight tools, industry engagement, and digital platforms to detect emerging challenges and opportunities. As outlined in Section 1.3, market sensing and digital foresight are becoming increasingly institutionalised practices within technology centres, supporting their role as anticipatory actors in regional innovation ecosystems.

Intelligence dissemination, or the internal communication and sharing of relevant information across functional units, is closely related to the concept of cross-functional coordination highlighted in organisational agility literature (Eisenhardt & Martin, 2000). Adaptive organisations not only collect strategic intelligence but also ensure that it flows seamlessly across departments, enabling coherent and aligned responses. The research findings presented in this study underscore the variability in internal coordination across centres, revealing that while some exhibit strong cross-functional integration, others continue to experience silos that undermine their responsiveness.

Finally, responsiveness — the organisation’s ability to act upon intelligence through adaptive decisions and actions — is functionally equivalent to the “seizing” and “transforming” components of dynamic capabilities. In practice, responsiveness encompasses the rapid mobilisation of resources, reallocation of priorities, and adjustment of organisational processes in response to environmental shifts. Within the Basque technology centres, this was reflected in their varying capacities to implement strategic change in a timely and effective manner, as evidenced by the mixed responses regarding formalisation of strategies and internal alignment.

Taken together, the Kohli et al. (1993) model provides a useful operational framework for assessing how well technology centres manage strategic adaptation at different stages of the information–action cycle. It complements broader models of adaptive capacity by offering a granular view of how knowledge is captured, shared, and acted upon within organisations. Moreover, when combined with dynamic capabilities theory, it reinforces the understanding that organisational responsiveness is not an isolated function but a system-wide process involving intelligence, communication, and coordinated execution.

In the present study, this integrative approach informed both the design of the measurement instrument and the interpretation of results. By grounding the empirical work in both market orientation theory and the dynamic capabilities perspective, the analysis highlights the multidimensional nature of adaptability — and the critical importance of managing it as a deliberate, structured capability within technology centres operating in complex environments.

2. OBJECTIVES

The present study seeks to:

1. To identify the practices implemented by the technology centres of the Basque Country to adapt to market changes, and
2. To assess the effectiveness of these practices in generating innovation and competitiveness.

3. METHODOLOGY

3.1. STUDY DESIGN

This research employed a quantitative, cross-sectional, and descriptive design to explore the adaptive practices of technology centres operating within the Basque Science, Technology and Innovation Network (BRTA). The primary objective was to assess perceptions related to organisational responsiveness, internal coordination, and the strategic use of technological tools. A structured survey was used to gather data directly from managerial-level respondents with operational oversight of adaptive strategies.

3.2. SAMPLE

The sample comprised 51 managers from BRTA-affiliated technology centres. A non-probabilistic convenience sampling method was employed, targeting individuals in senior roles with decision-making responsibilities related to strategic adaptation and customer-oriented practices. The survey was administered in two phases, capturing

responses from distinct subgroups within the same institutional network, thereby enhancing diversity within the sample without compromising its coherence.

3.3. DATA COLLECTION INSTRUMENT

Data were collected through a structured online questionnaire developed ad hoc, drawing on the widely recognised MARKOR scale introduced by Kohli, Jaworski, and Kumar (1993). This model, designed to measure market orientation in organisations, is grounded in three inter-related dimensions: the generation of market intelligence, the internal dissemination of that intelligence, and the responsiveness of the organisation to the information gathered. These components reflect a continuous cycle of sensing, sharing, and acting upon external signals—an approach that aligns closely with the dynamic capabilities framework that underpins this study.

Although the original MARKOR scale consists of multiple items for each dimension, the instrument used in this study was streamlined and fully adapted to the specific context of technology centres. The aim was to ensure relevance to the unique organisational dynamics of the Basque Research and Technology Alliance (BRTA), while also maintaining conceptual fidelity to the core principles of market orientation. The final version of the questionnaire included three key items, each representing one of the theoretical dimensions outlined above:

- Speed of response to market changes (e.g. “We quickly take advantage of market opportunities”)
- Internal coordination for adaptation (e.g. “The activities of the different functions in this business are well coordinated”)
- Use of technological tools for foresight (e.g. “There is a high level of cooperation and coordination among functional units to set the organization's goals and priorities, ensuring an effective response to market conditions”)

Each of these items was evaluated using a 5-point Likert-type scale ranging from -3 (Strongly Disagree) to +3 (Strongly Agree). This

symmetrical scale structure allowed respondents not only to express agreement or disagreement, but also to indicate the intensity of their perceptions in both positive and negative directions. Such a format provided a nuanced understanding of how these practices are perceived across the sample.

While no formal psychometric validation was carried out for this adapted version, the conceptual integrity of the original MARKOR framework served as a strong basis for constructing the items. The reduction to three core indicators was driven by practical considerations, including the need to minimise respondent fatigue among senior-level participants and maintain a high response rate. Nevertheless, the selected items were deliberately crafted to retain the diagnostic intent of the original model and reflect the strategic orientation, coordination capacity, and technological foresight of the organisations under study.

By integrating the MARKOR-based items into the study's design, the research was able to capture perceptual indicators of how technology centres engage in processes of strategic adaptation. The combination of theoretical grounding and contextual adaptation provided a meaningful lens through which to assess the maturity of market-oriented behaviours and their alignment with dynamic capabilities across BRTA member organisations.

3.4. DATA COLLECTION PROCEDURE

Data was collected through online surveys sent to participants. Data confidentiality and anonymity of responses were always guaranteed, with the informed consent of the research participants.

3.5. DATA ANALYSIS

The collected data were subjected to descriptive statistical analysis, focusing on measures of central tendency (mean, median) and distribution (standard deviation) for each item. No inferential statistics were applied, as the aim was exploratory rather than predictive. Interpretation of results was conducted in collaboration with domain experts to ensure

contextual accuracy and relevance to the operational realities of the participating technology centres.

4. RESULTS

The analysis of the responses collected provides a detailed picture of organisational adaptability in the face of evolving market conditions. The findings are organised around three key dimensions: agility in responding to market shifts, internal coordination, and the use of technological tools to anticipate trends.

RESPONSIVENESS TO MARKET CHANGE

A significant proportion of respondents (68%) indicated that their organisations respond quickly to changes in the market environment. This perception was reflected in the generally positive distribution of scores for the item *“We quickly take advantage of market opportunities”*, which yielded a mean of 0.69 and a median of 1 on a five-point Likert scale ranging from -3 (strongly disagree) to +3 (strongly agree). These findings suggest a broad recognition of adaptive capacity among the participating centres. However, it is notable that only 50% of respondents reported the existence of formalised strategies to manage such transitions, indicating a potential gap between reactive agility and structured strategic foresight.

INTERNAL COORDINATION

When asked about the coordination of activities across internal functions, 62% of respondents assessed their organisations positively, suggesting a satisfactory level of operational alignment. This is consistent with the results for the item *“The activities of the different functions in this business are well coordinated”*, which recorded a mean score of 0.39. Despite this, the relatively wide distribution of responses — including a notable minority of negative ratings — reveals that issues of miscommunication and departmental misalignment persist in a significant number of centres. Indeed, 38% of participants explicitly reported

challenges in these areas, highlighting internal coordination as an area for further development.

STRATEGIC ALIGNMENT AND TECHNOLOGICAL TOOLS

With respect to cross-functional cooperation for strategic alignment, the item “*There is a high level of cooperation and coordination among functional units to set the organisation's goals and priorities, ensuring an effective response to market conditions*” produced a mean of 0.49, again pointing to a moderate but uneven implementation of integrative practices. While some organisations demonstrate strong alignment across units, others appear to struggle with fragmented decision-making structures.

Furthermore, 72% of respondents affirmed the use of technological tools such as market intelligence platforms and digital systems to anticipate trends and identify emerging opportunities. However, qualitative feedback and variation in response patterns suggest that the effective application of these tools differs markedly across centres. This inconsistency may be attributed to disparities in resource availability, digital maturity, or the embedding of foresight tools into broader strategic processes.

Taken together, the results reveal a relatively strong adaptive orientation among BRTA centres, particularly in their responsiveness to market dynamics and their use of digital tools. Nonetheless, the data also point to critical areas for enhancement — notably the formalisation of strategic frameworks and the strengthening of internal coordination mechanisms — both of which are essential for sustaining innovation performance in volatile environments.

TABLA 1. Results

Item	Mean	STD	Median
We quickly take advantage of market opportunities	0,55	1,79	1
The activities of the different functions in this business are well coordinated	0,39	1,69	1
There is a high level of cooperation and coordination among functional units to set the organization's goals and priorities, ensuring an effective response to market conditions	0,49	1,76	1

Note: N= 51 (-3 = Strongly disagree 3=Strongly agree)

5. DISCUSSION

The findings of this study underscore the growing relevance of adaptive capabilities within technological centres operating in rapidly changing market environments. In line with the dynamic capabilities framework (Teece et al., 1997; Eisenhardt & Martin, 2000), the ability to sense, seize, and reconfigure organisational resources appears essential for these centres to maintain their competitiveness and fulfil their role as catalysts of regional innovation.

One of the clearest strengths identified in the study is the relatively high responsiveness to market change. A majority of respondents (68%) perceived their organisations as agile and capable of acting swiftly upon emerging opportunities. This aligns with the concept of "sensing" — the capacity to identify relevant external signals — which is a foundational component of dynamic capabilities. Nevertheless, the fact that only 50% of respondents reported the existence of formalised strategies to guide this responsiveness suggests a reactive rather than proactive orientation. Without structured processes to govern adaptation, these organisations risk inconsistencies in execution, or may fail to sustain adaptive responses over time. The literature on strategic agility (Doz & Kosonen, 2010) emphasises that agility without strategic intent can lead to fragmented efforts and suboptimal outcomes.

Internal coordination emerged as another critical, albeit unevenly developed, dimension. While 62% of respondents viewed functional coordination positively, a substantial 38% reported misalignments and communication breakdowns. These internal frictions may act as

significant bottlenecks in the effective translation of market signals into coherent organisational action. According to Helfat et al. (2007), dynamic capabilities rely not only on external awareness but also on the organisation's internal capacity to mobilise, share, and integrate knowledge across functional and hierarchical boundaries. Without robust internal alignment, even well-sensed opportunities may fail to be seized or operationalised effectively. Hence, improving cross-functional collaboration — particularly during periods of strategic or operational transition — is likely to enhance the overall responsiveness and innovation performance of these centres.

This challenge may be further compounded by the structural nature of the BRTA, which functions as an alliance of 17 research centres that differ in size, scientific domain, and organisational maturity. As a relatively recent post-merger initiative, the BRTA must contend with the complexities of integrating diverse operational cultures, legacy systems, and institutional priorities. While this diversity can be a source of strength and complementarities, it also introduces considerable challenges in achieving coherent decision-making, efficient resource allocation, and unified strategic direction. For executives and centre managers, the task of harmonising goals and processes across such a heterogeneous alliance demands sustained leadership commitment and the development of shared governance mechanisms capable of fostering collective agility without suppressing institutional autonomy. The third pillar of the analysis relates to the use of technological tools for market intelligence and trend anticipation. The widespread adoption of such tools (reported by 72% of respondents) signals a positive trajectory toward data-driven decision-making. However, the variation in their effective application highlights a familiar challenge: the mere adoption of technology does not guarantee competitive advantage. As Porter and Heppelmann (2014) have argued, it is the integration of digital tools into strategic routines — not the tools themselves — that creates value. This suggests a need for capacity-building initiatives to ensure that these tools are embedded within broader strategic and operational processes, rather than functioning in isolation.

Taken together, the findings suggest that while The Basque Country technological centres possess many of the foundational elements of dynamic capabilities, there remain opportunities for maturation. Enhancing internal alignment, formalising strategic processes, and embedding foresight tools into decision-making frameworks are key levers for improving both agility and long-term impact. Given their central role in the region's innovation ecosystem, reinforcing these capabilities will not only benefit the centres themselves but also the broader industrial and economic fabric in which they operate.

6. CONCLUSIONS

This study set out to examine how technological centres in the Basque Country are responding to increasingly dynamic market conditions, with a specific focus on three interrelated dimensions: speed of response, internal coordination, and the use of technological tools to anticipate trends. These dimensions are also closely related to core aspects of market orientation, highlighting the importance of proactive sensing, information dissemination, and organisational responsiveness. The findings confirm that these centres are, in general, well-positioned to act with agility in the face of environmental change. A majority of participants indicated that their organisations are capable of responding rapidly to market shifts and are actively incorporating digital tools and market intelligence systems to support timely decision-making processes.

However, this adaptive capacity is not without significant limitations. The absence of formalised strategic frameworks in approximately half of the organisations surveyed points to a structural vulnerability that may hinder the long-term sustainability of their responsiveness. Without consistent strategic planning mechanisms, there is a risk that agile behaviours will remain reactive rather than evolve into anticipatory and systematised capabilities. Similarly, persistent challenges in internal coordination—highlighted by over a third of respondents—suggest that organisational silos, fragmented communication, and inconsistent

cross-unit collaboration continue to inhibit the effective implementation of change initiatives.

The widespread, yet uneven, use of technological tools such as market intelligence platforms and digital foresight systems further underscores the need for a more structured and integrated approach to technology adoption. While many centres have begun investing in these systems, their impact appears to be highly dependent on the extent to which they are embedded within broader organisational routines and decision-making cultures. In some cases, technological adoption may remain superficial or disconnected from strategic priorities, limiting its transformative potential.

In conclusion, the technological centres of the Basque Country exhibit a promising but still developing set of dynamic capabilities. They demonstrate a growing awareness of the need for agility and market responsiveness, but often fall short in terms of systemic integration and strategic coherence. To fully realise their potential as engines of innovation and regional competitiveness, greater emphasis must be placed on strengthening strategic planning processes, fostering sustained cross-functional alignment, and embedding technological foresight into the fabric of organisational culture. Advancing in these areas will not only improve internal performance but also amplify the contribution of these centres to broader processes of industrial transformation and sustainable economic development.

Despite its contributions, this study is subject to several limitations. The use of a non-probabilistic convenience sample limits the generalisability of findings beyond the specific population of BRTA-affiliated technology centres. Furthermore, the exclusive reliance on self-reported perceptions, while insightful for understanding internal views and attitudes, introduces potential bias and does not account for objective behavioural data. The questionnaire, although grounded in a widely recognised theoretical model, was not subjected to prior psychometric validation, thereby constraining its suitability for predictive or causal analysis.

Future research could expand on these findings through the application of longitudinal study designs, allowing for the observation of changes in adaptive practices over time. Employing validated and standardised instruments would also enhance the reliability and comparability of results. Comparative studies involving other regional innovation ecosystems could further contextualise the findings and help identify structural or policy-related factors influencing adaptive capacity. Additionally, incorporating qualitative methodologies—such as in-depth interviews or organisational case studies—could offer richer insights into the cultural, structural, and leadership dynamics that enable or constrain the development of dynamic capabilities in technology centres.

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