

Cluster dynamics and firms' strategies – an integrative framework

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Abstract

Purpose – This study aims to systematise the links between firms' strategies (corporate and business) and the cluster dynamics (through the cluster life cycle [CLC] perspective) and propose an integrative framework bridging firms' strategic behaviour and cluster dynamics (CLC).

Design/methodology/approach – The methodology used is an integrative literature review, which provides a distinctive form of research.

Findings – The study identifies several links between firms' strategies (corporate and business) and the cluster dynamics (CLC), namely: (1) firms' strategies as a triggering factor of cluster evolution; (2) firms' strategies and path's decline; (3) firms' strategies and cluster's renewal; (4) resilience strategies and the cluster life cycle; and (5) cluster's features and firms' strategies.

Research limitations/implications – This study contributes to developing strategic management theory and cluster theory by bridging firms' strategies and cluster dynamics (CLC). It proposes a new conceptualisation of the impact of cluster dynamics on firms' strategic choices – firstly, it proposes a specific approach to identify the CLC; and secondly, it develops an integrative framework model that relates firms' strategies and each stage of the CLC. These are theoretical tools relevant for further advancements in this area of research, as they can be applied in studies of different clusters for validation, something that was not done.

Practical implications – The integrative framework is expected to be helpful to company managers, allowing them to design better strategies that account for dynamic cluster environments.

Originality/value – This study aims to fill this gap in the literature by systematising the links between firms' strategies (corporate and business) and the cluster dynamics (CLC).

Keywords Corporate strategy, Business strategy, Integrative framework, Cluster dynamics, Cluster, Cluster life cycle, Cluster evolution, Path development

Paper type Conceptual paper

1. Introduction

Firms should design strategies to survive, be more profitable, increase their market share (Islami *et al.*, 2020) and be ready for the rapid changes in the environment (Chatzoudes *et al.*, 2021). What enables firms to enjoy competitive performance advantages is fundamental to strategy research (Feldman, 2020, p. 182). When developing a strategy, there are various

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aspects to account for, and assessing the firm's external environment is one of the pillars of successful strategy formulation. Knowledge of the context is increasingly important for successfully competing in the global marketplace because the context and a firm's strategy is a two-way relationship (Puig and Gonzalez-Loureiro, 2017). According to Delgado (2018), locational attributes, specifically cluster attributes, are at the core of formulating and implementing firms' and regional strategies. "Types of strategies, organisational practices, operations, and, ultimately, the performance of firms is shaped by the attributes of the locations and clusters they participate in" (Delgado, 2018, p. 2). Consequently, Delgado (2018) emphasises that future work should examine the interaction among firms' spatial organisation, specifically clusters, management practices and performance.

The influence of clusters on firms' performance is a widely discussed topic (Branco and Lopes, 2018; Diez-Vial and Fernández-Olmos, 2014; ECCP, 2021; Porter, 1985; Ribeiro and Santos, 2008), especially from an innovation perspective (Desmarchelier and Zhang, 2018; Sultan *et al.*, 2020), and internationalisation activity (Forte and Sá, 2021; Kowalski, 2014). Also, the understanding of changing cluster environments is addressed, and it is stated that positive agglomeration effects are not perpetual; they are replaced by congestion effects that constrain firms in later stages of cluster development (Dyba *et al.*, 2020; Martin and Sunley, 2011; Menzel and Fornahl, 2010). Because clusters are not static phenomena, they evolve and change their structure over time (Trippel *et al.*, 2015). Namely, the cluster life cycle (CLC) perspective explains their dynamics as evolution through the stages of emergence, growth, maturity and decline or renewal (Menzel and Fornahl, 2010).

Nevertheless, the role of a dynamic cluster environment in strategy development is still an issue underexplored, which calls for "further investigation on the role of context" (Puig and Gonzalez-Loureiro, 2017, p. 7). According to Kim *et al.* (2021), strategy scholars have made significant progress in understanding industry clusters, but they have paid little attention to their dynamics, which may have critical implications for firms' outcomes. "Cluster motion is potentially important because the concentration of firms, workers, or other actors within an industry cluster is seldom stable and may move in ways that run counter to industry or region-wide trends. Broadening the focus of research to include cluster motion enables a more complete understanding of the implications of geographic clustering for firm strategy" (Kim *et al.*, 2021, p. 823). Bittencourt *et al.* (2022) define the topic of the impact of a cluster's development stages on firms therein as an emerging topic in the literature. According to Puig and Gonzalez-Loureiro (2017), it is vital to investigate the responses and actions that firms implement, such as internationalisation, relocation, innovation, differentiation, specialisation, outsourcing, offshoring and reshoring, to adapt to the continually changing conditions in their environment.

Strategy "is an act of aligning company and its environment", where "the task of strategy is to maintain a dynamic, not a static balance" (Porter, 1991, p. 3). There are different approaches to gaining an understanding of the influence of the environment on the strategy. Among these is the approach by Pertusa-Ortega *et al.* (2008), which analyses the strategy in its external adjustment to the environment, but without a dynamic perspective. Firms' strategy suitability including the dynamic perspective has been approached from an industry life cycle perspective (Beal and Yasai-Ardekani, 2001; Porter, 1980), but the links between firms' strategies (corporate and business) and the cluster dynamics (CLC) have not yet been specifically explored and systematised. Still, other strategies have been approached from a cluster dynamic perspective. Bittencourt *et al.* (2022) investigate how clusters influence firms in terms of innovation's strategy, culture, management and infrastructure and concluded that the influence of the clusters varies according to the development stage they are in. Felzensztein *et al.* (2018) focused their study on inter-firm cooperation ("coopetition") strategy changes over time. Thus, in the context of the interplay between strategy and cluster theory, there is still no clear understanding and systematisation of the links between firms' strategies (corporate and business) and the cluster dynamics (CLC).

This study aims to fill this gap in the literature by systematising the links between firms' strategies (corporate and business) and the cluster dynamics (CLC). It proposes an integrative theoretical framework that clarifies these links. The rest of the paper is organized as follows: [Section 2](#) two presents the typology of firms' strategies and the development of the literature on cluster dynamics (CLC); [Section 3](#) presents and explains the methodology; [Section 4](#) systematizes the links between firms' strategies (corporate and business) and the cluster dynamics (CLC); [Section 5](#) proposes an integrative theoretical framework of firms' strategies and cluster dynamics (CLC), and finally, [Section 6](#) provides the conclusion.

2. Theoretical background

2.1 *The typology of firms' strategies*

To date, there is no standard definition of strategy but rather a wealth of strategy concepts and different interpretations of the term ([Köhler and Zerfass, 2019](#)). This research considers strategy “a mediating force between the organisation and its environment: consistent patterns in streams of organisational decisions to deal with the environment” ([Minzberg, 1979](#), p. 25). A business unit's strategy is the “route to competitive advantage that will determine its performance” ([Porter, 1985](#), p. 25).

Usually, strategies are classified at two primary levels: corporate and business levels ([Porter, 1987](#)). Corporate strategy concerns two separate questions: what businesses the corporation should be in and how the corporate office should manage the array of business units; business or competitive strategy, on the other hand, concerns the competitive advantage in each of the businesses in which a company competes ([Porter, 1987](#)).

Overall, the corporate strategy sets the general direction for the company and provides a starting point for deriving strategies for individual business units and functional areas ([Köhler and Zerfass, 2019](#)). Three corporate-level strategies are considered in this study, in line with [Cappa et al. \(2020\)](#): vertical integration, diversification and internationalisation. The first brings together activities up and down the same value network, while the diversification strategy relates to different value networks, and internationalisation concerns an increase in operations across national boundaries ([Cappa et al., 2020](#)). Successful corporate strategies must expand and reinforce competitive strategies ([Porter, 1987](#)).

Business-level or competitive strategies represent firms' actions to gain a competitive advantage in a single market or industry. According to [Islami et al. \(2020\)](#), [Islami et al. \(2020\)](#), [Moon et al. \(2014\)](#), [Parnell \(2011\)](#), one of the most original typologies of competitive strategies that remain among the most widely cited, tested, criticised and refined was defined by Michael Porter and, therefore, will be adopted in this study. Competitive strategies include cost leadership, differentiation and focus strategies ([Porter, 1987](#)). Thus, the links between firms' strategies (corporate and business) and the cluster dynamics (CLC) mentioned above are explored.

2.2 *Cluster dynamics (CLC)*

Interest in the agglomeration economy and the geographical distribution of economic activities was started in the 19th century when Alfred Marshall worked in industrial districts; however, it was only since the 1990s that it became one of the most relevant research themes ([Cruz and Teixeira, 2010](#); [Lazzeretti et al., 2014](#); [Sedita et al., 2020](#)). Cluster stands for “geographic concentrations of interconnected companies, specialised suppliers, service providers, firms in related industries, and associated institutions (e.g. universities, standards agencies, trade associations) in a particular field that compete but also cooperate” ([Porter, 2000](#), p. 15).

The CLC theory is the most prominent and consistent research on cluster dynamics ([Lazzeretti et al., 2019](#); [Pronesti, 2019](#)). Product life cycle theories ([Levitt, 1965](#)) and the industry life cycle ([Klepper, 1997](#)) serve as inspiration for the emergence of the CLC theory. The life cycles of clusters “and industries” are not the same; different clusters belonging to the same industry can follow

different growth paths (Menzel and Fornahl, 2010; Scur and Garcia, 2019). Thus, clusters can grow or be diminished independently of industry development (Trippel *et al.*, 2015).

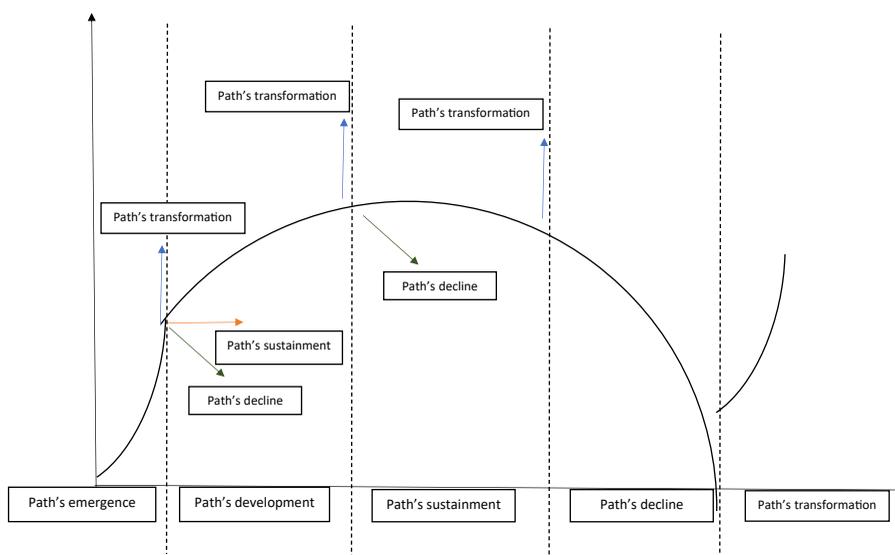
Clustering is a regional phenomenon, so evolutionary economic geography (EEG) also inspired the development of CLC theory (Mobedi and Tanyeri, 2019), incorporating some of its concepts such as path development and lock-in situations (Martin, 2010; Martin and Sunley, 2006). “Path dependency and lock-in are two closely related concepts used to analyse differences in the ability of regional economies to reshape adjustment problems. Both concepts emphasise the importance of context and history in regional processes of industrial evolution” (Vanthillo *et al.*, 2018, p. 1522). Belussi and Sedita (2009) acknowledge that past choices (technologies embodied in firms, labour skills acquired, etc.) influence subsequent choices and, for this reason, the economic performance of a territory – the past-dependence argument. Lock-in relates to a lack of renewal as a negative aspect of clustering (Hassink, 2010). Nevertheless, at the same time, this does not imply that the rigid sequence determined by the past as spatial path dependence is not only past/place dependence. Therefore, a cluster has a development cycle, making it necessary to study the logic of cluster evolution, considering its regional past and possible future developments.

From the analysis of several studies, the division of the “life” of the cluster into four phases (birth, growth, maturity and decline or renewal) seems to be the most consensual (Belussi, 2018; Bergman, 2008; Brenner and Schlump, 2011; Erola *et al.*, 2012; Martin and Sunley, 2011; Menzel and Fornahl, 2010; Pronesti, 2019; Shin and Hassink, 2011; Sölvell, 2009; Swann, 1998; Tavassoli and Tsagdis, 2014; Ter Wal and Boschma, 2011; Tichy, 1998; Trippel *et al.*, 2015; Van Klink and De Langen, 2001; Wolter, 2003). Nevertheless, there is still no consensus on a particular identification of phases or terminology, but they all follow the same logic, pointing out the appearance, development and exhaustion of the cluster phenomenon in parallelism to “life” itself. Additionally, clusters do not jump from one stage to another but slowly turn to the next stage (Menzel and Fornahl, 2010). Consequently, the CLC identification model proposed by Ostapenko (2017) follows this logic and terminology.

According to Harris (2021), the CLC approach has gone through a period of stagnation and could benefit from contributions in recent conceptual advances from evolutionary and institutional economic geography. “By applying this typology of path development to clusters, we hope to develop a better understanding of how actors can change the evolutionary trajectories of clusters over long periods of time in a path-dependent manner” (Harris, 2021, p. 8). It has been observed that CLC terminology converges with path development concepts (Blažek *et al.*, 2020; Harris, 2021), freeing CLC stages from a certain rigidity, allowing us to see different tendencies and gradual transitions within cluster dynamics that otherwise may not be observed.

Hence, following the CLC literature, it is proposed to maintain the perception of cluster evolution as a passage through certain “stages”, in which it is possible to identify a set of parameters that will distinguish the different stages from each other. Nevertheless, this paper incorporates the latest EEG insights and adopts the “path” approach, which is a more flexible and dynamic view.

The following five paths and terminology are proposed: the emergence stage – “*path’s emergence*” – inspired by Jolly *et al.* (2020) is when the cluster appears and enters a certain path; the growth stage – “*path’s development*” – Harris (2021) suggests a notion of path upgrading for this stage, but the path’s development seems more appropriate to the growth stage particularly when the cluster develops the trajectory that was initiated at the path’s emergence; to the maturity stage – “*path’s sustainment*” – adapted from sustaining path used by Fredin *et al.* (2019), which refers to a period of no growth but sustainment; the decline stage – “*path’s decline*” – incorporated from Jolly and Hansen (2021) as a decline of the chosen path; and the renewal stage – “*path’s transformation*” – based on Baumgartinger-Seiringer *et al.* (2021) is a period during which changes are incorporated at any time to escape the path’s sustainment or decline. It is stressed that a cluster does not necessarily follow these paths in the specified sequence (Figure 1) but does have a certain number of characteristics that will distinguish it.



Source(s): Authors' elaboration

Figure 1.
Cluster
dynamics (CLC)

The model for CLC stage identification is adapted from Ostapenko (2017) and presented in Table 1; it contains the description of each parameter and the corresponding type of path. Grounding on the CLC literature, the seven most important parameters of cluster evolution are pointed out:

- (1) *Cluster Identity/Brand* – During the emergence of the cluster, the identity that is being defined in the following stage is still very low, reaching precisely defined core business at the path's sustainment (Belussi and Caloffi, 2018; Davis et al., 2006; Menzel and Fornahl, 2010; Pronesti, 2019);
- (2) *Number of firms* – at the first stage starting from the small number of firms, the number increases, then stabilises and during the path's transformation increases again (Blažek et al., 2020; Desmarchelier and Zhang, 2018; Menzel and Fornahl, 2010);
- (3) *Number of employees* – starting with a small number, it increases, stabilises, falls during the path's decline and then increases again during the path's transformation (Menzel and Fornahl, 2010);
- (4) *Network* – during the path's emergence network is unstable, identification of partners begins, followed by productive networks, development of formal institutions and then during path's sustainment network becomes well-established and dense, narrowing to smaller networks that are blocking and non-productive at the path's decline and finally restructuring at path's transformation (Belussi, 2018; Fornahl et al., 2015; Handayani et al., 2011; Knop et al., 2011; Menzel and Fornahl, 2010; Pronesti, 2019; Tripl et al., 2015);
- (5) *Innovation* – during path's emergence, there is innovation and entrepreneurship, followed by an increasingly high level of innovation, and by a further change to incremental innovation at path's sustainment, towards the disappearing of innovation activity during path's decline and, finally, by integration of newness, new technologies or exit to a new area during path's transformation (Bergman, 2008; Harris, 2021; Menzel and Fornahl, 2010; Tripl et al., 2015);

Parameters	Cluster Dynamics				
	<i>Path's emergence</i>	<i>Path's development</i>	<i>Path's sustainment</i>	<i>Path's decline</i>	<i>Path's transformation</i>
<i>Cluster Identity</i>	Low (Davis, Arthurs, Cassidy, & Wolfe, 2006)	Being defined (Menzel & Fornahl, 2010)	Precisely defined core business (Martin & Sunley, 2011; Davis <i>et al.</i> , 2006; Pronesti, 2019)	-----	-----
<i>Number of firms</i>	Small number (Menzel & Fornahl, 2010; Pronesti, 2019; Dyba <i>et al.</i> , 2020)	Increase (Menzel & Fornahl, 2010; Desmarchelier & Zhang, 2018; Martin & Sunley, 2011; Sölvell, 2009)	Stabilisation (Menzel & Fornahl, 2010; Pronesti, 2019)	Decrease, relocation (Menzel & Fornahl, 2010; Pronesti, 2019; Trippel <i>et al.</i> , 2015; Blažek <i>et al.</i> (2020)	Increase again (Menzel & Fornahl, 2010)
<i>Number of employees</i>	Small number (Menzel & Fornahl, 2010)	Increase (Menzel & Fornahl, 2010)	Stabilisation (Menzel & Fornahl, 2010;)	Decrease (Menzel & Fornahl, 2010)	Increase again (Menzel & Fornahl, 2010)
<i>Network</i>	Unstable, identification of partners begins (Fiorenza Belussi, 2018; Davis, Arthurs, Cassidy, & Wolfe, 2006; Pronesti, 2019; Fornahl, Hassink, & Menzel, 2015; (Dyba <i>et al.</i> , 2020); Handayani, Cakravastia, Diawati, & Bahagia, 2011; Knop <i>et al.</i> , 2011)	Productive networks, development of formal institutions (Belussi, 2018); (Dyba <i>et al.</i> , 2020)	Network well-established and dense (Pronesti, 2019, Menzel & Fornahl, 2010)	Smaller networks, that are blocking and non-productive (Trippel <i>et al.</i> , 2015 Dyba <i>et al.</i> , 2020)	Restructuring (Baumgartinger-Seiringer <i>et al.</i> , 2021; Menzel & Fornahl, 2010)
<i>Innovation</i>	Innovation and Entrepreneurship (Menzel & Fornahl, 2010; Pronesti, 2019)	High (Davis <i>et al.</i> , 2006; Menzel & Fornahl, 2010)	Incremental Innovation (Belussi, 2018 (Menzel & Fornahl, 2010; Pronesti, 2019; Vanthillo <i>et al.</i> , 2018)	-----	Integration of newness, new technologies or exit to a new area (Martin & Sunley, 2011; Trippel <i>et al.</i> , 2015; Knop <i>et al.</i> , 2011; Menzel & Fornahl, 2010; Blažek <i>et al.</i> , 2020)
<i>Policies and regulation</i>	-----	Expansion aids (Bergman, 2008)	-----	-----	-----
<i>External markets - exports /FDI</i>	-----	New markets, export growth (Harris, 2021; Sölvell, 2009; Elola <i>et al.</i> , 2012).	-----	-----	-----

Table 1.
The model for CLC stage definition

Source(s): Authors' elaboration

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- (6) *Policies and Regulations* – Expansion aids are typical during the path's development (Bergman, 2008; Sölvell, 2009);
 - (7) *External markets – exports/FDI* – New markets, export growth are characteristic of the path's development (Eloola *et al.*, 2012; Sölvell, 2009).

This research suggests that by analysing the change in these parameters, it is possible to understand the cluster's path at a certain period.

3. Methodology

3.1 Planning the review

When the research purpose is to combine perspectives and create a new theoretical model, an integrative review is an appropriate methodology in business research (Snyder, 2019; Stoeckl and Luedicke, 2015). Since this research aims to combine insights from cluster and CLC theories and the firm's strategy field to propose a new theoretical integrative framework, an integrative literature review is considered adequate. By reviewing, criticizing and synthesising representative literature, an integrative review provides a distinctive form of research that generates new knowledge about the topic reviewed (Torraco, 2016).

There is still no comprehensive literature review on the interplay between the CLC and firm's strategies; consequently, this research addresses the emerging topic of cluster dynamics (CLC) interplay with firms' strategies (Torraco, 2016). It benefits from an integrative review to form a holistic conceptualisation and synthesis of the literature to date, providing an initial conceptualisation of this interplay (Torraco, 2005). According to Elsbach and van Knippenberg (2020), there is value in integrative work to complement primary empirical research (in management research), including theory papers to narratively integrate the evidence in a field of research to arrive at review-driven new insight. Thus, this research suggests an insight – a conceptual idea arising from the review rather than guiding the review. It intends to drive research on CLC and the firm's strategies forward by highlighting important interactions that should be considered in future studies (Elsbach and van Knippenberg, 2020).

According to Cronin and George (2020), the integrative review is best used when different communities of practice seem to be working in parallel and when research therein could be improved if their findings were synthesized. Post *et al.* (2020) state that reviews that integrate interdisciplinary literature within the management context can assist in dissolving disciplinary boundaries and may provide novel evaluations within areas that may have been hitherto misunderstood or insufficiently explained. The present research is bridging a managerial perspective with a CLC perspective.

The relationship between CLC and firms' strategies covers different areas of research: management, business, economics, development studies, environmental studies, environmental science, geography, regional urban planning and urban studies. It is justified by the cluster's conceptual nature itself. The "founder" (Michael Porter) has addressed this phenomenon from an economic and business perspective and the benefits that agglomeration provides to firms; additionally, being a regional phenomenon, it is widely discussed in EEG literature as well (Kim *et al.*, 2021; Lazzarotti *et al.*, 2014). In total, two main streams of research can be pointed out: strategic management and economics and EEG (Hervas-Oliver *et al.*, 2020; Kim *et al.*, 2021; Lazzarotti *et al.*, 2014; Sedita *et al.*, 2020).

Knowledge from the integrative literature review is expected to be synthesised into a model or conceptual framework that offers a new perspective on the topic (Torraco, 2016). Hence, a conceptual framework on the relationship between firms' strategies and CLC is proposed in the present research.

3.2 *Conducting the review*

The Emerald, ScienceDirect, Scopus and Web of Science (WOS) databases were searched for relevant articles. According to the established boundaries, in WOS, the following categories were included: business, economics, management, development studies, environmental studies, environmental science, geography, regional urban planning and urban studies. In Scopus, the following categories were included: business, management and accounting, economics, econometrics and finance and environmental science. All three authors were involved in the literature's screening, selection, analysis and systematisation. The detailed research protocol is described in [Table 2](#).

According to [Snyder \(2019\)](#), there is no strict standard for data analysis, as the aim is to critically analyse and examine the literature, the main ideas and the relationships of an issue. The integrative literature review requires the creative collection of data while assuring the transparency of how articles were selected, "as the purpose is usually not to cover all articles ever published on the topic but rather to combine perspectives and insights from different fields of research traditions" ([Snyder, 2019](#), p. 336). Since the research objective is to find the links between firms' strategies (corporate and business) and the cluster dynamics (CLC), the search went after the literature that would indicate the interdependency between clusters' dynamic environment and firms' business or corporate strategies.

The first step was to identify the period of published articles. Since the founding of the concept of the cluster is related to the work of [Porter \(1998\)](#), which corresponds to only 3 decades of research, it was decided to analyse all existing literature without limiting the search.

The initial search focus was on the literature that would indicate the interdependency between cluster dynamic environment and firms' business or corporate strategies. Thus, the second step was to define specific subjects and consequent keywords for the literature analysis. Since CLC theory is based on the understanding of cluster evolution and dynamics, these keywords were used in the search providing three units of analysis: cluster life cycle, cluster evolution and cluster dynamics. Regarding firms' strategies, the search was also narrowed to specific business and corporate strategies, providing eight units of analysis: firms' strategies, business strategies, corporate strategies, cost leadership, differentiation, product diversification, vertical integration and internationalisation. A total of 24 combinations were established ([Figure 2](#)).

It was decided to select an article if it would consider the combination of CLC (or evolution or dynamic) and firms' strategies (even if only one of the strategies). The review followed the following criteria of inclusion: firstly, the title and an abstract were read, if there would be some indication of cluster dynamics and firms' strategic behaviour, the whole article was screened, and if the article contained the link, the whole article was carefully read and analysed. Only the works that would consider firms' strategies accounting for changing cluster environment were included in the framework construction. The following exclusion criteria were applied: articles considering CLC and regional strategies; articles based on other than CLC, such as firm, industry or product cycles; articles linking CLC and other than business or corporate strategies; and articles considering firms' strategies and generally addressing the evolution, but not classifying according to the stages were not selected for the framework construction.

Surprisingly, among a total of 554 articles analysed from WOS and 496 from Scopus, the search identified only 2 works that addressed the intended topic of research and were appropriate for the framework construction. Additionally, while analysing these works, the article of [Belussi and Sedita \(2009\)](#) was mentioned within the text as having similar results, so it was found, read and included for consideration. All three works belong to the CLC stream of research.

Thus, this initial approach did not provide fruitful results; moreover, the results were discouraging. It was concluded that the direct combination of the CLC and strategies would not return clear hits, as this evidence might be within the research on CLC and not pointed out

INTEGRATIVE LITERATURE REVIEW STEPS								
1. Limit the scope of the search	WOS: business, economics, management, development studies environmental studies, environmental science, geography, regional urban planning, urban studies. Scopus: business, management and accounting, economics, econometrics and finance, environmental science.							
2. Define period of search	Not to limit the search, due to the novelty of wide use of "cluster" terminology itself regarding the regional formations							
3. SELECT KEYWORDS								
3.1. CLC and firms' strategies								
KEYWORDS	WOS	Scopus	KEYWORDS	WOS	Scopus	KEYWORDS	WOS	Scopus
1. (cluster life cycle or cluster lifecycle or cluster life-cycle) AND firm* AND strateg*	47 *1 (Scur & Garcia, 2019)	24 +0	9.cluster evolution AND firm* AND strateg*	169 	72 +0	17.cluster dynamic* AND firm* AND strateg* Refined for "cluster dynamic*" AND firm* AND strateg*	316 too vague Adapted for 3 results *0	7 +0
2. (cluster life cycle or cluster lifecycle or cluster life-cycle) AND (business or competitive) strateg*	57 +0	46 +0	10. cluster evolution AND (business or competitive) strateg*	144 +0	97 +0	18. "cluster dynamic*" AND (business or competitive) strateg*	2 +0	4 +0
3. (cluster life cycle or cluster lifecycle or cluster life-cycle) AND corporate strateg*	13 +0	11 +0	11. cluster evolution AND corporate strateg*	32 +0	23 +0	19. "cluster dynamic*" AND corporate strateg*	0 +0	2 +0
4. (cluster life cycle or cluster lifecycle or cluster life-cycle) AND cost leadership	1 +0	4 +0	12. cluster evolution AND cost leadership	3 +0	4 +0	20. "cluster dynamic*" AND cost leadership	0 +0	0 +0
5. (cluster life cycle or cluster lifecycle or cluster life-cycle) AND differentiation	14 +0	24 +0	13. cluster evolution AND differentiation	43 +0	132 +0	21. "cluster dynamic*" AND differentiation	1 +0	1 +0
6. (cluster life cycle or cluster lifecycle or cluster life-cycle) AND product diversification	4 +0	3 +0	14. cluster evolution AND product diversification	10 +0	8 +0	22. "cluster dynamic*" AND product diversification	0 +0	0 +0
7. (cluster life cycle or cluster lifecycle or cluster life-cycle) AND vertical integration	1 +0	0 +0	15. cluster evolution AND vertical integration	5 +0	8 +0	23. "cluster dynamic*" AND vertical integration	0 +0	0 +0
8. (cluster life cycle or cluster lifecycle or cluster life-cycle) AND international*ation	11 +0	4 +0	16. cluster evolution and international*ation	42 *1 (Belussi, 2015)	19 +0	24. "cluster dynamic*" AND international*ation	4 +0	3 +0

Table 2. Integrative literature review steps
(continued)

3.2. CLUSTER LIFE CYCLE				
Keywords	WOS results	Taken for integrative framework	Scopus results	Added
<i>cluster life cycle or cluster lifecycle or cluster life-cycle</i>	738	33 articles were retained for the CLC model revision. Among them 8 revealed the link to firms' strategic behaviour: <i>Menzel and Fornahl (2010), Martin and Sunley (2011), Elola et al. (2012), Østergaard and Park (2015) Trippel et al. (2015) Valdalisio et al. (2016), Carli and Morrison (2018), Harris (2021)</i> <i>Two more discovered after text analysis: Harris (2021) – led to Blažek et al. (2020). Sölvell (2009) included through Tavassoli and Tsagdis (2014)</i>	636	Added 3 works to the CLC subject.
<p><i>Martin and Sunley (2011)</i>, referred to <i>Martin (2010)</i> work regarding path dependence concept, so it was read and included for CLC category due to its relevance for the CLC.</p> <p><i>Sölvell (2009)</i> work was included to CLC category and into the framework construction after the analysis of <i>Tavassoli and Tsagdis (2014)</i>.</p> <p><i>Harris (2021)</i> indicated for the convergence of CLC literature and path development literature, the attempt to explore this area brought to the research some other works (<i>Baumgartinger-Seiringer et al., 2021; Blažek et al., 2020; Boschma & Frenken, 2018; Frangenheim et al., 2020; Hassink et al., 2019; Jolly et al., 2020; Jolly & Hansen, 2021; MacKinnon et al., 2019</i>) where <i>Blažek et al. (2020)</i>, revealed the link between trajectories of decline and firms' strategic choices. But this approach on path development was not systematic, indicated new line of investigation, some insights were adopted but in-depth analysis was abandoned due to the scope of the present research.</p>				
3.3. CLUSTER AND FIRMS' STRATEGIES				
Keywords	WOS results	Taken	Scopus Results	
Cluster AND firm* AND strateg*	1410	(Conz et al., 2017), the only work that reverses the logic and sees the strategies, not as a part of evolution drivers, but as a response to the environment, even though resilience strategies, and not the ones that are defined in present research. Did not appear in previous search as the focus is on maturity stage in the title and abstract.		Not used due to lack of efficiency of this approach
3.4. CLC AND FIRMS' STRATEGIES/CLUSTER AND FIRM'S STRATEGIES ON GOOGLE SCHOLAR				
Keywords		Google Scholar		
Cluster and/or (life cycle or lifecycle or life-cycle) or evolution or dynamics AND (firm OR firms or firm's or firms') AND (strategies OR strategy)		(Viederytė, 2018)		Article is not in WOS and Scopus, but addresses the strategies in line with triggering factors. It was also included.
		(Knop et al., 2011)		Not included in WOS/Scopus but brings important contribution to CLC literature and some insights for strategy, namely to renewal stage.
cluster and competitive or business strategy		(Delgado, 2009)		Not included in WOS/Scopus. It is not a published work but contains important contribution to the relationship of cluster structure and firms' strategies, the only work that considers the influence of cluster on firms' competitive strategy
cluster and diversification		(Harper, 2017)		Not included in WOS/Scopus. The work that relates product diversification and cluster size, as well the attribute that is subject to change along the CLC, that is why it is considered in the framework.

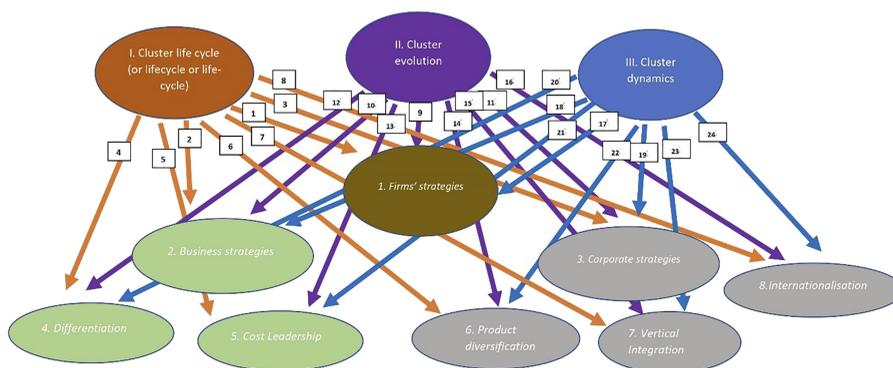
Table 2.

(continued)

4. CRITERIA FOR INCLUSION/EXCLUSION	
4.1. Criteria for inclusion	<ul style="list-style-type: none"> If the title and the abstract were indicating that the CLC and firms' strategies within the cluster were addressed the article was read Only the works that would consider firms' strategies accounting for changing cluster environment were included into the framework construction
4.2. Criteria for exclusion	<ul style="list-style-type: none"> Not considering CLC Not considering firm's strategies in CLC Considering CLC and regional strategies Other than CLC, such as firm, industry, or product. CLC and other than business or corporate strategies Considering strategies and generally addressing the evolution, but not classifying according to the stages
5. CODING	
<ol style="list-style-type: none"> Strategies across CLC – as triggering factors Strategies at certain stage – 2.1. decline and 2.2. renewal Resilience strategies across CLC – CLC influence on strategy Cluster's features and firms' strategies 	<ol style="list-style-type: none"> firms' strategies as a triggering factor of cluster evolution firms' strategies and path's decline firms' strategies and cluster's renewal resilience strategies and the cluster life cycle cluster's features and firm's strategies

Source(s): Authors' elaboration

Table 2.



Source(s): Authors' elaboration

Figure 2. Keywords construction – units of analysis

in the title or abstract. Thus, the decision was made to go over the CLC literature, searching for the indication of firms' strategies within the text and refining the proposed model of CLC identification.

The search on CLC provided 738 results in WOS and 636 in Scopus. The same criteria for inclusion in the integrative framework were applied. Additionally, works addressing stages of CLC development were retained for CLC model refining. Thus, 33 articles from WOS and 3 more from Scopus were retained for CLC model revision. From the analysis of the sources, 9 more articles were included for the same purpose. From all these articles included for CLC model revision, 8 works were identified that referred to the firm's strategic behaviour and CLC and were included in the framework construction. Two more were discovered during their further analysis.

Another attempt to reveal the links between firms' strategies (corporate and business) and the cluster dynamics (CLC) was made by considering only cluster and firm's strategies for other possible interpretations of cluster dynamics. One work was found that addresses the adoption of certain strategies in response to the changing cycle of the cluster. Additionally, a combination of cluster and specific strategies (business and corporate, cost leadership, differentiation, diversification, vertical integration and internationalisation) were used, but the results were not adjusted to the theme of the research and were not included. There is much-published research on cluster advantage for the internationalisation process, but there is no specific link between this specific strategy and CLC.

Additionally, the research was undertaken using GoogleScholar, using all the combinations of keywords used in databases. Since it is an emerging line of research, it was used to see if there are some conferences or press releases that address this issue. It was an advantageous step. It brought some unpublished works not included in WOS and Scopus (conference material, books, etc.). Eight more works were thereby included for CLC understanding. Two of these included references for firms' strategic behaviour and two correlated firms' strategies and cluster's features and were, therefore, included in the framework construction.

Thus, in the CLC area, 59 articles were included in the analysis, of which only 16 fulfilled the criteria and included firms' strategies (corporate and business) and cluster dynamics (CLC) (Table 3). Additionally, two articles were found to have valuable contributions to strategy analysis and cluster's features. A total of 18 articles were included in the integrative framework construction (Figure 3).

3.3 Identification of main categories

According to [Torraco \(2016\)](#), it is necessary to address how the main ideas and themes from the literature were identified and categorized. Firstly, from 18 studies that related firms' business and/or corporate strategies and cluster dynamics, the literature regarding the whole CLC stages and relevant strategies was separated. It was observed that firms' strategies were identified as triggering factors of cluster evolution, which is why the papers were categorised as such. Secondly, it was observed that some papers addressed specific stages of cluster evolution and firms' strategies were implied in the research. They were categorised according to a specific stage of the cycle, namely, decline and renewal. Thirdly, the only work that considered the cluster cycle of development and its influence on firm's strategic behaviour was categorised apart due to this approach, even though it addressed resilience strategies. Finally, the two works that analysed the impact of cluster structure on firms' competitive and diversification strategies were included.

Thus, the analysis provided five categories of research in which the links between firms' strategies (corporate and business) and the cluster dynamics (CLC) are explored: (1) firms' strategies as a triggering factor of cluster evolution – seven sources; (2) firms' strategies and path's decline – one source; (3) firms' strategies and cluster's renewal – seven sources; (4) resilience strategies and cluster life cycle – one source; and (5) cluster's features and firms' strategies – two sources (Table 4).

The sources included fall into the period between 2009 and 2021 (Figure 4). The most consistent research line relates to understanding firms' strategies as triggering factors of cluster evolution (Category 1) and CLC literature itself (Category 3). The order of categories is related to the CLC. The first category relates to corporate and business strategies with the whole CLC. The second one specifically relates strategies to the path's decline; the third to the subsequent stage of path's renewal; the fourth, despite it considers the whole cycle, is related to the resilience strategies so placed in the following category; and the fifth is related to firms' strategies to the cluster features and not the CLC, so it comes the last.

Cluster dynamics and firms' strategies

		AUTHOR	KEY POINTS	CLC+strategies	CLC WOS	CLC Scopus	Cluster Evolution	Cluster + Firm strategies	Inspired by Harris (2021)	Google Scholar
	1.	<i>Van Klink and De Langen (2001)</i>	One of the first relevant works on CLC		✓					
	2.	<i>Davis et al. (2006)</i>	Indicators and CLC							✓
	3.	<i>Martin and Sunley (2006)</i>	CLC and EEG synergy		Led by <i>Martin and Sunley (2011)</i> ✓					
	4.	<i>Bergman (2008)</i>	Description of the cycle			✓				
1	5.	<i>Belussi and Sedita (2009)</i>	The study considers application of diversification, differentiation, cost leadership strategies through CLC	Led by <i>Scur and Garcia (2019)</i> ✓						
2	6.	<i>Sölvell (2009)</i>	CLC and policies *Renewal and firms' behavior (strategy)		Led by <i>Tavassoli and Tsagdis (2014)</i> ✓					
	7.	<i>Martin (2010)</i>	Dissociation of path dependence from lock-in		Led by <i>Martin and Sunley (2011)</i> ✓					
3	8.	<i>Menzel and Fornahl (2010)</i>	Became one of the most used to identify/parameters in empirical studies <i>EX:</i> Branco and lopes (2013, 2018), Shin and Hassink (2011), Elola <i>et al.</i> (2012, 2017), Tavassoli and Tsagdis (2014), Mahroum and Al-Saleh (2016), Viederyte (2018), Santer, (2018), Dyba <i>et al.</i> (2020); *Renewal and firms' behavior (strategy)		✓					
	9.	<i>Brenner and Schlump (2011)</i>	One of the most important and cited works for policies adoptions and CLC		✓					
4	10.	<i>Knop et al. (2011)</i>	Non/linear development argument *Renewal and firms' behavior (strategy)							✓
5	11.	<i>Martin and Sunley (2011)</i>	The most cited and used in non-linear development argument! *Renewal and firms' behavior (strategy)		✓					
	12.	<i>Shin and Hassink (2011)</i>	CLC base		✓					

(continued)

Table 3. Development of the research on the cluster dynamics (CLC)

	13.	<i>Handayani et al. (2011)</i>	Assessment model to identify phase of industrial CLC			✓				
6	14.	<i>Elola et al. (2012)</i>	Included the importance of business strategies at each stage of CLC.		✓					
	15.	<i>Ingstrup and Damgaard (2013)</i>	CLC base		✓					
7	16.	<i>Ostergaard and Park (2013)</i>	Factors of resilience *Renewal and firms' behavior (strategy)		✓					
	17.	<i>Branco and Lopes (2013)</i>	This paper is about the relative economic performance of clustered and non-clustered companies in the different phases of the CLC							✓
	18.	<i>Tavassoli and Tsagdis (2014)</i>	Central study for CSF		✓					
	19.	<i>Ter Wal and Boschma (2011)</i>	CLC base				✓			
8	20.	<i>Tripl et al. (2015)</i>	Development of CLC * new industrial and sectoral identities (implied diversification)		✓					
9	21.	<i>Belussi (2015)</i>	Growth factors in development for selected Italian IDs/Cs + strategies				✓			
	22.	<i>Fornahl et al. (2015)</i>	Importance of actors, networks and institutions during the evolution and CLC		✓					
	23.	<i>Hartono and Sobari (2016)</i>	The role of cluster cycle and pattern of interaction to competition strategy (but form clusters' and firms' perspective)							✓
	24.	<i>Mahroum and Al-Saleh (2015)</i>	CLC base	✓						
	25.	<i>Mossig and Schteber (2014)</i>	Importance of firms' routines in cluster evolution		✓					
10	26.	<i>Valdatiso et al. (2016)</i>	Adapting and expanding the data form Elola et al. (2012) presented the analysis between CLC and the trajectory of its corresponding industry, the role of strategies is assessed		✓					
	27.	<i>Rodriguez-Rodriguez et al. (2017)</i>	CLC and CSF							✓
	28.	<i>Elola et al. (2017)</i>	CLC and policies		✓					
	29.	<i>Fornahl and Hassink (2017)</i>	CLC and policies			✓				
	30.	<i>O'Connor et al. (2017)</i>	CLC base		✓					

Table 3.

(continued)

11	31.	<i>Conz et al. (2017)</i>	Resilience strategies and CLC					✓		
12	32.	<i>Viederytė (2018)</i>	Role of firms' capabilities (strategies) in CLC							✓
	33.	<i>Belussi (2018)</i>	Role of MNE in cluster evolution		✓					
	34.	<i>Belussi and Caloffi (2018)</i>	Cluster and firms' performance			✓				
	35.	<i>Boschma and Frenken (2018)</i>	Overview of relevant literature on evolutionary economic geography.						✓	
	36.	<i>Desmarchelier and Zhang (2018)</i>	Network analysis and CLC		✓					
	37.	<i>Santner (2018)</i>	CLC base + factors of their external environment, esp. Factors of cluster renewal		✓					
13	38.	<i>Carli and Morrison (2018)</i>	CSF/Triggering Factors– Firms' strategies Role of external factors and socio-economic contingencies + strategies and CLC		✓					
	39.	<i>Branco and Lopes (2018)</i>	Relative performance of clustered and non-clustered companies during the different stages of CLC		✓					
	40.	<i>Felzensztein et al. (2018)</i>	Changes over time in inter-firm cooperation		✓					
	41.	<i>Pinkse et al. (2018)</i>	Cluster paradox, role of agency in renewal		✓					
	42.	<i>Vanhillo et al. (2018)</i>	Regional development strategies (considers firms' strategies but not enough)		✓					
	43.	<i>Bernela et al. (2019)</i>	Approach, by integrating drivers at the micro, meso and macro-economic scales of analysis + Concept of embeddedness		✓					
	44.	<i>MacKinnon et al. (2019)</i>	Rethinking path creation						✓	
14	45.	<i>Scur and Garcia (2019)</i>	Consider role and types of strategies in evolution	✓						
	46.	<i>Mobedi and Tanyeri (2019)</i>	Spatial knowledge in life cycle, EEG + Network theory		✓					
	47.	<i>Pronesti (2019)</i>	S3 + CLC	✓						
	48.	<i>Hassink et al. (2019)</i>	Multi-actor and multi-scalar approach/path creation/ convergence with cluster renewal						✓	
	49.	<i>Lazzeretti et al. (2019)</i>	Future research agenda for cluster		✓					

(continued)

Table 3.

	50.	<i>Dyba et al. (2020)</i>	Knowledge sourcing and CLC		✓					
	51.	<i>Frangenheim, Trijpl and Chlebna (2020)</i>	Multiple path and agency role, framework to analyse the dynamic interdependencies between multiple new regional growth paths						✓	
	52.	<i>Abbasiharofteh (2020)</i>	Conceptual framework of cluster policies that accounts for cluster evolution based on endogenous micro-forces that are immanent in a knowledge sourcing structure		✓					
	53.	<i>Jolly et al. (2020)</i>	develops a framework for understanding the role of multiple types of actors and the agency they exercise for regional industrial path development.						✓	
15	54.	<i>Blažek et al. (2020)</i>	Trajectories of decline						✓	
16	55.	<i>Harris (2021)</i>	EEG + CLC * Stage and firms' behavior (strategy)		✓					
	56.	<i>Baumgartinger-Seiringer et al. (2021)</i>	CLC approaches differ from the model suggested in this paper in various ways. They put focus on the whole lifespan (from emergence to decline) of a clustered industry. In contrast, our model sheds light on mature industries and pays attention to a particular phase of their evolution, namely their transformation based on radical innovations						✓	
	57.	<i>Jolly and Hansen (2021)</i>	Decline and dark phases of path development processes						✓	
	58.	<i>Kim et al. (2021)</i>	Measure of cluster dynamics consisting of three steps: (1) measuring cluster concentration levels, (2) identifying trends in concentration levels, and (3) quantifying characteristics of those trend	✓						
	59.	<i>Bittencourt et al. (2022)</i>	Influence of cluster on innovation strategy, including the CLC influence		✓					

Table 3. Source(s): Authors' elaboration

It is visible that it was a latent topic that was addressed within a wider issue of an understanding of cluster evolution itself. The specific need for investigation of the link between firms' strategies and CLC started to come to light only beginning in 2017 but has now become an important topic of research.

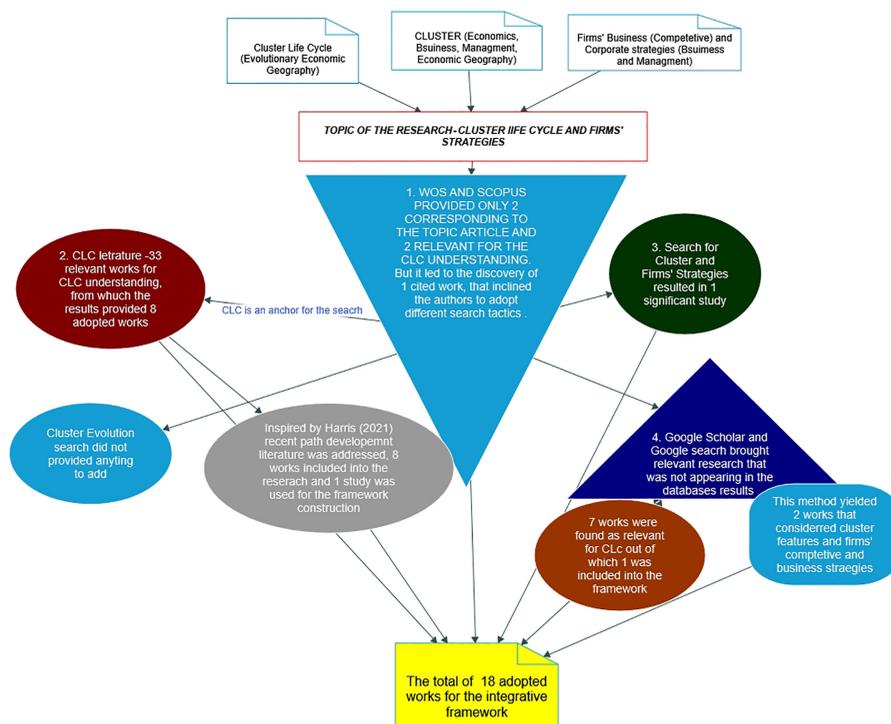


Figure 3. Steps of literature extraction

Source(s): Authors' elaboration

From the descriptive analysis of the results (Table 5), it is seen that most of the research addresses the European countries, except for one that covers a wide set of 74 countries for the analysis. Most of the research is developed in the form of conceptual papers. Although the area of regional development dominates the scope of the publications, research is also published within economics and management fields, reflecting an integrative character of the present research.

4. Firms' strategies (corporate and business) and the cluster dynamics (CLC)

4.1 Firms' strategies as a triggering factor of cluster evolution

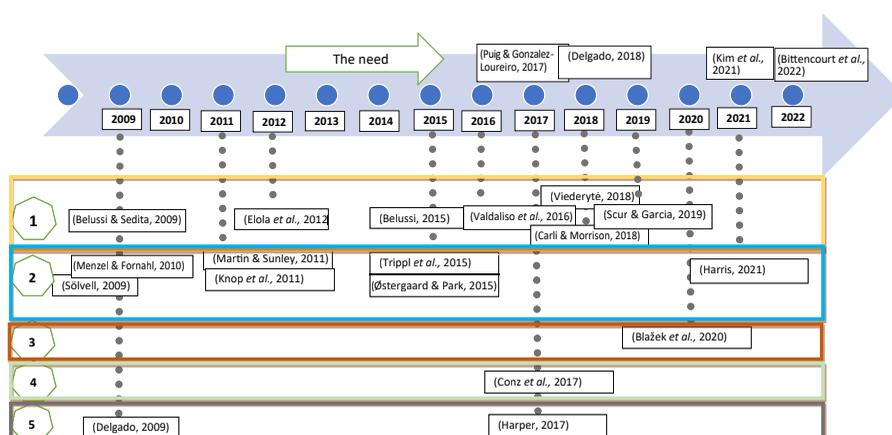
The most common approach linking strategies and CLC considers corporate and business strategies as part of the triggering factors of clusters' evolution.

Belussi and Sedita (2009) conducted a meta-analysis of empirical research on 12 Italian clusters. Addressing the triggering factors of an evolutionary process, they concluded that district dynamics, among other factors, are strongly influenced by individual firm strategies, which shape micro-founded changes. During the growth and maturity stages, diversification and differentiation and product upgrading strategies were found to be an important mechanism of "unlocking", enlarging the local capabilities and paving the way to new development and growth trajectories. Cost leadership was exclusively pursued in two clusters (Verona and Val Vibrata clusters) during their growth stage, revealing to be strongly path-dependent and leading to lock-in trajectories. "This strategy is myopic and firms

Table 4.
Systematisation of the research on firms' strategies (corporate and business) and cluster dynamics (CLC)

Category	Author	Path's emergence	Path's development	Path's sustaiment	Path's decline	Path's transformation
1) firms' strategies as a triggering factor of cluster evolution;	Belussi and Sedlitz (2009)		Diversification and differentiation and product upgrading strategies Internationalisation, Cost leadership (-)	Diversification and differentiation and product upgrading strategies Internationalisation, Cost leadership (-)		
	Belussi (2015)	Cost leadership	Cost leadership Internationalisation	Product differentiation Numerous low-cost sources have been utilised by local firms Internationalisation		
	Eloha et al. (2012) Viestryc 2018	Cost leadership and diversification SMEs	Cost leadership and diversification and standardisation by larger firms, SME – diversification and innovation.	Product differentiation and diversification in niche markets, <i>innovational product differentiation</i> in auxiliary industry.		
	Carli and Marzoni (2018)	Cost leadership (-)	Retained diversification	Cost leadership (-) by SMEs Vertical integration namely through establishing own distribution channels. Concerning the strong actors, the largest firms, continued to innovate by following the trends towards <i>retained diversification</i> already started in the previous period. Companies also focused on <i>Internationalisation and diversified in terms of export markets</i> , entering promising new geographies.		Diversification acquiring related businesses that could be integrated into the cluster, reducing the dependence on a single product (i.e. woman's hosiery).
2) firms' strategies and path's decline; 3) firms' strategies and cluster's renewal	Scar and Garcia (2019)		At growth stage <i>compete based on costs, hence following cost leadership strategy</i>		In declining cluster, firms were able to improve their products and compete at a higher value level. Cost leadership based on <i>downgrading</i> <i>path devaluation</i> .	
	Blazek et al. (2020)					Implied diversification: • new industrial and sectoral identities (Trippi et al., 2015). • New ideas - new cluster (Knop et al., 2011). • cluster enters "renaissance" (Søvel, 2009). • increase in heterogeneity with the integration of new knowledge (Menzel & Fornahl, 2010) • A radical, innovation-based form of path's development is path transformation, (Blazek et al., 2020).
	(Trippi et al., 2015) (Menzel & Fornahl, 2010) (Blazek et al., 2020). (Knop et al., 2011). (Søvel, 2009)					
	Ostergaard and Park (2013)					change in strategic direction, namely diversification in other technologies, forming a new industrial complex (Ostergaard & Park, 2013).
	Harris (2021) Martin & Sunley, 2011					Upgrading, new direction (that may suggest diversification strategy); development of niches through the integration of symbolic knowledge (may be a focus strategy). (Harris, 2021; Martin & Sunley, 2011).
4) resilience strategies and cluster life cycle	Conz et al. (2017)		Resilience strategies of SMEs vary along the cycle: cooperative strategies	organisational strategies	entrepreneurial strategies	The relevance of innovative strategies (that are related to the diversification strategy)
	Delgado 2009 Harper (2017)		Positive and robust relationship between clusters' strength in a country and national companies' adoption of quality-differentiation strategies. It is found that firms located in clusters may benefit from a more developed product portfolio; however, an increase in cluster size may yield a reduction in product breadth (resource product offering or diversification)			

Source(s): Authors' elaboration



Source(s): Authors' elaboration

Figure 4. Evolution of the topic of CLC and firms' strategies

adopting it risk being stuck in a perverse spiral of cost reduction, which does not provide any relevant resources to face global competition from low-cost countries” (Belussi and Sedita, 2009, p. 510).

This approach was further developed by Belussi (2015), who also applied meta-analysis to reports developed in previous studies, creating new interpretations from secondary sources of 22 Italian clusters. Among various factors for the growth stage of the cluster, special attention was given to analysing firms' strategies towards product differentiation/diversification and internationalisation. Product differentiation and new designs (incremental innovations and product customisation) were applied during the maturity phase. In addition, numerous low-cost sources have been utilised by local firms to be creative, such as being located near design offices, having internal engineering departments, and above all, having good interactions with their clients and suppliers. However, in this study, cost leadership was generally typical in the initial stages of the life cycle in most of the industrial districts/clusters investigated. It was related to implementing cost-cutting innovations, introduced mainly through the adoption of new machinery and organisational methods (innovations originating externally to industrial districts/clusters).

Eloia *et al.* (2012) identified strategies such as cost leadership, diversification and differentiation as the local drivers of cluster evolution. In the Basque maritime industry cluster, the findings were that from emergence to development, cost leadership and diversification strategies were adopted by larger firms, while SMEs followed diversification strategies. During the development to maturity stage, larger firms adopted cost leadership and diversification strategies plus standardisation, while SMEs adopted diversification and innovation. During maturity, product differentiation and diversification strategies in niche markets, and innovation and product differentiation in the auxiliary industry were adopted. In the electronics and Information and Communication Technology (ICT) cluster of the Basque Country, from the stage of emergence to development, the founding leading firms followed strategies of diversification, vertical integration and internationalisation (Eloia *et al.*, 2012). In addition to recording the type of strategies pursued at every stage of the CLC, the type of companies, either large or small were also distinguished. And it is considered a relevant issue which needs further investigation.

Viederytė (2018) followed Eloia *et al.* (2012) and summarised the driving factors from the literature and case studies in the EU maritime regions. However, the focus of these studies

Authors	Journal	Type of study	Citations In Web of Science Core Collection	Category
Belussi and Sedita (2009)	<i>European Planning Studies</i>	meta-analysis of empirical research on 12 Italian clusters.	155	1) firms' strategies as a triggering factor of cluster evolution;
Delgado (2009)	<i>Web, unpublished</i>	The empirical analysis exploits a detailed country-level panel dataset based on the 2000-2004 of 74 countries Executive Opinion Surveys (EOS) developed by the World Economic Forum	Not on WOS	5) cluster's features and firms' strategies;
Sölvell (2009)	<i>Book</i>	Conceptual + application in Sweden	Not on WOS	3) firms' strategies and cluster's renewal
Menzel and Fornahl (2010)	<i>Industrial and corporate change</i>	Conceptual	373	3) firms' strategies and cluster's renewal
Martin and Sunley (2011)	<i>Regional Studies</i>	Conceptual	185	3) firms' strategies and cluster's renewal
(Knop <i>et al.</i> , 2011)	<i>The Economy and Economics After Crisis</i>	Conceptual	Not on WOS	3) firms' strategies and cluster's renewal
Eloia <i>et al.</i> (2012)	<i>European Planning Studies</i>	Meta-Study on Basque Clusters.	41	1) firms' strategies as a triggering factor of cluster evolution;
Østergaard and Park (2015)	<i>Regional Studies</i>	High-Tech Cluster in Denmark	49	3) firms' strategies and cluster's renewal
(Trippel <i>et al.</i> , 2015)	<i>European Planning Studies</i>	Conceptual	67	3) firms' strategies and cluster's renewal
Belussi (2015)	<i>Investigaciones Regionales – Journal of Regional Research</i>	meta-analysis of empirical research on 22 Italian clusters	26	1) firms' strategies as a triggering factor of cluster evolution;
Conz <i>et al.</i> (2017)	<i>Journal of Enterprising Communities: People and Places in the Global Economy</i>	SMEs - La Versa and Torrevilla, operating in the Oltrepò Pavese - Italian wine cluster	14	4) resilience strategies and cluster life cycle
Harper (2017)	<i>Journal of Marketing Development and Competitiveness</i>	Conceptual	Not on WOS	5) cluster's features and firms' strategies;
Carli and Morrison (2018)	<i>European Planning Studies</i>	Castel Goffredo, a traditional textile cluster in Italy	2	1) firms' strategies as a triggering factor of cluster evolution;
Viederytė (2018)	<i>Regional Formation and Development Studies</i>	Conceptual	Not on WOS	1) firms' strategies as a triggering factor of cluster evolution;
Scur and Garcia (2019)	<i>Competitiveness Review: An International Business Journal</i>	Brazilian ceramic clusters	1	1) firms' strategies as a triggering factor of cluster evolution;
Blažek <i>et al.</i> (2020)	<i>European Planning Studies</i>	Conceptual	19	2) firms' strategies and path's decline;
Harris (2021)	<i>Progress in Human Geography</i>	Conceptual	13	3) firms' strategies and cluster's renewal

Table 5.
Evolution of the research on firms' strategies (corporate and business) and cluster dynamics (CLC)

Source(s): Authors' elaboration

was to comprehend the strength of the factors selected that drive cluster evolution and not differentiate which strategies were the most effective at each stage of the CLC.

Valdaliso *et al.* (2016) presented an analysis of the relationship between CLC and the trajectory of the corresponding industry, accessing the role of strategies. Four out of the six clusters followed the life cycle of their dominant (mature) industries and managed to maintain their competitive position. There are, however, two new clusters that have appeared – aeronautics and ICTs – related to the technological change in those industries. Strategies of cost leadership, focus, innovation, internationalisation and diversification were identified as important drivers of

clusters' evolution. "With different degrees of innovation, the clusters of papermaking, maritime industries, machine tools and energy, would be good examples of 'innovation-based adjustment of mature clusters'; while those of aeronautics and ICT would fit, respectively, into the 'diversification' and 'radical change' types" (Valdaliso *et al.*, 2016, pp. 77–78).

Carli and Morrison (2018) addressed the triggering factors for the evolution of the Castel Goffredo hosiery cluster, in which strategies were considered endogenous factors. They conclude that the cluster was shaped by internal co-evolution mechanisms between firm strategies and policy interventions. Firstly, cost leadership appeared as a common strategy used by firms during the take-off or emergence stage and was the driving force behind the cluster's extraordinary growth. It was stressed that cost leadership remained the driver throughout the entire duration of this cluster's growth and stabilisation phases. Additionally, cost leadership was not suitable for further stages in this cluster, as it diverted resources away from more critical areas of intervention, such as training, innovation and diversification. During the cluster maturity phase, reliance on cost reduction locked the cluster into already declining activities, preventing local actors from diverting resources from slow to fast-growing activities. In this context, large firms showed a parallel differentiation trajectory to maintain a competitive edge over foreign rivals; however, their strategies did not imply significant renewal of the cluster's core functions. Secondly, during the maturity stage in the CLC, vertical integration was observed by establishing its own distribution channels. Concerning strong actors, the largest firms continued to innovate by following the trends towards related diversification that had already started in the previous period. Companies also focused on internationalisation and diversified export markets, entering promising new geographies. In the renewal stage, leading companies started to diversify, acquiring related businesses that could strengthen the emergence of a new related sector in the cluster, reducing dependence on a single product (i.e. women's hosiery).

Scur and Garcia (2019) analysed the driving forces behind cluster evolution based on qualitative empirical research, with multiple case studies in Brazilian ceramic tile clusters. In the Criciúma cluster, which showed signs of being a declining cluster, firms improved their products and competed in a higher value market based on differentiation. On the other hand, in the Santa Gertrudes cluster, which exhibited very fast growth, local producers were able to accumulate new capabilities, especially in manufacturing, which, in turn, allowed them to compete based on costs, thereby following a cost leadership strategy. It was noted that fostering collaboration and cooperation should be part of firms' strategies at this stage to increasingly promote local capabilities for cluster evolution and upgrading through the strengthening of local and non-local networks of firms and institutions.

Considering firms' strategies as one of the forces driving cluster evolution is the most common way of examining the link between firms' strategies (corporate and business) and cluster dynamics (CLC). Despite not providing a clear conclusion on whether these strategies deployed by firms at a certain stage are suitable or effective, they are considered extremely important. In this sense, a certain tendency is found across different clusters, which indicates that some strategies are prevalent at certain stages of the CLC.

4.2 Firms' strategies and path's decline

Blažek *et al.* (2020) addressed the possible trajectories of a path's decline. These are downgrading (serving yet lower market segments and/or performing mere low-value-adding production activities), contraction (key companies tend to make new investments to enhance their position in selected and demanding niches) or path delocalisation (relocation of key economic activities). Even though this work focused on understanding distinctive decline trajectories, it reveals possible firms' strategies for this period. Downgrading and contraction correspond to the focus of business strategy by choosing a specific niche to serve. Delocalisation represents a form of corporate strategy and geographical diversification. Hence, this study was included in the framework.

4.3 Firms' strategies and cluster's renewal

Clusters can renew themselves by taking advantage of specific existing capacities and infrastructure and building new industrial and sectoral identities (Trippi *et al.*, 2015). New ideas are the beginning of new networks and structures that result in a new cluster (Knop *et al.*, 2011) or the cluster enters "renaissance" (Sölvell, 2009). The main point is the heterogeneity; when it increases, the cluster enters a new growth phase (Menzel and Fornahl, 2010). This increase in heterogeneity can be incremental with the integration of new knowledge in the same technological trajectory of the cluster, or it can be of a more radical nature by integrating new technologies. The change can be so radical that clusters go into entirely new areas.

Østergaard and Park (2015) found that among the strategies applied by firms was the change in strategic direction, namely, diversification in other technologies, forming a new industrial complex that drove clusters to renewal (Østergaard and Park, 2015).

Among the various types of new path development, Harris (2021) has linked the following to the stage of renewal: moving up the value chain based on upgrading the skills and production capabilities, new direction based on new technologies or organisational innovations, or new business models (that may suggest diversification strategy), or development of niches through the integration of symbolic knowledge (may be a focus strategy). This is attributed to a crucial role in innovation for a cluster to enter a new growth path: the creation of new technologies and industries, diversification into technologically related industries and upgrading of existing industries by the infusion of new technologies or the introduction of new products and services (Harris, 2021; Martin and Sunley, 2011).

4.4 Resilience strategies and cluster life cycle

The only study that reverses the perspective from the strategies as factors for cluster evolution to strategies as firms act within and conditioned by the cluster environment and connected to the cluster evolution is Conz *et al.* (2017). The authors investigate the resilience strategies of SMEs in mature clusters based on the Oltrepò Pavese Wine cluster in the Lombardy region. From a longitudinal perspective, the authors found that the resilience strategies of SMEs (i.e. organisational, innovative, cooperative and entrepreneurial) vary along with the CLC. The relevance of innovative strategies (related to the diversification strategy) is stressed at the renewal stage, cooperative is equally relevant during the growth stage, organisational is more relevant at the maturity stage and entrepreneurial is at the decline stage. This study concludes that firms' resilience varies over time. It is determined by the manager's ability to choose and pursue resilience strategies that are dynamic and consistent with the evolution of the adaptive cycle. "Strategies adopted by managers are equally relevant and can determine the company's longevity. Indeed, although they have both been influenced by the strength of the connectedness of the cluster, Torrevilla and La Versa have adopted different behaviours with remarkable results" (Conz *et al.*, 2017, p. 205). These findings imply that cluster dynamics (CLC) may play a role in conditioning firms' strategies and, therefore, are included in the framework construction.

4.5 Cluster's features and firms' strategies

Finally, the approach to exploring the relationship between the cluster environment and firms' strategic direction is to consider the different features of the clusters.

Delgado (2009) studied the strength of clusters and firms' strategies. Cluster strength is considered as the prevalence and depth of a cluster, namely, the level of collaboration among cluster suppliers, partners, local customers, institutions and supply- and demand-side factors of the cluster environment (local availability of high-quality process machinery, local customers' sophistication and the intensity of rivalry). Delgado (2009) suggests a positive and

robust relationship between cluster strength at the country-level and national companies' adoption of quality differentiation strategies. Another perspective is employed by Harper (2017), relating cluster size to product diversification strategies. Firms located in clusters may benefit from a more developed product portfolio; however, an increase in cluster size may reduce product breadth (broader product offering or diversification) (Harper, 2017).

Thus, these approaches suggest that different cluster structures relate to firms' behaviour in terms of strength and size. Since it has been established that cluster structure changes over time, these findings provide valuable insights and, therefore, are considered.

5. Integrative framework of firms' strategies and cluster dynamics

The analysis of these links between firms' strategies (corporate and business) and the cluster dynamics (CLC) revealed that different strategies are more prevalent, depending on the path that a cluster is on (Table 6). Namely, cost leadership appears to be mainly applied at the path's emergence and development, showing lock-in tendencies if used at later points of the CLC. Differentiation and diversification are mostly used during path development and sustainment. Vertical integration during the path's sustainment; internationalisation strategy is especially pursued during the path's development (as an expansion) and sustainment (as an exit to new markets). For the path's transformation, the diversification strategy is the most notable. Moreover, it seems possible to state that the cluster becomes stronger and larger after the conclusion of the path's development, and also at the subsequent path's sustainment, suggesting that the quality differentiation strategy becomes relevant at these paths, while diversification is less pursued.

These systematised findings represent only the record of what strategies were pursued at a particular path and not the evaluation of their effectiveness. However, it is possible to provide an initial conceptualisation of the influence of the CLC on firms' strategic choices. The prevalence of certain strategies depending on the path of CLC suggests an understanding that, since they are mostly used, they seem to be the most effective. Therefore, a particular path of the CLC and its characteristics creates peculiar environments (Table 1) and, therefore, influences firms' strategies.

For instance, during a path's emergence, while there are only a few firms present, and they have not yet gained their position and may have little capital, cost concerns are at the fore, it seems that the cost leadership strategy is the most suitable business strategy. This stage is characterised by innovation and entrepreneurship, which is reflected in product diversification strategies because firms are still experimenting with what will become the core activities of the cluster.

During path's development, when more firms start to become established in the cluster, the competition increases, so there is more variety of strategies employed, but also cooperative behaviour starts to be relevant in the network making it more productive. Thus, cost leadership, differentiation, diversification and internationalisation seem to be equally effective, as there is a need to gain more market share for their products and services. By choosing a certain strategy, each firm establishes its position and gains its market share.

With the exhaustion of the markets during path's sustainment, it is understandable that some firms will exit, and some will tend to obtain more control over production and quality and pursue a vertical integration strategy, as well as internationalisation in search of new markets. The cost leadership strategy seems less suitable, as due to the greater number of firms and dense network, the competition is high and there is the need for stronger differentiation of the firms' offers, including the search for a specific focus strategy. The wide range of strategies deployed reflects the need to avoid lock-in and activation of various strategies.

<i>Type of path</i>	<i>strategies</i>	<i>Authors</i>	<i>Negatively associated with performance</i>	<i>Authors</i>
path's emergence	cost leadership	<i>Belussi (2015)</i> <i>Elola et al. (2012)</i> <i>Carli and Morrison (2018)</i> <i>Viederytė (2018)</i>		
	diversification	<i>Elola et al. (2012)</i> <i>Viederytė (2018)</i>		
path's development	diversification	<i>Belussi and Sedita (2009)</i> <i>Belussi (2015)</i> <i>Elola et al. (2012)</i> <i>Viederytė (2018)</i>	cost leadership	<i>Belussi and Sedita (2009)</i> <i>Elola et al. (2012)</i> <i>Viederytė (2018)</i>
	differentiation	<i>Belussi and Sedita (2009)</i> <i>Belussi (2015)</i>		
	internationalisation	<i>Belussi (2015)</i>		
	cost leadership	<i>Carli and Morrison (2018)</i> <i>Scur and Garcia (2019)</i>		
path's sustainment	differentiation	<i>Belussi and Sedita (2009)</i> <i>Belussi (2015)</i> <i>Elola et al. (2012)</i> <i>Viederytė (2018)</i> <i>Carli and Morrison (2018)</i> <i>Delgado (2009)</i> <i>Harper (2017)</i>	cost leadership	<i>Belussi and Sedita (2009)</i> <i>Carli and Morrison (2018)</i>
	product diversification	<i>Belussi and Sedita (2009)</i> <i>Elola et al. (2012)</i> <i>Viederytė (2018)</i>		
	vertical integration	<i>Carli and Morrison (2018)</i>		
	internationalisation (new export markets)	<i>Carli and Morrison (2018)</i>		
path's decline	focus, geographical diversification (relocation)	<i>Blažek et al. (2020)</i>		
	differentiation	<i>Scur and Garcia (2019)</i>		
path's transformation	product diversification	<i>Carli and Morrison (2018)</i> <i>Østergaard and Park (2013)</i> <i>Harris (2021)</i> <i>Conz et al. (2017)</i> <i>Trippel et al. (2015)</i> <i>Knop et al. (2011)</i> <i>Sölvell (2009)</i> <i>Menzel and Formahl (2010)</i> <i>Blažek et al. (2020)</i> <i>Martin and Sunley (2011)</i>		
	focus	<i>Harris (2021)</i>		

Table 6.
The links between firms' strategies (corporate and business) and cluster dynamics (CLC)

Source(s): Authors' elaboration

During the decline, there are fewer firms and a lack of innovation, so the focus strategy seems to be a possible strategy for firm survival, focusing on specific niches for which their products are still relevant.

During path's transformation, new members are drawn to the cluster, networks are restructuring and innovation is high, so the diversification strategy seems to be the most effective, as it provides the possibility of finding new customers for a new product or service offerings and subsequent cluster survival; but also, a focus strategy, saving some products or services representing core activities of the "old" cluster, but providing them to some niche customers.

Thus, we can outline the relationship between a firm's strategies (corporate and business) and cluster dynamics (CLC) and propose that a dynamic cluster environment conditions a firm's strategic behaviour, where certain strategies seem to be more suitable depending on the specific path of cluster evolution:

- (1) During path's emergence cost leadership and diversification strategies seem to be more suitable
- (2) During path's development differentiation, diversification and internationalisation strategies seem to be more suitable, while cost leadership can be positively and negatively associated with performance.
- (3) During a path's sustainment differentiation, focus, internationalisation, diversification strategy and vertical integration seem to be more suitable, whereas cost leadership is negatively associated with performance.
- (4) During path's decline focus, geographical diversification (relocation) and differentiation seem to be more suitable.
- (5) During path's transformation diversification and focus strategy seem to be more suitable.

Thus, we propose the following integrative framework (Figure 5) to combine firm strategy development with cluster dynamics (CLC).



Figure 5.
Integrative framework
of firms' strategies and
cluster dynamics

Source(s): Authors' elaboration

6. Conclusion

The influence of a dynamic cluster environment on a firm's strategic behaviour is an emerging research topic. Various researchers have stressed the importance of investigating this influence, among which are [Bittencourt *et al.* \(2022\)](#), [Delgado \(2018\)](#), [Kim *et al.* \(2021\)](#), [Puig and Gonzalez-Loureiro \(2017\)](#). Still, no study specifically explored firms' corporate and business strategies according to each stage of the CLC.

In this research, firm's strategies are classified into business (differentiation, cost leadership and focus) and corporate (product diversification, vertical integration and internationalisation). Cluster dynamics is considered from the CLC perspective plus the concept of path development from EEG. We provide a model of cluster dynamics that differentiates between path's emergence (emergence stage), path's development (growth stage), path's sustainment (maturity stage), path's decline (decline stage) and path's transformation (renewal stage) ([Figure 1](#)). Every path has certain characteristics that can be identified by analysing variation in the parameters of cluster identity, the number of firms and employees, innovation, network, policies and regulations and external markets ([Table 1](#)).

Combining these perspectives, some studies were found that address the impact of strategies on the cluster's evolution among other triggering factors; some examine only a specific stage; one specifically addresses the influence of CLC on resilience strategies. Additionally, some studies analyse the suitability of business and diversification strategies by examining different qualities of clusters and not their dynamics. The integrative review allowed us to systematise these approaches into five different categories that explore the links between firms' strategies (corporate and business) and the cluster dynamics (CLC) ([Table 4](#)): (1) firms' strategies as a triggering factor of cluster evolution; (2) firms' strategies and path's decline; (3) firms' strategies and cluster's renewal; (4) resilience strategies and the cluster life cycle; and (5) cluster's features and firm's strategies.

By analysing the prevalence of firms' strategies according to every stage of CLC, the integrative framework is proposed ([Figure 5](#)). It suggests that certain strategies are more suitable at different stages of cluster evolution. We find that cost leadership and diversification strategies are more suitable during path's emergence; differentiation, diversification and internationalisation strategies during path's development; differentiation, focus, internationalisation, diversification strategy and vertical integration during a path's sustainment; focus, geographical diversification (relocation) and differentiation during path's decline; diversification and focus strategy during path's transformation.

This study contributes to developing strategic management theory and cluster theory by bridging strategies and cluster dynamics (CLC). It proposes a new conceptualisation of the impact of cluster dynamics on firms' strategic choices. The proposed CLC identification and integrative framework model are theory tools for advancing further research on CLC and firms' strategies, as they can be applied in studies of different clusters.

A cluster's dynamic environment influences firms' behaviour and performance. Certain strategies appear to be more suitable than others according to the stages of the CLC. It is expected that the framework will be helpful for company managers when designing strategies. Considering the dynamic cluster environments, the framework identifies the most common competitive challenges that may help managers find the most effective strategies for their organisation at every stage of CLC.

Since this research has an explorative and integrative character of an emerging topic, sources for constructing the framework are scarce. The type of resources used are also limited. Peer-reviewed journal articles were used, but also with the help of Google Scholar some resources were used that are not widely appreciated in scientific research but represent an advantage for emerging topics. These include books, book chapters and unpublished

works of leading researchers in the field (such as Delgado, Solvell, Porter, Hassink and Pronesti).

This is an initial approach to discussing the major theme of the influence of a cluster dynamic environment on firms' strategic behaviour, and the proposal thus requires empirical testing for its validation. So, in future research, applying this framework to clusters at different stages of their CLC is important to confirm the most effective strategies for the firms' performance, including looking for differences by firm size, as observed by [Elola et al. \(2012\)](#).

Further empirical validation of the proposed framework may also provide more specific guidance to company managers for developing their strategies and help consolidate the theoretical framework. Moreover, developing the ideas of [Felzensztein et al. \(2018\)](#) and [Bittencourt et al. \(2022\)](#) that co-competition strategy and innovation strategy also vary according to CLC stages can further enhance the development of the present framework.

Finally, a valuable line of research is on the convergence of CLC and path development literature (as suggested by [Harris \(2021\)](#)). The attempt to explore this area brought to the research some relevant works, but this approach to path development was not systematic. Some insights were adopted, but the in-depth analysis was abandoned due to the scope of the present research. Hence, it indicated a new possible line of investigation, namely, through systematic literature review to analyse the evolution of CLC research and its convergence with the path development literature.

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