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VI

RETHINKING CLUSTERS

THE PARADOX OF SUSTAINABILITY
INNOVATION: LOCAL OR GLOBAL?

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Diversification in industrial districts: is it about embedded regional or firm-level capabilities?

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Positioned in the relatedness-diversification topic, this article analyzes whether regionally embedded or firm-level capabilities drive regional diversification in IDs (Industrial Districts). Adding to the agents of change literature, we analyze the process of regional diversification in industrial districts in intermediate regions, examining the relationship between relatedness and Marshallian agglomerations. We argue that regional diversification lacks an explicit mechanism to explain how a region branches into new products. We posit that the origin of branching is based on firms' heterogeneity, which is overlooked. We elaborate by showing that the mechanism for regions to diversify is based on firms' diversification process through recombining their own capabilities with those available in the local/regional settings, generating thus a related-driven regional diversification. Utilizing mixed methods based on archival analysis, interviews and patent analysis (1895–2019; 3,592 patents and utility models), the learning dynamics and product diversification of the Toy Valley district in Alicante (Spain) are analyzed, showing their capability reconfiguration and accumulation. It gradually evolves from a capability domain centered on toys into a multi-industry manufacturing territory driven primarily by local companies' diversification and local institutional reconfiguration: both regionally embedded and local firm diversification co-exist. Firm related-diversification with extensive local search explains, at the micro-level, the mechanism of the regional relatedness-diversification process.

The emergence of place-based renewable energy clusters: a proposed framework for typification

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Renewable energy clusters are gaining attention as key drivers for achieving a reliable and low-carbon energy transition. However, a lack of clear definitions and a comprehensive understanding of the factors influencing their emergence hinder progress in this area. To address this gap, a new analytical framework is proposed, drawing upon regional sciences, technology innovation systems, and energy geography. The proposed framework identifies three qualitative types of clusters, ranging from industrial to material reliable, and highlights the importance of actor interactions, institutions, networks, knowledge and tools, proximity, location characteristics, and path dependency. Policymakers and researchers can utilize this framework to design effective strategies and policies that promote the development of renewable energy clusters. Through an analysis of the drivers, contexts, and inhibitors of these clusters, the study provides valuable insights into the enabling factors, impacts, and diverse emergence patterns observed in different.

Skills for the circular economy: evidence from Emilia-Romagna, Italy

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The challenges posed by the achievement of the circular economy require the adoption and diffusion of new tasks and skills and/or the recombination of existing ones. Understanding the relationship between circular economy innovations (CEIs), skills endowment, and skills needs through the lens of the 'complexity framework' is the main aim and added value of the present work. More specifically, we put to the test the existence of a nexus between skills/task complexity and CEIs. The empirical work relies on a composite dataset constructed through the merging of micro-administrative data and survey data on manufacturing companies located in the Emilia-Romagna region, Italy. The empirical analysis shows a positive relationship between specific types of CEIs and skill/task complexity measured both at occupational level and at firm level. The results offer an interesting starting point to analyze and understand the non-trivial needs of firms introducing CEI in terms of workforce skills and organizational tasks.

JEL codes: J24, Q55, R1

Keywords: Circular innovation, Circular Economy, Skills, Tasks

Spatial Heterogeneity in the Effect of Regional Trust on Innovation

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Generalized trust represents a regional resource which lowers transaction costs and facilitates more intense collaboration, which, in turn, enhances innovation outcomes. We develop four theoretical mechanism for why the trust-innovation relationship is not homogeneous across geographic space, and some regions are more likely to benefit from higher trust than others.

First, very high levels of trust can increase in-group interaction at the expense of interacting with actors outside the region, and thereby hamper the inflow of new knowledge, i.e. individuals are locked into their strong-tie social network. In consequence, there are diminishing returns to trust (see Molina-Morales et al., 2011, Echebarria and Barrutia, 2013, Roth, 2009).

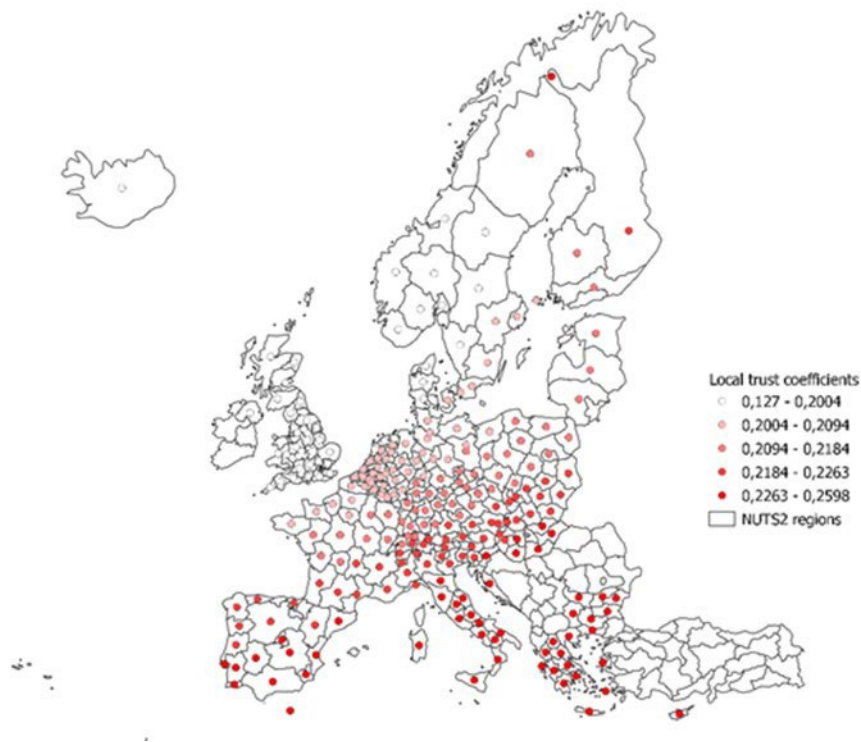
Second, a novel research strand suggests that regions substantially differ in their innovation patterns. Most importantly, firms in less innovative regions fundamentally rely on external sources of knowledge, which is obtained through collaboration, while innovation in more innovative regions is based on a combination of in-house R&D, external collaboration and non- R&D activities (Hervás-Oliver et al., 2021; also see Hervás-Oliver et al., 2021b). If innovation in lagging regions is more dependent on external sources of knowledge and collaboration than in leading regions, higher levels of trust should also hold stronger importance as it is a crucial driver of cooperation and knowledge exchange.

Third, smaller companies possess fewer in-house capabilities than larger companies and must consequently cooperate with external partners (Barge-Gil et al., 2011; Santamaría et al., 2009; Hervás-Oliver et al., 2011; Hervás-Oliver et al., 2014; Hervás-Oliver et al., 2015). Lacking internal research and development (R&D), they often operate under a doing-using-interacting (DUI) mode of innovation (Hervas-Oliver et al., 2021b; Runst & Thomä, 2021; Thomä, 2017; Hervás-Oliver et al., 2011). Small firms are consequently more likely to cooperate informally. Regional trust supports informal cooperation and can therefore serve as a substitute for lacking in-house resources. The trust-innovation relationship should therefore be more pronounced in regions with a high share of smaller firms.

Finally, in the presence of well-established formal institutions – defined as the political rules of the game (North, 1991) – governments enforce the law and protect property rights. In this way, transaction costs decline, and investments and cooperation become less risky, which fosters innovation and economic growth (North, 2010; Acemoglu et al., 2005; Knack and Keefer, 1997; Kaasa and Andriani 2022), whether at the national or sub-national level (Rodríguez-Pose, 2013; Rodríguez-Pose and Ketterer, 2020). We argue that trust may serve as a facilitator of cooperation in the absence of high-quality formal institutions because trust replaces the need for legal protection to some degree.

We empirically analyze a large sample of 216 European NUTS2 regions, and a large time period between 2005 and 2018. We apply geographically weighted regression (GWR) to reveal a considerable heterogeneity in the trust-innovation relationship. Despite higher levels of trust in economically advanced regions, and presumably, higher levels of collaboration, we find that eastern and southern European regions benefit more strongly from increases in trust than northern and western regions (see Fig. 1).

Figure 1: Local coefficients from geographically weighted regression



Our results suggest that that this finding can be mainly explained by two contextual factors, i.e. diminishing returns to trust, and a higher share of small firms in less advanced regions. In conjunction with the recent findings by Ganau, R., & Rodríguez-Pose (2023), and Bischoff et al. (forthcoming), our research underlines the critical role of trust for economic development in catching-up regions. Specifically, trust seems to be related to the existence of regional ecosystems, in which smaller firms can overcome their lack of internal capabilities by efficiently exploiting external resources through more intense collaboration.

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From local markets to global legitimacy: A bottom-up perspective on technological innovation system's dynamic

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Theoretical Background

Over the last decade, the TIS literature has been following a particular line of theorizing, encouraging to follow the TIS-relevant actors, networks, and processes to wherever they lead at various geographical scales and advising against setting a priori spatial boundaries (Binz et al., 2014; Coenen et al., 2012). Having emerged from the criticism of predominantly national TIS perspective (Markard et al., 2012), this line has motivated scholars to develop various spatial conceptualizations of TISs (Fig. 1). By introducing different geographical scales into the arsenal of a truly spatial approach to TISs, authors have studied different TISs from *primarily* global (Fig. 1a), *primarily* national (Fig. 1b,c), and *primarily* regional (Fig. 1d) perspectives, while augmenting these primary scales with other geographical scales as well, to which they ascribed secondary roles. Furthermore, the connections between and across primary and secondary scales have been considered as well. Studying e.g. vertical (Rohe, 2020) or structural couplings (Bergek et al., 2015; Binz & Truffer, 2017), authors have elaborated on various ontologies of the multiscalar¹ interrelations, arising primarily from the need to compensate for the lack of TIS resources at one scale with resources available at other scales.

¹ In sustainability transitions literature, the term “multiscalar” has been used to indicate the existence of more than one spatial scale (e.g. regional, national, and global).

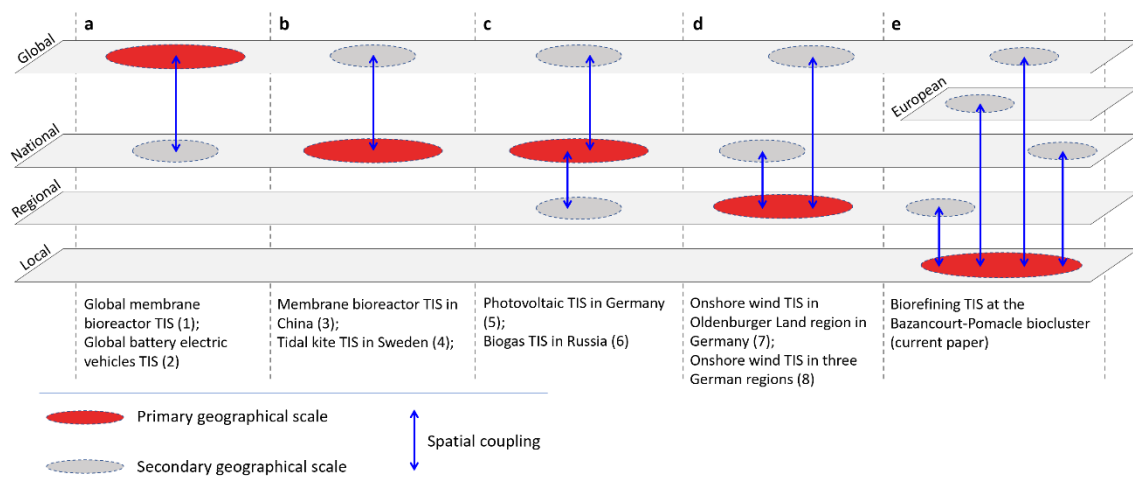


Figure 1. Spatial conceptualizations of TISs in the literature (a-d) and in the current paper (e). Sources: own elaboration based on (1): Binz et al. (2014); (2): Yuan and Li (2021); (3): Binz et al. (2012); (4): Andersson et al. (2018); (5): Dewald and Fromhold-Eisebith (2015); (6): Nevzorova (2022); (7): Rohe (2020); (8): Rohe and Mattes (2022)

In spite of remarkable advances in increasing the spatial sensitivity and resolution of the TIS framework, a lacuna with regard to the local scale of TISs remains open. This gap is particularly surprising, since the TIS framework has been mostly applied in analyses of the development and diffusion of sustainable technologies (Markard et al., 2012), according to its place as one of the founding frameworks in the field of sustainability transitions (Köhler et al., 2019). The latter, however, stresses that innovations in sustainable technologies often emerge from particular sub-regional localities and networks (Coenen et al., 2012), as well as calls for more attention to local institutions, local resource endowment, local market formation, and local policies (Hansen & Coenen, 2015). In effect, despite the calls to make the TIS framework more representative of local contexts (Coenen et al., 2012; Hansen & Coenen, 2015) and the conceptual leeway to define TISs locally (Carlsson & Stankiewicz, 1991; Markard et al., 2015), the local scale has received little to no attention in the TIS literature.

We address this gap by conceptualizing a TIS perspective with a primary focus on the local scale which is linked to all the broader, i.e. secondary, scales through spatial couplings (Fig. 1e). In contrast to the frequent confusion among TIS scholars regarding geographical terms (Rohe, 2020), the Local, in our case, is “smaller” than Regional and is socially constructed (Coenen et al., 2012). We operationalize this approach with a case

study on the evolution of the BioRefining Technological Innovation System (BRTIS) from the perspective of a particular local scale. Our case is a cluster operating an integrated biorefinery, which is the local scale of the global BRTIS (in short: local BRTIS). Using TIS functions approach (Bergek et al., 2008; Hekkert et al., 2007), we study how the local BRTIS interacted with other broader scales, such as regional, national, European, and global during its evolution. Therefore, our research question is:

How did the local BRTIS evolve through functional interactions with different geographical scales?

To answer this question, we employ the idea of clusters in the bioeconomy (bioclusters for short). Bioclusters often operate under the model of integrated biorefineries (Ayrapetyan et al., 2022). These biorefinery-based bioclusters are local phenomena, whose boundaries are defined socially, based on where the industrial partners and networks of local actors operate. Biorefinery-based bioclusters employ the principles of circular economy and industrial symbiosis to localize the value chains of natural resources (Deutz & Gibbs, 2008) and thus contribute to environmental sustainability and bioeconomy transition (Bosman & Rotmans, 2016; Hermans, 2021). Therefore, representing biorefinery-based bioclusters as local scales of the global BRTIS makes an interesting case, because it can showcase local contributions to a global system working toward bioeconomy transition. In terms of policy, it provides the possibility to adjust instruments and interventions to particular local contexts, thus promoting biorefining technology through local cluster policy making.

Case study and method

Our study context is the Bazancourt-Pomacle cluster (BPC) which hosts one of the largest and most advanced biorefineries in the world (Diakosavvas & Frezal, 2019). Intense technological innovations in this biocluster over the last 40 years have produced a system of circular economy aimed at the utilization of the whole plant and the resulting by-products. Therefore, the biocluster produces not only biofuels and bioenergy (which correspond to most of the EU visions on biorefinery technologies (Bauer et al., 2017)), but also a wide range of bio-products including food, feed, biochemicals, and cosmetic

ingredients (Allais et al., 2021). Therefore, the biorefinery has a high level of technological sophistication described by a system of multiple biomass conversion technologies, making it one of the most integrated biorefineries in Europe (Thénot et al., 2018). Furthermore, unlike most European biorefineries, the biorefinery of BPC has passed the pilot and demonstration phases and has entered the market deployment phase with regard to many of its technologies (Philp & Winickoff, 2017, 2019). This makes the case particularly relevant for a TIS analysis, since all the TIS functions, including the process of market formation, can be represented and analyzed.

To answer our research question, we applied the method of event-history analysis. The choice of this method is justified for three main reasons. First, during the development of a TIS, the occurrence of certain events can explain why some later event took place (Hekkert et al., 2007). Therefore, representing the actual temporal sequence of events is crucial. Event-history analysis gives primary importance to the temporal sequence of events, in which critical events can be pointed out and causation can be explained (Abbott, 1995; Poole et al., 2000). Second, events can be related to all TIS functions (Table 1), which is why event-history analysis is a systematic method in this case (Suurs & Hekkert, 2009). Third, events can happen at different geographical scales (Bunnell & Coe, 2001): from local to global, while still being related in a cause-effect logic. Therefore, the causal dynamics of TIS functions, that have been linked to events, creates couplings among different scales as well, making it possible to study how the local BRTIS interrelates with other broader scales through TIS functions.

Table 1. Scheme of allocation of events to TIS functions.

Source: adapted based on Suurs and Hekkert (2009)

TIS functions	Types of events
F1: Entrepreneurial activities	<ul style="list-style-type: none"> • Launch of a plant/facility/factory • Firms entering TIS • Starting project/business • Business expansion • Firms performing R&D
F2: Knowledge development	<ul style="list-style-type: none"> • Conducting trials/assessment studies • Filing patents • R&D collaboration
F3: Knowledge diffusion	<ul style="list-style-type: none"> • Network creation/expansion • Cluster formation

F4: Guidance of search	<ul style="list-style-type: none"> • Choosing among technological opportunities • Positive/negative outcomes of trials • Forming positive/negative technology visions • Devising policies/quotas • Firms orienting their activities
F5: Market formation	<ul style="list-style-type: none"> • Firms entering/creating markets • Obtaining market/production quotas
F6: Resource mobilization	<ul style="list-style-type: none"> • Mobilizing financial/human/natural resources • Providing R&D subsidies
F7: Creation of legitimacy	<ul style="list-style-type: none"> • Receiving political endorsement • Improving reputation • Lobbying to government authorities

To construct the event-history of the local BRTIS, this study used a number of secondary and primary data sources. Secondary sources involved academic literature, professional journals, websites of industrial and financial news, and websites of BPC actors. Primary data sources consisted of participatory observations, stakeholder meetings, and nine in-depth, semi-structured interviews.

Results

Fig. 2 depicts the timeline of the local BRTIS evolution that involves four development periods: emergence, shaping, expansion, and diversification. The events marked in red signify the beginning of a new period.

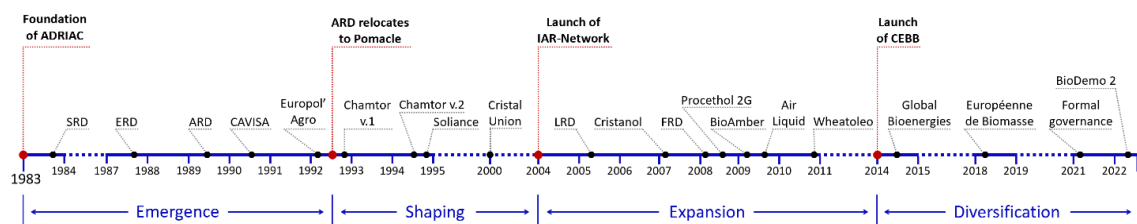


Figure 2. Timeline of the evolution of the local BRTIS.

The conducted analysis shows that the evolution of the local BRTIS took place through functional dynamics taking place within the local scale as well as functional dynamics unfolding between the local and higher scales, i.e. spatial couplings. Fig. 3 provides an illustration of the results for one of the four periods of the local BRTIS evolution: the period of expansion.

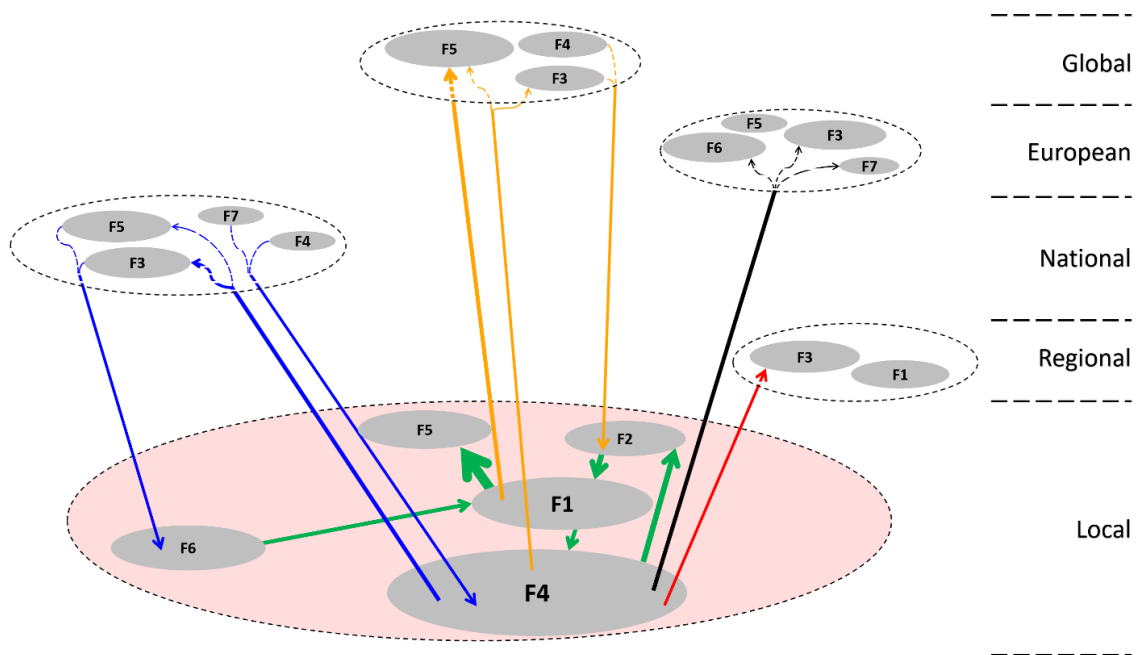


Figure 3. Illustration of the functional dynamics of the local BRTIS with different geographical scales in the period of expansion.

Theoretical and practical implications

The results reveal shifting configurations of TIS functions at various scales in different periods. While the key role of the regional scale was described by providing guidance and investments, broader spatial scales took over more diverse and flexible roles by forming markets for and disseminating the legitimacy of the local scale. The study yields important theoretical and practical implications.

Theoretical implications: multiscale resource constellations in TISs

This study contributes to the debate on TIS resource constellations that local actors need “survive” (Binz et al., 2016; Binz & Truffer, 2017; Musiolik et al., 2020; Rohe, 2020). Adapting the functional approach to TISs, Binz et al. (2016) have conceptualized four key resources important for the creation of new regional paths. These are knowledge, investments, markets, and legitimacy. The literature on multiscale TISs has studied these resources from the perspective of their spatial dynamics and the actors’ ability to access them from different geographical scales (Andersson et al., 2018; Rohe, 2020; Nevzorova, 2022; Rohe & Mattes, 2022). By focusing on the local scale and adopting a

bottom-up approach to TIS development (Wieczorek et al., 2015), we were able to enhance the spatial resolution of the TIS analysis (as called for by Andersson et al. (2018)). This allowed us to study the geography of TIS resources by integrating all geographical scales, i.e. from local to global.

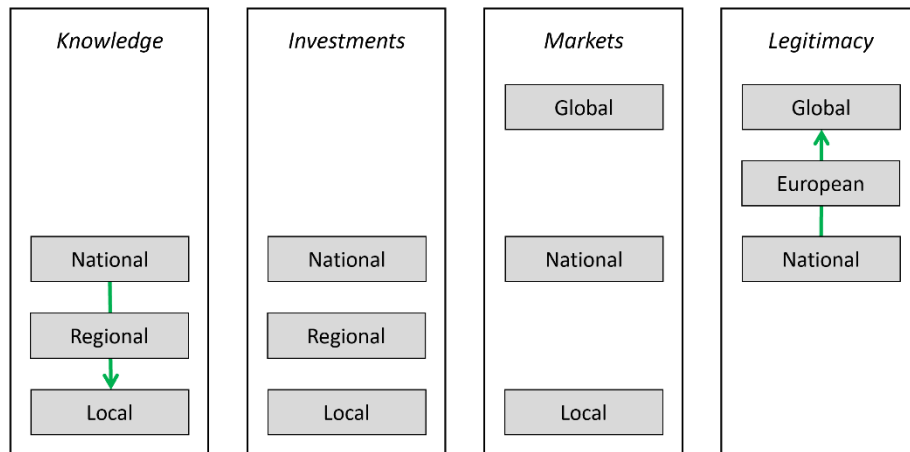


Figure 4. The geography of key resources for building local innovation systems

Fig. 4 presents the geographical distribution of the four key TIS resources in the case of local bottom-up innovation system building. The local actors accessed new knowledge at local, regional, and national scales, while relying more on the local scale over time. We observe the same geographical distribution with regard to investment mobilization, although without shift to any particular scale over time,

The geography of niche market formation indicates the formation of markets at local, national, and global scales. Interestingly, we discovered the existence of two types of markets that biorefineries can form: markets for by-products and markets for end products. Moreover, the former took place only locally, whereas the latter were formed predominantly at the national and global scales. These results contribute to the literature on spatial characteristics of market formation in TISs (Dewald & Truffer, 2011, 2012; Boon et al., 2020) by distinguishing between local and extra-local geographies of market formation in biorefineries.

The local actors “exported” the creation of legitimacy to national, European, and global scales, while focusing more on the global scale over time. Once the legitimacy of the

local BRTIS crossed scales and reached the global scale, the local actors could expand their access to resources situated at regional and national scales as well. This is illustrated by the increasing effect of these scales on local entrepreneurial activities in the period of diversification, when the legitimacy of the local BRTIS reached the global scale. These results therefore add to the literature on legitimacy of TISs (Markard et al., 2016) and to the emerging debates on spatial aspects of legitimacy (Andersson et al., 2018; Heiberg et al., 2020; Rohe & Chlebna, 2021). In particular, they resonate with findings of Andersson et al. (2018) regarding the non-sticky nature of legitimacy, and also respond to the recent call by Rohe and Chlebna (2021) for deeper insights on spatial and temporal dynamics of legitimation and its relation to other TIS functions.

Practical implications: locally-tailored policies for biorefineries

Motivating businesses to join biorefineries and, therefore, promoting their growth has been a complicated issue (Bauer et al., 2017). In this regard, a clear policy target is revealed based on our results on the market formation processes in biorefineries. While trying to stimulate firm entry, the policy should promote the formation of internal markets in biorefineries. The case of the local BRTIS revealed that the primary driving force for firms to join the biorefinery was the opportunity to utilize and benefit from the existing markets of by-products at the local scale, especially in the periods of expansion and diversification. Increasing the offer of available local streams of by-products both in terms of their quantity and diversity, might attract outside actors to join biorefineries.

Promoting biorefinery-internal markets of by-products is can also support biorefinery markets of advanced end products. Given the commonly-supported markets for biofuels and bioenergy, markets for other bio-based materials and products have not been provided a level playing field from policy (OECD, 2017). In our case, local market formation appeared as a pre-requisite for firms to be able to target markets of bio-based end products. Therefore, biorefinery policies should focus more on shaping local existing markets as “protected spaces” (Bergek et al., 2008c) that firms can rely on and use to target markets at broader scales as well. However, such policy measures will have to align with the interests of incumbent actors, who can control the access to natural resources

(Hansen & Coenen, 2017; Ayrapetyan et al., 2022). Following their political interests and short-term profit streams (Hansen & Coenen, 2017), incumbents often create strong technological lock-ins around the possible uses of natural resources (Ayrapetyan et al., 2022) and are reluctant to diversify into high value products. Therefore, without relevant demand-side policies, the “incumbent’s curse” (Chandy & Tellis, 2000; Roy & Sarkar, 2016) in biorefinery technology innovation might lead to a trade-off between agro-industrial specialization within a limited varieties of biomass and diversification into high value products.

Policy makers can also use the legitimacy of biorefining technologies as a tool to support local biorefineries. As a basis for attracting different resources (Markard et al., 2016), technology legitimacy can be promoted through international organizations, NGOs, and industry associations. Involving these organizations in the developments and achievements at the local context might be beneficial for technology legitimacy and a broader societal acceptance of the consumer products (Wilde & Hermans, 2021). Policy should aid in spreading narratives (Heiberg et al., 2020) about successful technology trials and ecological advances of local biorefineries, especially among transnational organizations operating at international and global scales. As illustrated by our results, such broad-scale legitimacy formation might help local actors to expand their access to resources situated at broader scales.

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Multipliers, internal scale economies and local development

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Our work endeavors to extend knowledge on the contribution of large firms to local economic development. Working on model of economic geography and expanding their interpretation through the economic base theory, we investigate the effect of a change in the population of manufacturing firms on non- manufacturing employment. Using Istat data on employment and establishments of different size across 610 Italian local labor market areas over the span 2011-2020, we employ instrumental variable regressions to find a causal nexus linking the presence of internal-to-the-firms economies to local development. Our findings are twofold. On the one hand, a positive multipliers is activated when the population of large and medium firms increases. On the other hand, building on territorial heterogeneity, we show that medium firms generate multipliers in industrial districts, and that large firms activate positive multipliers in non-district areas.

Living Labs as an open innovation network: the ArtCast4D case study for immersive art environments

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An exploration of the methodological approach utilized by living labs (LL) as open innovation networks is provided, specifically focusing on the ArtCast4D case for immersive exhibition environments in arts and culture. It examines key aspects such as the purpose, significance, and phases of the LL approach, along with the roles and responsibilities of LL actors. The governance model of ArtCast4D LL is analyzed, defining the commitments of key stakeholders.

The Role of Clusters in Advancing Industry 4.0 Solutions: Insights from the Polish automotive context

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The analysis of digital transformation, including the implementation of Industry 4.0 (I4.0) technologies and processes, cannot be carried out in isolation from the spatial or geographic organisational aspect. Therefore, the place of implementation of the solutions of the fourth industrial revolution needs to be included in the analysis to adequately reflect the specifics of this transformation (Fraske, 2022). Industry 4.0 is not just about technologies like 3D printing, the Internet of Things, Big Data and Analytics, Cloud Computing, Artificial Intelligence, Machine Learning, Cybersecurity, Advanced Robotics and Automation, Augmented Reality, etc., but also about the organisational and social aspect (Cugno et al., 2022). Surviving in the I.40 era inevitably aligns with the introduction of digital innovations (Gupta and Jauhar, 2023). Firms harness the technologies mentioned above, such as augmented Reality, AI, or cloud computing, as enablers for automating logistics and supply chain systems, improving manufacturing system performance, or simplifying automated production systems.

A particular catalytic role for the fourth industrial revolution and related digital business transformations is attributed to clusters. Previous research confirms this potentially stimulating role (Jankowska et al., 2021). In this article, we determine the importance of Polish clusters for entities interested in implementing Industry 4.0 processes. Starting from a selective literature review (narrative review - Gancarczyk, 2019) and the author's previous experience in working with clusters, we describe the importance of using essential I4.0 technologies based on a benchmarking study conducted periodically by the government agency PARP - Polish Agency for Enterprise Development (PAED), and analyse all Polish clusters included in the 2020 study, enriched by a detailed case study of the PGM cluster - Polish Automotive Group. The automotive industry is particularly

relevant for implementing Industry 4.0 technologies due to the complexity and high-volume nature of car manufacturing and the growing trend towards electric and autonomous vehicles.

This study is explanatory in nature and is designed to address the poorly documented issue in the literature. The dimensions of regional distribution or spatial organisation of the fourth industrial revolution, and in particular the potential role of local aspects, also as epitomised by clusters or local industrial districts, have only recently been addressed (Fraske, 2022). Most available studies focus on advanced, mainly West European countries such as Germany, Spain, or Italy (Götz, 2021; Hervas-Oliver et al., 2020; Balland and Boshma, 2021). The literature on I4.0 in other countries, such as the CEE or post-transition economies like Poland, is developing fast. However, it largely ignores the spatial distribution or geographical, organisational aspects, concentrating instead on spatially blind or place-neutral issues like HR aspects or technological challenges (Zakrzewska-Bielawska and Staniec, 2020). In response to the identified knowledge gap, this paper aims to identify the role of clusters in the transformation towards Industry 4.0.

We ask why clusters may matter for advancing the fourth digital transformation. Against this background, we intend to investigate how advanced in implementing I4.0 solutions are the residents of Polish clusters and how they perceive the advantages of cluster membership for such implementation. Finally, we will formulate some policy recommendations based on the gathered evidence. With this explorative pilot study, which can paint a broad-brush picture of the interdependency of Polish clusters and I4.0 implementation, we hope to set the stage for more detailed studies. A recent study by Gwosdz et al. (2022) revealed that clusters of digital entrepreneurs in Industry 4.0 tend to concentrate in a small number of the largest Polish cities. Seven main metropolises host 76% of digital entrepreneurs, with the capital city (Warsaw) alone accounting for 24%. The revealed difference between the geography of Polish digital I4.0 enterprises and the geography of high-technology sectors lies in the more significant role of multifunctional urban centres in the country's south. Nevertheless, the heterogeneity of fourth-generation industry technologies means that individual cities and regions can

explore different new paths related to Industry 4.0 technologies once they identify their asset potential.

In this article, we understand Industry 4.0 as a business model focused on creating value through integrating advanced technologies into manufacturing processes and using data-driven insights to optimise operations, increase efficiency, and improve the overall customer experience.

The definition of 'cluster' varies in different studies. They are understood as 'natural clusters'- shaped according to the definition of Porter (1990, 1998, 2000), or they are described as 'cluster initiatives' or 'organised clusters' in the form of cluster organisations (e.g., Furman et al., 2002; Morgulis-Yakushev and Soelvell, 2017). The natural clusters are sometimes accompanied by cluster organisations. As a natural cluster develops and matures, adopting an organisational form and emerging a coordinator to represent the members and manage internal and external relations sometimes prove beneficial.

Using Porter's definition (2000, p. 16), a cluster is a geographically proximate group of interconnected companies and associated institutions in a particular field, linked by commonalities and complementarities. The benefits of agglomeration could be pointed out. A cluster organisation implies that firms, educational and research institutions, and public bodies, triggered by the initiative of particular institutions (e.g., regional development agencies, universities, etc.), decide to form an organised and managed legal entity. The cluster organisation (CO) plays a crucial role in strengthening and deepening relations between these actors through various types of 'bridge-building' activities, which helps to meet pre-defined objectives (Lechner and Leyronas, 2012; Morgulis-Yakushev and Soelvell, 2017). Duranton (2011, p. 33) states that 'all the studies examined so far assess the effects of clustering when it occurs 'naturally', but they do not constitute a direct assessment of cluster initiatives. The distinction between a natural cluster and a cluster organisation is important insofar as the cluster coordinator's incentives allow companies to increase their propensity to innovate more intensively. Studies show that this is a crucial factor, as the impact of other cluster characteristics on the propensity to innovate for companies operating within specific Polish business

clusters is negligible. On the other hand, the existence of a leader influences a better flow of knowledge, more excellent symmetry of information between companies in the cluster, and a more productive and innovative way of functioning for companies in general (Kuczevska and Tomaszewski, 2022).

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Skills relatedness and technological diversification

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This paper studies the relationship between the structure of skills present in Latin American cities, with the invention of new technologies and their level of complexity. Through this, it is intended to contribute to the understanding of how this relationship can guide the design of evidence-based public policies that seek to foster the generation of new knowledge, based on local skills. In order to approach this research problem an evolutionary perspective is adopted.

The paper's argument is based on three elements. Firstly, that new knowledge is produced as a process of recombination, and that observing individuals who manage to move between technologies gives us clues as to which ones are linked. Secondly, that territorial proximity affects the possibilities of knowledge recombination in a territory, which is favoured by the agglomeration observed in cities. Finally, that the possibilities for diversification are dependent on the past and that the paths taken for diversification are often based on movements between related knowledge.

The relevance of generating knowledge on this topic is clear for Latin American countries. A vast literature, linked to economic geography and the geography of innovation, has shown that economic complexity is a central factor in the development and convergence of economies, both at the national and sub-national levels. The degree of complexity of an economy is related to the variety and ubiquity of the activities (products, patents, industries, etc.) it develops. The entry of new activities into a territory has been shown to be related to the proximity of skills prior to their emergence. Therefore, the proximity of skills affects the variety of activities in a territory and their level of complexity. On the other hand, complexity has also been found to be related to inequality and environmental sustainability, both issues are of great relevance for Latin American countries.

The search for economic diversification can be pursued through the development of activities related to those that are present in the territory, trying to reach some that are unrelated, or with a combination of both strategies that fits the characteristics of the region under study. Latin American economies have characteristics that have made it difficult to consolidate industrial diversification processes. They also show fragile and fragmented innovation systems. This makes it particularly relevant for Latin American countries to investigate strategies that can facilitate the transition towards more complex productive structures, which imposes the challenge of identifying trajectories that make it possible to use existing capacities to achieve activities that are currently distant.

We use data from the USPTO, obtained through the PatentsView project, which provides disambiguated information on the inventors and owners of patents, as well as the technologies in which each patent is classified, since 2000 to 2019. This will allow the aggregation of information on inventors residing in Latin American cities, and to know the order of the technological fields in which the patent is classified.

The analysis shows that the proposed network topology presents evolution with a strong tendency to close triads, which allows identifying structures that are associated with a higher probability of a city developing comparative advantages in a given technology. These characteristics of the network prove to be relevant for designing diversification strategies that contribute to overcoming the constraints generated by the knowledge base in Latin American cities.

The economic impact of port cluster: the case of Valenciaport

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Keywords: impact analysis, port cluster, Input/Output model, regional economy, port services.

The aim of the paper is to illustrate the impact analysis of the three ports (Valencia, Sagunto and Gandía) run and managed by the Port Authority of Valencia (Valenciaport). Given the central role played by the port activity in the economy of the whole region, Valenciaport has been carrying out impact analyses since 1997 for the port of Valencia, and since 2000 for the ports of Sagunto and Gandía, with the last study conducted in 2016. The analysis described in the paper has covered 2018, 2019 and 2020, and, while ensuring continuity with previous studies, it has also introduced new features. In fact, the approach based on the traditional Input/Output model has been complemented with some methodological innovations. The analysis consists of several steps, which have been summarised below.

First, the perimeter of the activities under investigation (the port cluster) has been defined, including all the companies that operate within and are functional to the port activity. Second, economic and financial data on companies belonging to the port cluster have been collected by means of a survey aimed at complementing information from the Companies Register (Registro Mercantil). Once data have been collected, processed

and organised in a consistent database, they have been used to estimate the port cluster demand vectors.

Third, the national Input/Output table has been regionalised and updated to obtain a regional Input/Output table for the Community of Valencia in the abovementioned years. Next, the demand vectors, achieved in the previous step, have entered the model in order to assess the typical I/O effects (direct, indirect and induced).

The results of the analysis, obtained both in terms of regional gross value added and full-time equivalent employment, have been disaggregated by year and port. Then, the outcomes have been compared with those of the previous studies and analysed to highlight the relevance of the activity generated by port cluster for the economy of the Community of Valencia.

In addition to the standard methodology, an alternative approach, the Extended Hypothetical Extraction (EHE), has been added. The latter considers not only demand-side effects, but also supply-side effects. As a matter of fact, the EHE intends to answer the hypothetical question of what would happen in a region if the sector of interest ended producing and selling and, therefore, also buying goods and services from other sectors and regions. Applied to the port cluster, the EHE estimates the effects on regional economy of the hypothetical closure of the ports of Valenciaport, measured by the output loss caused by the complete substitution of the port services with imports from other Spanish regions. As expected, the EHE estimates are larger than the previous ones, although the difference between the results of the two models is relatively narrow because the same data and modelling framework have been used.

Finally, the study provides a comparison of the results with other port impact analyses, both in the Spanish and the European context, as well as with other sectors of the economy of the Comunidad Valenciana. The aim of the exercise is twofold: validate the results of the impact analysis and gather information on the specificity of the Valencian port cluster.

Internationalizing cluster organizations on market terms

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Cluster internationalization is a growing topic within regional science, and in this paper internationalization is broadly framed as “...the process of increasing involvement in international operations” (Welch & Luostarinen, 1988, p. 36). Research on internationalizing clusters can generally be divided into two perspectives. The first one, the firm perspective, focuses on how firms take advantage of their cluster affiliation when internationalizing and how firms enter clusters to take advantage of their attributes (e.g., Andersson et al., 2013; Chiarvesio & Di Maria, 2009; Cook et al., 2012; da Rocha et al., 2009; Libaers & Meyer, 2011). In other words, cluster internationalization is the result of inward and outward movements of firms in clusters. The second one, the cluster perspective, deals with how the cluster itself, including the cluster organization, internationalizes (e.g., Islankina & Thurner, 2018; Jankowska & Głowska, 2016; Jankowska & Götz, 2017). Comparing these two perspectives, the first one dominates and the second one is less developed but can prosper from new insights.

We argue that it is increasingly vital to consider how cluster organizations can internationalize since they can ease cluster firms’ internationalization through a range of initiatives, relationships, and pipelines (Jankowska & Głowska, 2016). So far, the internationalization of cluster organizations has typically happen through project-based relationships to foreign counterparts with the support of policy measures. In this paper, a cluster organization is defined as an intermediary in charge of improving the dynamism and performance of a cluster and its firms (Morgulis-Yakushev & Sölvell, 2017) by developing a cluster identity and supporting networking and knowledge sharing, by

facilitating innovation activities, and by offering and assisting with business development activities to the cluster firms (Sölvell, 2015). To accomplish that, cluster facilitators, employed in these organizations, perform tasks such as knowledge transfer support, project management, event planning and execution, and fundraising (Ingstrup & Damgaard, 2013).

In the wake of these insights, and to offer an alternative approach to internationalizing cluster organizations than the current one supported by policy measures, we ask the following research question: how can an international network of cluster organizations emerge on market terms? By answering this question, we are able to introduce duplication as a new internationalization mode of cluster organizations and the underlying factors that support it. These findings address the lack of research on the mechanisms and conditions of cluster internationalization, see e.g., Grashof, Fornahl and Becker (2021). Moreover, the findings provide learning on how cluster organizations can internationalize without the intervention of policy-makers and at the same time give new international opportunities to cluster firms.

We arrive at these findings by building on theory on cluster internationalization (da Rocha et al., 2009; Jankowska & Głowska, 2016; Jankowska & Götz, 2017; Libaers & Meyer, 2011) and by relying on an explorative and embedded single case study (Yin, 2017) of the cluster organization Iceland Ocean Cluster (IOC) in Reykjavik, Iceland and its four sister cluster organizations in Portland, Maine, USA, New Bedford, Massachusetts, USA, Seattle, Washington, USA, and Hirtshals, North Jutland, Denmark. The IOC is the original cluster organization and has inspired actors in Portland, New Bedford, Seattle, and Hirtshals to establish cluster organizations within the ocean industry and in particular within the area of fishery. The cluster organizations are united around a joint mission of innovatively utilizing ocean resources.

Merging cluster organizations: pre-existing, process and sequence triggers

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In today's globalized world, clustering of economic activities is still an essential economic reality (Grashof et al., 2021; Sedita et al., 2020) offering benefits, for instance, in terms of productivity (Borowiecki, 2013), innovativeness (Baptista & Swann, 1998), and regional prosperity (Ketels & Protsiv, 2021). As a result, both researchers and policy-makers have a strong interest in regional clusters, which has led to a large number of publications (Lazzeretti et al., 2014) and funding efforts (Zenker et al., 2019). The dynamics underlying the co-location in regional clusters are not new, see e.g., Marshall (1920), and particularly, knowledge spillovers have an outstanding relevance for firms in knowledge-based industries (Audretsch & Feldman, 1996; Saxenian, 1994), since the geographic proximity to thematically related organizations can encourage the interchange of knowledge in general and especially tacit knowledge (Daft & Lengel, 1986; Jaffe et al., 1993).

Nevertheless, these advantages do not necessarily arise only due to the co-location in close proximity (Bocquet & Mothe, 2015; Wolf et al., 2019). Instead, they depend on multi-level conditions, for example, absorptive capacities (Cohen & Levinthal, 1990; Hervás-Oliver et al., 2018). In the case of knowledge spillovers, especially intermediaries play an important role, such as cluster organizations promoting the development of projects, networking, and knowledge exchange within clusters (Bocquet & Mothe, 2015; Ingstrup & Damgaard, 2013; Inkinen & Suorsa, 2010). At least, since the introduction of the concepts of local buzz and global pipelines (Bathelt et al., 2004), it is clear that the simple reliance on local knowledge (i.e., local buzz) is not enough and might lead to lock-in situations (Boschma, 2005; Martin & Sunley, 2003). Therefore, clusters need to have

a functioning cluster-internal knowledge exchange as well as global pipelines in order to expand the knowledge base (Bathelt et al., 2004; Grashof et al., 2021). Despite the relevance of complementary knowledge coming from outside the region through global pipelines (Hesse & Fornahl, 2021; Miguelez & Moreno, 2018), policy measures still primarily concentrate on the local buzz by stimulating collaboration and knowledge exchange on the local or regional level (Dohse et al., 2018; Grashof, 2021a).

While previous research has investigated these global pipelines on the firm-level (e.g., Bathelt et al., 2004), we argue that cluster organizations, providing the organizational framework for collaboration and knowledge exchange, can also build up external knowledge linkages through either establishing institutionalized linkages between international cluster organizations, such as in the case of the Health Axis Europei, or through a cluster organization merger process. In light of the ongoing trend of local government consolidation across OECD countries (Blesse & Roesel, 2019; Reingewertz & Serritzlew, 2019), especially the cluster organization merger process appears relevant. This holds particularly true in the context of smart specialization (Balland et al., 2019; Foray, 2015), according to which it seems sensible to bundle competencies in a specific field in order to achieve possible synergy effects and economies of scale. In fact, there is recent evidence that the theoretical principals of smart specialization are not fully translated into practice, for instance with respect to the selected priorities which tend to be the same within countries and thereby counteracting the idea of labor division (Deegan et al., 2021; Gianelle et al., 2020).

Although, we already have substantial knowledge about merging processes at the firm-level and its relevance for innovation (e.g., Ahuja & Katila, 2001; Christofi et al., 2019; Entezarkheir & Moshiri, 2018), so far, the cluster-level has been widely ignored, even though it is key for building global pipelines to access cluster external knowledge (Chapman, 2003). In the wake of this, this paper aims to (1) conceptualize cluster organization merger processes by combining the management literature about mergers and acquisitions (M&As) with the cluster literature as well as (2) investigate which factors in a cluster organization merger process hamper and enable it. For the second aim, we take advantage of a recent policy measure in Denmark that aimed to merge regional

cluster organizations, and we qualitatively analyze in depth five cases of cluster organization mergers. Data for these cases stem from 17 semi-structured, personal, interviews and document studies, which offered insights into the pre-existing conditions and triggering events that influenced the mergers.

By conceptualizing the merger process of cluster organizations and empirically investigating drivers and barriers to the implementation of this process, we do not only extend the level of analysis in the context of global pipelines and thereby contribute to the cluster literature (e.g., Bathelt et al., 2004; Grashof, 2021b), we also provide practical implications for policy-makers. Based on our findings, policy-makers can better evaluate potential barriers to the merger process of regional cluster organizations and thereby increase the likelihood of a successful outcome. In particular, they should pay attention to allocating resources for proper economic and legal counselling to the actors involved, as well as offering support schemes and neutral facilitation to ease the merger processes by lowering tensions and avoiding conflicts.

Solving the puzzle? An innovation mode perspective on lagging regions

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Promoting innovation activities in lagging regions to stimulate new path development in corresponding areas is currently on the regional policy agenda – whereby 'lagging' can be defined by different, often interrelated factors, be it the peripherality of an area or structural factors such as socio-economic disadvantages or the organizational thinness of a region (European Commission, 2017; OECD, 2020). Such a policy approach should be based on a sound understanding of the corresponding learning and knowledge environments in order to take into account the fact that innovation patterns in lagging regions can be very different from those in advanced regions (Isaksen & Trippl, 2017).

A well-established theoretical approach to learning and knowledge in lagging regions is the 'knowledge base concept', which goes back to Asheim & Coenen (2005) and Asheim & Gertler (2005). According to it regional innovation systems are shaped by specific knowledge base configurations, distinguishing between analytical (science-based), synthetic (engineering-based) and symbolic (cultural-based) types of knowledge – whereby a potential of lagging regions is seen primarily in terms of synthetic knowledge.

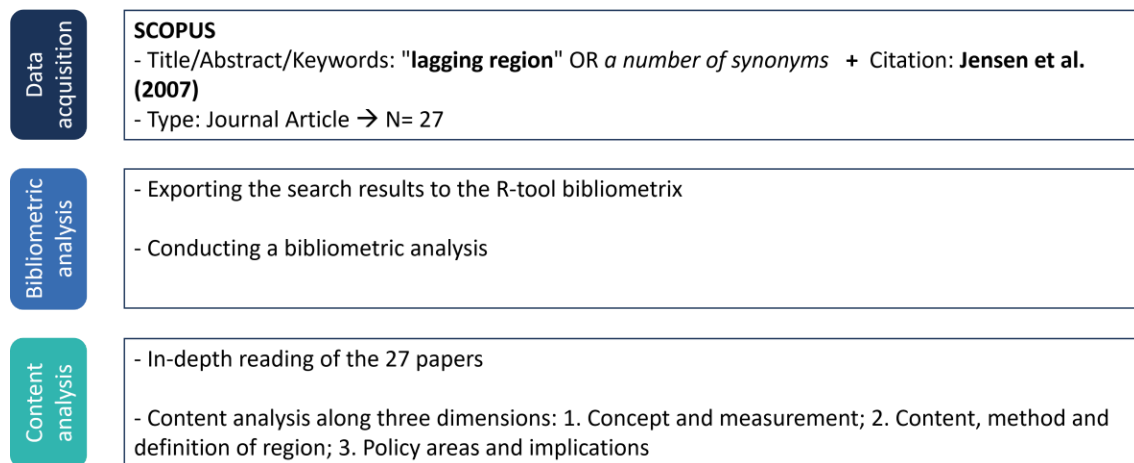
The knowledge base concept refers to the meso-level of sectors and industries to describe the framework conditions for knowledge-based development in a region. Corresponding taxonomies are therefore somewhat static, focusing on either the starting point or the outcome of regional innovation processes (Pelkonen & Nieminen, 2016; Calignano et al., 2022). For this reason, the picture provided by the knowledge base concept remains in some ways incomplete, as learning processes at the company level tend to be neglected. However, this is exactly what is needed to understand the dynamics of knowledge-based development in lagging regions (Varis et al., 2014; Eder,

2019; Calignano et al., 2022). From a theoretical point of view, therefore, there is a need to complement the knowledge base concept with an additional, more dynamic perspective on learning and innovation in lagging regions, related to the micro-level of firms and institutions, in order to better understand, from a policy perspective, whether and how knowledge-based development can serve as a starting point for the creation of new pathways in lagging regions.

Against this background, the basic argument of this contribution is that Jensen et al.'s (2007) 'STI/DUI concept' of the different modes of innovation applied by firms offers precisely this possibility – which should, in a way, make it a relevant piece of the “innovation puzzle of lagging regions” (Rodríguez-Pose & Wilkie 2019). To substantiate this argument, the STI/DUI concept is first described theoretically, contextualised regionally and contrasted with the knowledge base concept – with the result that, for example, the Doing, Using, Interacting (DUI) mode of innovation in SMEs is likely to be particularly important for lagging regions (see e.g., Hervás-Oliver et al., 2021).

On this basis, as a next step, a systematic literature review is conducted on journal articles that draw on the STI/DUI concept in the context of lagging regions (see Figure 1). A series of 27 papers dealing with "lagging regions" (covered by various synonyms) are identified in the SCOPUS database, with Jensen et al. (2007) cited as a seminal contribution to the literature on innovation modes. In a first step of the literature review, this sample is then first subjected to a bibliometric analysis in order to obtain an overview of various variables (e.g., information on most relevant authors, years of publication, journals, keywords, citation networks, etc.). In a second step, a content analysis is carried out along three dimensions (1. Concept and measurement; 2. Content, method and definition of the region; 3. Policy areas and implications) in order to obtain more detailed information on the key themes of the papers searched.

Figure 1: Methodical approach



Based on the results of the literature review, the potential of the STI/DUI concept for a better understanding of innovation in lagging regions is assessed (thus providing an answer to the corresponding research question underlying this contribution). What does the literature tell us in the current context, what have we learnt and where are the open questions? Finally, several avenues for future research are suggested. In this way, a research agenda is proposed for future studies that examine the dynamics of knowledge-based development in lagging regions from an innovation mode perspective.

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Developing a model for research, development and innovation in a creative industries cluster

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Introduction

In the UK in 2019, the Arts and Humanities Research Council (AHRC) launched the Creative Industries Clusters Programme (CICP), creating nine Research, Development and Innovation (R,D&I) clusters across the UK. This was the first time in the UK that the creative industries had been included in a significant R&D programme.

This intervention was long overdue. Although the terms ‘culture’ and ‘industry’ first collided in the 1940s, a range of policy instruments have kept them at arms length. This gap was repeatedly reinforced – and enshrined in public policy - by distinctions between culture and commerce, policed by many cultural commentators for whom cultural value was, almost by definition, a counterpart to popular taste (Lewis, 1990).

The importance of the creative industries to the UK economy – alongside a series of reappraisals of the whole notion of cultural value - made this distinction increasingly unhelpful. But the idea of the creative industries as an industrial sector (albeit one with huge cultural significance), with key strengths in regional clusters only began to emerge in the UK in the 1980s, and only at UK governmental levels from the late 1990s (Hesmondhalgh et al, 2015). In the past, policymakers have treated creative industries as a welfare sector or as a sector that has no particular effects on other economic sectors. Evidence now suggests that creative industries clusters may be considered economic growth drivers, playing a strategic role in the innovation system as catalysts of variety creation and facilitators of systemic evolution (Potts and Cunningham, 2008).

This, in turn, has led to a debate about the economisation of culture (Schlesinger, 2017), with a focus of economic rather than social and cultural value.

The CICP initiative was, in this sense, an R&D project in its own right. The nine clusters were blazing a trail for the importance of R&D in boosting creative innovation. In so doing, they were addressing a fundamental question: what is R&D in the creative industries and how might it lead to successful innovation in regional creative clusters?

Rethinking innovation in creative clusters

This paper is based on the preliminary findings from a systematic analysis of Clwstwr (Welsh for 'cluster'), one of the AHRC's nine clusters. Clwstwr is a place-based creative industry innovation programme – funded by both UK and Welsh governments – based in the South Wales Media Cluster (one of the UK's leading Media Clusters). The Clwstwr programme (2018-2023) aimed to put innovation at the core of media production in South Wales - moving the Welsh media sector from strength to leadership. Clwstwr's focus is on the media sector, broadly defined, encompassing a range of creative practices, from digital tourism to dance.

Our analysis is based on a range of data sets:

- Monitoring data collected from 118 R,D,I projects curated and funded by Clwstwr with 85 different creative industry partners;
 - In depth interviews with 68 of these industry partners to explore their experience of and understanding of R&D;
 - Over 500 survey responses from Clwstwr funded and non-Clwstwr funded (with the South Wales cluster) businesses before and after Clwstwr's R,D&I intervention.

In this paper, we will report some of our key findings.

- R&D is still a new concept for many creatives (see also Davis, Creutzberg and Arthurs, 2009). For many in the creative industries, R&D is another country: a

patriarchy populated by men in white coats, with its own esoteric practices and language. To be successful, investment therefore needs to be backed by an innovation ecosystem that provides support and expertise. This takes time and resources. Clwstwr's outreach involved 1,233 meetings with creative businesses across every stage in the process. Each project had academic input and an R&D Producer, and the programme's R&D specialists - PDR – held a total of 155 workshops. This support structure meant that most projects (77%) reported that Clwstwr changed their understanding of R&D.

- This innovation ecosystem helped embed an innovation culture: as a result, average annual R&D spending for Clwstwr-funded businesses more than doubled (up by 107% to £91,577) between the beginning and the end of Clwstwr.
- We need to rethink both what R&D is and how it works for effective investment in the creative industries. Current definitions are too techno-centric: nearly 40% of Clwstwr project innovation involved new forms of storytelling rather than new technology. Too technical a focus risks compounding the creative industries weak record on equality and diversity (Gill, Pratt and Virani, 2019) by reinforcing gendered perceptions of R&D: in Clwstwr's first funding round only 22% projects were led by women. By repositioning and rearticulating what R&D can mean, look like and achieve, Clwstwr changed this perception and by the third funding round 51% of applications and 59% of funded projects were led by women.
- The creative industries are made up of small independent companies who need support to develop innovative ideas. Most companies used funding to buy dedicated time for R&D: 83% of the total investment (funding and match-funding) was spent by the businesses on working days for their projects. Targeted R&D funding encourages small companies to contribute significant resources to R&D. Clwstwr's £3.42 million direct investment into funded projects generated an immediate £2.47 million company investment through match-funding. Subsequent additional investment worth more than £5 million has been received

by Clwstwr-funded businesses - a figure that will rise as more projects move closer to market.

- Collaboration is crucial: two thirds of the 118 funded projects were collaborative projects. While 85 companies received Clwstwr funding, 190 companies were involved in their R&D projects, backed by 273 individual freelancers brought in to support the R&D. This allowed the small businesses that make up the bulk of creative clusters to benefit from some of the synergies enjoyed by large, global media conglomerates.

- Data suggests that Clwstwr's R&D interventions had a significant economic impact. At a time when COVID-19 meant declines in average creative company turnover (-3%) and employment (-11%), Clwstwr-funded companies grew by 14.6% in turnover and 21.3% in employment. Clwstwr funding has already created £20,446,443 in additional turnover and 446 additional jobs in the creative industries in Wales. Every £1 of direct Clwstwr funding to businesses has already generated £5.98 in turnover and £4.55 of GVA, with more to come as companies commercialise. Between 2019 and 2022, Clwstwr directly contributed £1 in £7.50 of annual turnover growth, and £1 in every £12 of annual total GVA growth in the Welsh creative industries.

- Despite the unfamiliarity of R,D&I to many creative SMEs and freelancers, more than a third of Clwstwr-funded companies - 37% - reached Technology Readiness Levels (TRL) levels 7-9 (the Deployment Stage). Clwstwr-funded businesses grew the number of their copyrights, patents, trademarks and registered designs by 650% between the start and the end of Clwstwr.

- Clwstwr's dual focus on the economic, societal and cultural benefits of R&D sought to go beyond a dichotomy that pitches economic growth against social and cultural value (Schesinger, 2017). This appears to have some impact: at the start of the programme, only 19% of all Clwstwr-funded projects reported undertaking innovations with societal goals. By the end of the programme, this proportion more than doubled to 41%. Clwstwr supported a range of initiatives

to increase media sector environmental sustainability in production technology, content and awareness. At the start of the programme less than one fifth (19.%) of Clwstwr-funded businesses reported innovations which had an environmental impact. By the end of the programme, nearly half (49%) linked innovation to environmental goals.

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A proposal for an integrated framework for immersive technologies

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1. Introduction: problems and objective

Recent years have witnessed a fast-growing interest in immersive technology among scholars and practitioners. The term immersive technology originates from the first prototype of human- computer interaction in the mid-20th century (Sutherland, 1964), and today it commonly represents any technology capable of providing computer-generated stimulations with physical, spatial and visual dimensions (Suh and Prophet, 2018), such as virtual reality (VR), augmented reality (AR), mixed reality (MR), and others that are considered to lie in the virtuality continuum (Milgram and Kishino, 1994). Today immersive technologies are being widely leveraged to enhance user experience and ultimately improve innovation and competitiveness in a range of sectors and fields, from education (Rodriguez-Ardura & Meseguer-Artola, 2019; Tang et al., 2020; Wu et al., 2013) and health care (Tang et al., 2022) to tourism (Beck et al., 2019; Guttentag, 2010; Pratisto et al., 2022) and video games (Jennett et al., 2008; Michailidis et al., 2018; Nilsson et al., 2016). While there is an increasing awareness and capacity for the use of immersive technologies, in practice, however, theoretical research in this area has relatively lagged. Three significant problems can be noticed as follows.

First of all, the definition of immersive technology remains vague and imprecise. Most definitions in current literature have operational features to fit specific research purposes, while any scientific definition is still missing, as evidenced by its frequent overlap with VR (Slater and Sanchez-Vives, 2016), its confusion with “presence”,

“engagement” and “involvement” (Nilsson et al., 2016) and its misuse in the creative field to represent interactive and inclusive technologies (Carrozzino & Bergamasco, 2010; Guttentag, 2010; Jung et al., 2016). Secondly, the interplay between technology and humans has been generally neglected in the existing literature. While the roots of immersive technology lie in computer-human interaction, and both technology and user factors have been well studied respectively, how technology and people interact to achieve immersive outcomes is often treated as a black box that is outside the focus of research. Last but not the least, the application of immersive technology in cultural and creative sectors is not fully explored, in spite of that cultural and creative sectors are largely characterised by an experience economy, in which immersive technologies can play a crucial role.

To address the aforementioned problems and bridge the existing gap, our research endeavours to develop an integrated conceptual framework that synthesises current technological and psychological approaches to immersive technology. This framework aims to enhance our understanding of immersive technologies and facilitate the observation and explanation of the dynamic interplay between technology and humans in immersive generative processes.

2. Methodology

To establish a solid foundation, a literature review will be first conducted to delve into the existing technological and psychological perspectives surrounding immersive technology, with the main aim of extracting a synthetic conceptual definition, which gives importance to the interactive process between the technology and the user as the fundamental basis for the framework to be proposed. By defining immersive technology as an intersection between immersion and technology, a knowledge-based approach will be employed to deconstruct a technology into three knowledge bases: hardware, software and know-how, which subsequently results in four cross-cutting technological domains: namely (1) interoperability (hardware + software), (2) optimisation (hardware + know-how), (3) environment (software + know-how) and (4) experience (hardware + software + know-how). Based on this, further efforts will be given to the analysis of

features and functions of these four domains, as well as the possible role of users (i.e., developer and audience) in each domain to enable immersion generation.

Table 1. Comparative analysis between the technological and psychological perspectives

	Technological perspective	Psychological perspective
Convergence		
Nature	Immersion is essentially a technology-human interaction	
Precondition	Immersion results from isolating the user from irrelevant stimuli	
Mechanism	Immersive outcome is based on fidelity stimulation and fluid response.	
Divergence		
Property	Objective	Subjective
Source	Sensory stimulus	Attentional state
Isolation technique	Physical isolation	Mental absorption
<u>The</u> role of user	Passive	Active
The role of technology	Generator	Enhancer
Content	Frame	Driver

Source: elaborated by authors.

3. Results

3.1. Immersive technology based on the technology-human interaction

Immersive technology has its roots in the first prototype of computer-human interaction (Sutherland, 1964). Technology-centred and human-centred approaches have historically developed separately, often competing rather than merging, in an effort to gain a deeper understanding of immersive technology. While the technology-centred approach focuses on the technical features of immersive environments and requires the use of different sensory devices to make users interact with artificial information (Rubio-Tamayo et al., 2017), the human-centred approach concentrates on the psychological state and subjective state of individuals interacting with virtual environments, in terms of their mental investment and engagement in the activities (Agrawal et al., 2020). There are both differences and commonalities between the two approaches, as shown in Table 1. They converge in their understanding of the nature, prerequisite and mechanism of immersive technology, while diverging in their views on the property, source, isolation technique, the roles of users and technology and content of immersive technology. Based on their commonalities, it can be assumed that immersive technology is

essentially a technology-human interaction, where immersive outcomes result from the isolation of the users from irrelevant stimuli and the degree of immersion depend to some extent on the fidelity of the stimuli and fluid response. In other words, immersive technology can be understood as the collection of technical elements that mediate between the user and a virtual object or environment through the display of sensorial stimuli, which drives the user's attention and elicit a sense of involvement in displayed contents.

3.2. Three knowledge bases of immersive technologies

Immersive technology is a special type of technology that contains both the essential characteristics of technology and the specificity given to it by immersion. Technology includes all the skills, knowledge, procedures, and contributions acquired for making, using and doing useful things (Chandra & Zulkieflimansyah, 2003). Knowledge exists in different forms, including tangible and intangible, hard and soft, codified and tacit, and explicit and implicit (Polanyi, 1997). From a knowledge-based perspective, immersive technology is composed of at least three bases of knowledge, as follows:

- **Hardware.** It is the tangible knowledge comprising the set of instruments and devices or equipment used in a system that enables its operation. In this sense, the different devices within the system determine its capabilities, in terms of storage, processing power, tracking (input data) and rendering (output data). Moreover, the different input/output devices allow the system to stimulate different senses. For example, a system equipped with stereoscopic vision displays, spatial audio or haptic interface has the ability to generate visual, auditory and tactile stimuli. Therefore, hardware characterizes the system's capacity, in terms of the array of supported actions and the available sensory stimulation possibilities or sensory-motor contingencies (Slater, 2009).
- **Software.** It refers to the intangible, technical artefacts such as programs, algorithms and other data structures embedded in a database that enable the system's functionality. Software is at the intersection between the hardware and the user. On the one hand, the controller software regulates the hardware

through a set of instructions and routines to provide an appropriate response to user cues. On the other hand, programs and applications include the data that provide the interface, allowing the user to interact with the system. The software, therefore, carries the content represented in the immersive system, with which the user interacts, such as graphics or audio, and the instructions for the system to execute it in a way that is harmonious and comprehensible to the user. Thus, software features the system performance, in terms of effectiveness and efficiency.

- **Know-how.** It is a specific component that encompasses the skills and expertise from different domains used in the design, development and operation of a system to elicit immersion within the user. In other words, know-how enhances the immersive potential of the system and content. Know-how applies the understanding of how technology affects the user and what different pathways or mechanisms can be used by technology to elicit immersion. These mechanisms are essentially multi-sensory stimulation, which depends on the sensory-motor contingencies supported by the system, and mental absorption, resulting from the content's features and its narrative richness or the challenge it presents (Agrawal et al., 2020). Know-how can be sorted in terms of technical know-how (system's immersive potential) and creative know-how (content's immersive potential).

3.3. Four domains for technology-human interaction

There are four knowledge domains that can be identified in terms of different combinations of knowledge bases.

- **Interoperability.** The combination of hardware and software results in the interoperability between the different system components, an essential feature of immersive technology that describes the extent to which an immersive system works in a comprehensive and harmonic manner. This domain represents the configuration of the immersive system and its operational capabilities. A system is a heterogeneous set of hardware and software components whose purpose is

to establish the interaction between the user and the content. With this aim, the various components must communicate and coordinate effectively, ultimately working together to respond seamlessly and cohesively to user cues.

- **Optimisation.** It is the result of applying technical know-how to hardware with the aim of improving the performance of the equipment and subsequently its effectiveness in generating immersion. This domain involves the selection and configuration of equipment to maximise its performance at both device and equipment levels. At the device level, optimisation adjusts operating parameters to increase the efficiency of devices or to introduce improvements. At the equipment level, optimisation addresses the characteristics of the space where the immersive experience will take place to select an optimal composition of hardware (i.e. the type and a number of hardware components required for a given space of interaction) and its calibration (i.e. the fine-tuning of the input devices or sensors).

- **Environment.** Applying creative know-how to software aims to generate an interactive virtual environment that contains virtual elements with which the user can interact. The environment integrates a technical dimension and a content dimension. The technical dimension involves the characteristics of the database in terms of language, programs, and operations that generate the virtual environment, which affects how the user interacts within the virtual environment, as the software represents in the virtual environment the data it receives from sensors. The content dimension addresses content in terms of its typology, such as the plot and events that unfold during the interaction, or the level of challenge presented by the activities in which the user is involved. The results are not uniform, as they depend on the user's characteristics to generate immersion. The content may have richness in the narrative aspect and yet fail to engage the user in the plot if it is not of interest to the user.

- **Experience.** The combination of the three components of immersive technology is

designed to provide an immersive user experience. To do this, these technology components have to be combined synergistically to maximise the immersive potential of the system and content. The fluidity and naturalness of interaction, the ability of the system to isolate the user from irrelevant stimuli, the intuitive use of the system and the way in which content is presented to the users are features of the system that facilitate the user immersion. However, achieving user immersion during the experience is complex and depends on multiple factors, over which technology does not have direct control, as part of it relies on the user.

3.4. The role of users

The use of immersive technology is twofold: on the one hand, it is used by producers to generate immersive outcomes; on the other hand, it leads to immersive experience consumed by end-users. Producers are users who use their technical and creative skills to develop immersive experiences, based on their area of expertise, while end-users are consumers and recipients of the immersive experience, although this depends on the target persona, in the cultural sphere they are usually the visitors to a facility such as a museum. Producers and end-users contribute to immersive generative processes from producing and demand perspectives respectively.

- In the interoperability domain, producers enable an optimal operational capacity by setting up communication protocols and compatibility among these components in advance; end-users often need play a role as external device accessor with their equipment like smartphone, which can affect the final experience.
- In the optimisation domain, producers need utilise their expertise and skills to ensure an optimal combination of hardware by considering (1) the features of the space where the immersive experience will take place to decide the equipment composition and (2) parameter adjust for an accurate tracking. End-users have not a specific role in the optimisation, as they may not have the necessary skills to adjust hardware, but their feedback is critical for hardware

development, especially in terms of ergonomics and design features aiming to reduce physical discomfort.

- In the virtual environment domain, producers create the virtual environment by integrating the technical and creative dimensions of immersion, based on both software development and programming and arts and creativity. End-users explore the possibilities and limits of the virtual content, helping to identify bottlenecks and glitches.
- In the experience domain, producers conceive the immersive experience from a holistic perspective, in terms of the capabilities offered by the immersive system, how the content is integrated into the system, and what mechanisms are employed to facilitate consumer immersion. End-users, therefore, have the role of a testers, interacting with the content. Through their actions during the interaction, immersion is progressively generated.

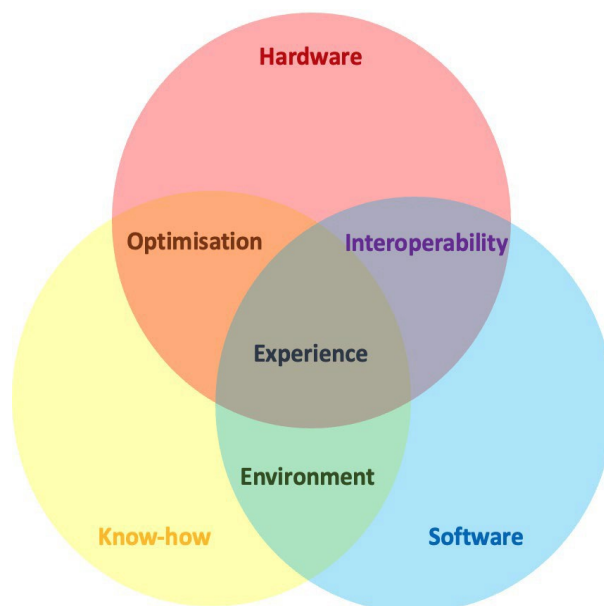


Figure 1. Four interaction domains of immersive technologies in terms of three knowledge bases.

4. Final remark and future work

Our research intends to propose an integrated framework for better understanding immersive technology by synthesising existing technological and psychological

perspectives while emphasising the interplay between technology and user in the immersive generative processes. By adopting a knowledge-based approach, we consider immersive technologies as collections of tangible and intangible knowledge carried by both producers and users, thus creating a theoretical space that makes possible the interaction of technology with humans. This framework can benefit the analysis and evaluation of the use of immersive technologies in experience-based sectors, such as cultural and creative sectors. However, the proposed framework is largely theory-driven and needs to be further tested and validated with empirical cases, which is the focus of our further work.

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Understanding innovation capabilities in the creative and cultural industries – Towards a new framework for managing innovativeness in places

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Keywords: Creative and cultural industries, innovation, innovation capabilities, creativity, cluster, place-based innovation, regional policy

The importance of innovating for regions and places to stay competitive and to manage the digital transformation of society and the economy has been widely acknowledged. However, some organisations prove to be better at reproducing innovation success than others. In literature, the differences in innovation success have been explained through innovation capabilities. Innovation capabilities can be broadly defined as a firm's abilities to “identify new ideas and transform them into new/improved products, services or processes that benefit the firm” (Aas and Breunig, 2017). While a lot of

research has investigated innovation capabilities to explain innovation output of different industries and firms, there is a lack of research that looks at innovation capabilities of firms of the creative and cultural industries (CCIs).

At the same time, the CCIs have been already widely acknowledged as a driver for innovation in regions creating spillover effects in both academia (e.g. Fleischmann, Daniel and Welters, 2017) and by policy makers (e.g. Cooke and De Propis, 2011). This is also the case for Wales and the Cardiff Capital Region (CCR). In 2016, the CCR City Deal was established by the UK and Welsh Governments and the ten local authorities in South East Wales to generate significant economic growth to the region through investment,

upskilling, and improved physical and digital connectivity. The CCI is one of six major target sectors of the City Deal.

This article argues that research into innovation in the CCIs is however needed, due to the specific characteristics of the sectors, which are highly reliant on project-based work and is constituted of a large freelance workforce. Additionally, the cultural value and public subsidies for the CCIs creates different innovation processes. Besides, understanding creative innovation is challenging, since creativity and innovation are particularly important organizational phenomena for the CCIs. At the same time while the CCIs is increasingly targeted by policy makers as local innovation driver, the approaches to increase their innovation capabilities is still embedded into “old” policy paradigms for innovation in other sectors.

This article intends to fill this gap by developing a novel framework for understanding innovation capabilities and their different dimensions regarding the CCIs. The novel framework pays special attention to the CCIs’ specific characteristics while being built on insights and research from interdisciplinary research fields ranging from organizational theory, management studies, economic geography, and innovation literature. Using a literature study, this article identifies first the dimensions that can describe and impact innovation capabilities of CCI businesses. The developed framework is then operationalized and tested with an analysis carried out in South Wales, the third largest film and TV cluster in the UK showing strong growth and innovativeness (Fodor, Komorowski and Lewis, 2021). A questionnaire was designed and distributed to managers of media firms. The survey run from December 2022 till June 2023 (with additional data gathered in 2019-2021). The analysed data ($N \geq 400$) is then used to test the developed framework.

The preliminary findings of the research show, that innovation capabilities in the CCIs are dynamic with multiple dimensions (see also Saenz and Pérez-Bouvier, 2014) and include “perceived” capabilities. Innovation capabilities in the CCIs should therefore not only be understood based on innovation output measures (e.g. patents), but also through perceived innovativeness of an organization driven by creative processes. Innovative

capabilities are dependent on not only the organisational reality of firms in the CCIs but the perceived work environment, which is constituted of internal (mostly related to capabilities) and external (related mostly to resources) factors of the organization. Additionally, the efficacy of policy interventions in regions and cities as so-called innovation agents for the CCIs should be taken into consideration – an often- overlooked dimension in other studies. The framework developed in this paper includes additionally considerations of cluster formations and agglomeration of business activities, as this is one of the core features of the CCIs (Komorowski and Fodor, 2020) and used for policy interventions in regions.

The article contributes with these findings to the current literature by extending traditional innovation management literature to the cluster research field. The findings and the new framework can inform and help fostering effective management of innovation capabilities which helps CCIs managers, policy makers and other stakeholders to better understand how to make local CCIs clusters more innovative.

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Potential formation of a hot spring industry cluster in Beppu, Japan: Learning from five European cities that participated in the 2018 World Hot Spring Summit

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Akira Yamasaki (Chuo University)

1. Introduction: Why aren't Japan's hot spring cities wealthy?

Beppu City in Oita Prefecture, Japan, has the largest number of hot spring sources and supplies the largest amount of hot spring water in the country. Furthermore, Beppu supplies the second largest amount of hot spring water after Yellowstone in the United States and the largest amount of hot spring water suitable for bathing worldwide. However, the per capita income of Beppu is low, similar to the other Japanese cities with a large supply of hot spring water. Moreover, these cities are situated in areas of severe depopulation (Table 1). Japan's hot spring cities do not always effectively use their hot spring resources for economic development.

Table 1: Top 5 cities in total amount of hot spring in Japan

City (Municipality)	Name of the hot spring	Total amount of hot spring (ℓ/min) (2014)	Population (persons) (2015)	Population change rate (%) (2010-15)	Per capita annual income (1,000 yen) (2015)	Average of its prefecture (1,000 yen) (2015)
Beppu, Oita	Beppu Onsen	83,058	122,138	-2.6%	2,141	2,619
Yufu, Oita	Yufuin Onsen	44,486	34,262	-1.3%	2,394	2,619
Takayama, Gifu	Okuhida Onsen	36,904	89,182	-3.8%	2,604	2,717
Ito, Shizuoka	Ito Onsen	34,081	68,345	-4.3%	2,081	3,316
Kusatsu, Gunma	Kusatsu Onsen	32,300	6,518	-9.0%	2,567	3,145

Source: Japan SPA Association. (2014) 'Top 10 Hot Spring Statistics.' Hot Spring. 82, 859.

: Japan National Census, Japan Economic Census, and Economic reports of each local government.

Meanwhile, several hot spring cities in other parts of the world, mainly in Europe, are economically rich. In 2018, 17 cities in 16 countries were invited to the World Hot Spring Summit held in Beppu. Among these cities, Bath, United Kingdom; Vichy, France; Abano, Italy; Bad Krozingen, Germany; and Grindavik, Iceland, were featured as successful examples of hot spring cities with obvious international competitiveness. These European hot spring cities supply less hot spring water than Japanese hot spring cities, but they seem to be wealthier. The existing assumption is that the hot spring resources in European hot spring cities are linked not only to tourism but also to fields such as medicine, beauty, gastronomy, energy, and agriculture. This broad linkage ultimately results in the formation of hot spring industry clusters. This study explores the potential of forming a hot spring industry cluster in Beppu on the basis of the aforementioned five hot spring cities in Europe.

2. Current status and issues of Beppu as the leading hot spring city in Japan

Beppu is a city located in the Oita Prefecture on Kyushu Island in southwestern Japan. It supplies 83,058 L/m of hot spring water and has 2,217 hot spring water sources. The city ranks first in both aspects in Japan. Of the 11 hot spring types worldwide, 10 of them can be found in Beppu. The areas of Beppu (a smaller city with the same name), Kannawa, Kankaiji, Myoban, Kamegawa, Shibaishi, Hotta, and Hamawaki, each with its own unique hot spring quality, are collectively called Beppu Hatto. A wide variety of hot springs are geographically concentrated in these areas (Figures 1 and 2).



Figure 1: Beppu Hattou (Beppu seven hot spring districts) locations

Source: Beppu City Official Website
<https://www.city.beppu.oita.jp/seikatu/gaikokujinmuke/ei/deta-il47.html>



Figure 2: Kannawa Onsen (Kannawa hot spring) photo

Source: Ritsumeikan Asia Pacific University Official Website
<https://www.apu.ac.jp/home/life/content14/>

Beppu has a population of 114,000 (2021) and a gross city product of 364.8 billion yen (2018), making it the second largest city in the prefecture after Oita City, the city where the prefectural capital is located. The accommodation and food service industry accounts for 9.0% of Beppu's gross domestic product while the ratio is 3.0% for the entire

prefecture. Beppu's per capita income is 2.34 million yen relative to the average per capita income of Oita Prefecture of 2.71 million yen. The low per capita income of Beppu City is thought to be due to the low productivity of the accommodation and food service industry, which is Beppu's main industry.

3. Competitive advantages of the five European hot spring cities

The five European hot spring cities considered in this study have populations of less than 100,000 and are located in rural areas far from the capital cities. Despite their small population and distance from the capital cities, these hot spring cities are widely popular as global hot spring tourist destinations. In addition, their labor productivity is at a high level relative to the average level of the EU (Table 2).

Table 2: European 5 hotspring cities

Country	City (Municipality)	Population (persons)	Greater Region or Country	Greater Region or Country Per capita GDP (€) (2017/18)	EU 28 Country Per capita GDP (€) (2017/18)	Characteristic products and services in each region
UK	Bath	88,859	North Somerset and South Gloucestershire	37,874	31,030	Spa, Roman ruins hot springs, World Heritage townscape
France	Vichy	24,992	Auvergne - Rhône-Alpes	33,624	31,030	Carbonated hot spring water, cosmetics, supplements, casino
Italy	Abano	19,062	Veneto	33,295	31,030	Mud therapy, underwater therapy, winery
Germany	Bad Krozingen	20,377	Baden-Württemberg	45,650	31,030	Open spa therapy, relaxation
Iceland	Grindavik	3,300	Iceland (Country)	59,834	31,030	Blue Lagoon, the world's largest hot spring using heat drainage

Source : Eurostat, Japan MOFA, and other local information.

On the basis of these five cities, the following three competitive advantages can be assumed for the potential formation of a hot spring industry cluster:

a) Long-term stay

In Europe, social security has long been applied to medical treatment and rehabilitation. Many long-term medical and recreational hot spring resorts target customers who stay for several weeks. In addition to hot spring baths, these hot spring resorts offer parks

with hot spring drinking facilities, hotels, pension houses, casinos, shopping districts, and related events. In recent years, the length of stay in these hot spring resorts has decreased, along with the reduction in social security costs in Europe.

During the Edo period (17th to 19th centuries) in Japan, different types of people, from the ruling class of feudal lords and samurais to ordinary citizens, sought hot spring cures for their illnesses, thus staying in hot springs for long periods. Hot spring areas, such as Beppu and Kusatsu, developed as hot spring resorts where people stayed for long periods. However, the hot spring cure culture gradually declined in modern times, and after World War II, hot spring resorts transformed into entertainment districts and short-term stay destinations.

The number of hot springs in Europe is considerably smaller than that in Japan. Therefore, European hot springs have historically been used as scarce resources for medical treatment and rehabilitation. In this process, social security and long-term leave systems have been applied. In Japan, which has a relatively large number of hot springs, hot spring tourism destinations have developed rapidly during periods of high economic growth as places of entertainment that are more familiar to Japanese people. Thus, hot springs in Japan have become incompatible with social security and long-term vacation systems.

b) High value-added products and services

The use of hot springs in the five European cities covered in this study is diverse. In Bath and Vichy, hot springs are symbolically branded together with townscapes registered as World Heritage Sites and are thus highly effective tourist attraction resources. In particular, Vichy develops beauty products that use the name of a hot spring, realizing the high added value of hot spring resources. The Blue Lagoon in Grindavik has also succeeded in branding itself as “the world’s largest hot spring,” with luxury hotels and services located in its hot spring areas. Abano and Bad Krozingen focus on medical, recreational, and beauty services, treating people with local wine and food while developing gastronomy tourism.

Meanwhile, the accommodation service industry is the base industry of Japan's top-ranked hot spring cities. In most cases, hot spring bathing facilities operate as sightseeing activity areas of accommodation facilities for tourists. In addition, several independent hot spring bathing facilities are located within cities as a service to citizens with reasonable prices.

c) Multipurpose use of hot spring resources

Since the oil crisis in the 1970s, Iceland has shifted to an energy supply system that does not depend on oil, and the diversification of its energy sources is progressing. Approximately 27% of the country's total electricity demand is met by geothermal power generation, and this ratio is the highest worldwide. Along with the development of a geothermal power generation system, the Blue Lagoon, one of the world's largest hot springs, has also been developed in Grindavik. Similar to the method used in the Blue Lagoon, many swimming pools in Japan use residual heat from waste incineration facilities.

However, deep-rooted concerns have formed with regard to the adverse effects of geothermal power generation on hot spring resources in Japan. Owing to legal restrictions, geothermal power generation accounts for only approximately 0.2% of Japan's electricity demand. The development of geothermal power generation facilities in the country has been regulated because most volcanic zones from which geothermal energy can be obtained exist within national parks. Furthermore, geothermal power generation is not widespread because of the existence of many hot spring accommodation facilities in areas suitable for geothermal power generation in Japan; thus, the development of power generation facilities requires complex coordination with existing stakeholders. Nevertheless, great business opportunities related to geothermal power generation are expected to spread globally in the future, and many Japanese companies are already entering the market. Advanced geothermal power generation facilities should be used as tourism resources for business development.

4. Discussion: Potential of forming a hot spring industry cluster in Beppu

Economic base analysis (Basic-Nonbasic analysis) by the number of employees in Beppu identifies the industries with a competitive advantage, revealing the potential components of a hot spring industry cluster in Beppu.

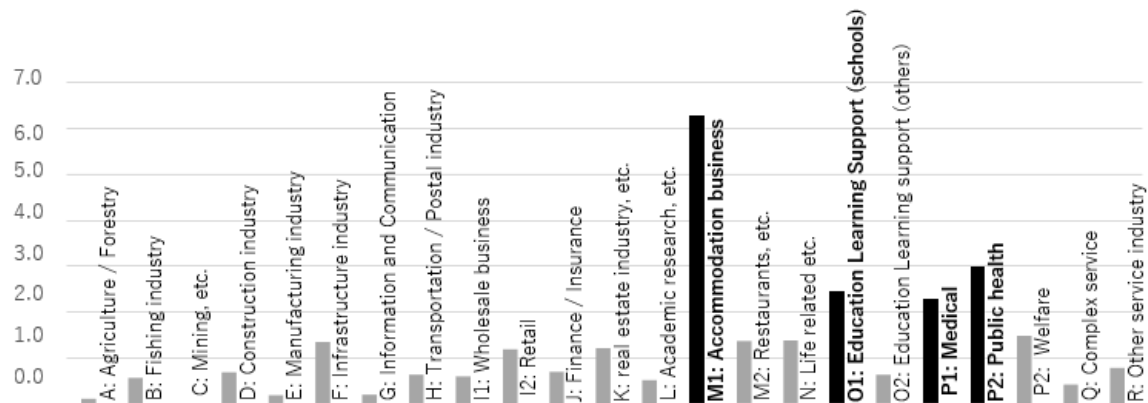


Figure 3: B-N analysis of industrial sectors of Beppu based on employees

Source: Japan Economic Census

As shown in Figure 3, the coefficient of Beppu's accommodation service industry specialization is 6.3. This figure shows that Beppu's economy is highly dependent on the accommodation service industry. As most hot spring resources are commercially used in accommodation facilities, there seems to be considerable room for their utilization in fields other than the accommodation service industry. The other core industries are public health (3.0), education and learning support (school education) (2.5), and medical care (2.3).

From this analysis, the potential of forming a cross-industry hot spring cluster that includes the education and medical industries, as well as the tourism industry, can be explored. In fact, Beppu already has functional clusters in advanced education, research, and medical care. In 1923, the Geothermal Research Facility attached to the Graduate School of Science, Kyoto University, was established. In 1931, the Kyushu University Beppu Hospital was established as a clinic of the Kyushu University Hot Spring Therapy Research Institute in Beppu. In 2000, in addition to Beppu University, Ritsumeikan Asia Pacific University opened with a rich international character, thus attracting Japanese and international students from 100 countries. Beppu is clearly transforming into a city that attracts diverse young and foreign talent.

In the future, the formation of an industrial cluster centered on hot springs could induce innovation in Beppu and result in an increase in per capita income. A new type of tourism, referred to as “workation,” has been attracting attention in Japan in recent years, particularly during the COVID-19 pandemic. Other concepts to consider include long-term recuperation (e.g., Germany’s Quaort) and lifelong learning with accommodation (e.g., Denmark’s Folkheuskore).

The formation of a hot spring industry cluster in Beppu should be aimed toward integrating health and wellness tourism and education tourism along with maximizing the city’s abundant hot spring resources. Such a direction can transform Beppu into a long-term stay destination and will create high value-added products and services while promoting the multipurpose use of hot spring resources.

Defining the concept of Immersion and the keys to immersion

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The study presents a systematic literature review to explore the definition of immersion in relation to the technological advancement concerning immersive technology that occurred in recent years. The Preferred Reporting Items for Systematic Reviews (PRISMA) has been adopted as a guideline for conducting the systematic analysis of the literature. The data obtained from the research comprises 33 studies from 2013 to 2022, retrieved from the Scopus database. The results are represented by a definition of the concept of immersion and the key elements constitutive of immersion, defined by the authors as the keys of immersion.

The study also presents, in the first section dedicated, some key experiences along the path of immersivity from pioneers to nowadays and near-future trends. After more than thirty years from the latest studies, we reopen the folder of immersivity in a social dimension enabling creatives to express themselves in open public spaces. “Immersivity” is an interesting and innovative “communicative experience” to be enjoyed together with other citizens, breaking cyber isolation.

The study reports part of the European research project Artcast4D activities, which addresses immersive technology for the cultural and creative sector. This research is an interdisciplinary Horizon Europe project aimed at designing and developing a cost-effective, hassle-free, easy-to-install and tune solution to set up a multi-user, multi-site, multi-platform non-invasive immersive and interactive users experiences.

KEYWORDS: immersion, immersive technology, systematic literature review, PRISMA

Creative Industries and Economic Complexity of Regions

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The present study analyses how the agglomeration of creative industries (CIs) affects the economic complexity of regions.

In the field of economic geography, the capacity of cities and regions to attract and retain talents and spread creativity has been considered one of the most determining variables in regional branching and urban competitiveness strategies (Landry, 2000; Florida, 2002).

Recent studies have shown that creative industries (CIs) clearly show their specific location patterns and tend to be concentrated in specific areas (i.e., the core of big cities), where it is easier to interact between different creative disciplines, access to cultural infrastructure and a greater concentration of demand for goods and services (Boix et al.; Coll-Martinez et al., 2018). Specifically, as distinct from traditional agglomeration economies (Sanchez-Serra 2016), specialisation in CIs is a strong determinant for entries of both creative and non-creative firms (Coll-Martinez and Arauzo-Carod, 2017; Arauzo-Carod et al. 2023). Previous results highlight the strong interindustry linkages between creative and non-creative industries that enhance the positive effects of the former over the later.

Despite this evidence, several authors agree that more efforts should be conducted to understand and identify the complexity and the cross-fertilisation of different creative jobs working in other industries than the CIs (Bakhshi and McVittie 2009; Cerisola 2018a, b; Innocenti and Lazzeretti 2019) as CIs may stimulate the complexity of regions, ultimately enhancing regional development and sustainable growth.

Economic complexity is introduced by Hidalgo and Hausmann (2009) which is a measure that draws valuable information from the structure of a bipartite country-product network, i.e. product space. Economic complexity is based on the method of reflections

(MOR), which iteratively combines two variables: products' ubiquity and countries' diversity. Consequently, countries with non-ubiquitous, untradable capabilities enjoy an exclusive source of comparative advantage, thereby producing more complex and privileged goods that only a small fraction of countries can produce. On the contrary, countries experiencing less exclusive, ordinary capabilities produce ubiquitous goods that many countries can produce; thus, they tend to have low complexity scores. The economic complexity approach based on MOR has been replicated by many scholars using either trade data and product space or different relational networks, including knowledge space (Balland and Rigby, 2017), digital proximity (Rahmati et al., 2021), technological complexity (Whittle, 2019; Mewes and Broekel, 2020) and skill complexity (Caines et al., 2017; Lo Turco and Maggioni, 2020; Antonieji et al., 2021; Buyukyazici et al., 2022) at multiple spatial scales such as countries, regions, and cities.

Creative industries employ a high share of creative workers thus they contribute to the knowledge creation and knowledge diffusion process not only among creative industries but also other industries (Coll-Martinez and Arauzo-Carod 2017; Arauzo et al. 2023). Based on this motivation, if a region has a relatively higher share of creative industries in its industry space, then that region is likely to produce goods and services that require creative and sophisticated knowledge which are the crucial sources of regional comparative advantage. Given that two components of economic complexity are ubiquity and diversity of knowledge, there could be a close relationship between the existence of creative industries and economic complexity in a spatial context. The present study aims to explore this relationship.

Descriptive analyses explore the position of creative industries in the industry space by employing network tools. In addition, the regional clustering of creative industries with Revealed Comparative Advantage (RCAs) and their relation with regional economic complexity measures are analysed.

In the empirical model, the dependent variable is regional economic complexity which is computed based on the MOR introduced by Hidalgo and Hausmann (2009). We consider several economic complexity measures such as co-location-based economic

complexity, skill complexity, and knowledge complexity based on patents. The primary explanatory variable is the share of creative industries in the regional industry space. We measure the regional share of creative industries with the creative trident approach: (1) creative workers employed in creative industries; (2) non-creative workers employed in creative industries; (3) creative workers employed in non-creative industries.

Results in this paper provide a framework to better understand the actual role of creative industries favouring the complexity and, thus, the economic diversification and growth potential of regions.

Government crowdsourcing across territorial levels

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Digital platforms are currently used in many areas, including those related to policies and the production of public goods and services (Kim et al., 2022). Among them, digital platforms dedicated to crowdsourcing have experienced great growth (Brabham, 2009, 2015; Prpić et al., 2015). Established as a tool to carry out open innovation projects by private companies, these platforms are increasingly being used by public bodies to accomplish various types of goals (Brabham, 2015).

Among the latter, the literature has especially emphasized the “participatory” ones. In fact, most contributions studying government crowdsourcing or policy crowdsourcing have described cases in which public administrations-especially, but not only, at the city level-have used digital platforms to gather opinions, ideas and projects from the citizens (Brabham, 2009; De Coninck et al., 2021). In contrast, examples regarding the use of crowdsourcing as a tool to support the production of innovative goods and services is very limited (De Coninck et al., 2023; Colovic et al., 2022).

However, although crowdsourcing can be used as a tool to support participation, it is a tool for promoting (open) innovation (Afuah and Tucci, 2012), and it could be used as such by the public administration. In the field of the production of public goods and services, crowdsourcing could help reversing the logic of traditional public procurement, placing the emphasis on the problem, rather than on specifying the desired solution (Uyarra et al., 2020). In fact, while public procurement regulations requires the government to identify ex ante all the characteristics of the good or service to be acquired from outside, crowdsourcing could be used to acquire various solution proposals from the crowd, and eventually implement them (Wesseling and Edquist, 2018; Randhawa et al., 2019).

This kind of crowdsourcing seems to be particularly relevant in the current scenario in which, starting from the 'Open Government Directive' in the US (Executive Office of the President 2009) to the European Union acts (COM(2007) 799; Directive 2014/24/EU), there is a growing push for the adoption of innovative procurement and digital government tools by public administrations.

Looking at the major crowdsourcing platforms worldwide, we explore in a systematic way whether and to what extent crowdsourcing as an open innovation tool has been used in public administration at different territorial levels.

We will specifically explore whether public administrations operating at different territorial levels have used these platforms differently. By their nature, lower levels of government are concerned with the provision of public goods and services at a regional or local scale. These goods usually have a high level of specificity (Lambooy and Boschma, 2001; Johansson et al., 2001; Bellandi and Caloffi, 2012). Both at the stage of their design and at the stage of their implementation and delivery, much knowledge is needed about the specific needs of the population and the characteristics that these goods and services should possess in order to be functional for them. Very often, these characteristics are not easily known from the outside (Barca et al., 2012). For this reason, the use of an anonymous crowd for the design of local-scale public goods might seem of doubtful utility. However, given the peculiar characteristics of crowdsourcing, the distance between the seeker and the solver could precisely help public administration change its perspective on how to solve local problems and ultimately innovate.

Our empirical analysis consists of two main steps. In the first, we make a systematic analysis of major crowdsourcing platforms to analyse whether and to what extent national, regional, or local governments are active in crowdsourcing projects. In the second step, we perform a series of interviews with public administrations and managers of crowdsourcing platforms to investigate what are the characteristics of public goods produced through crowdsourcing, and what are the main differences with other goods and services produced through the traditional procurement process.

Systematic research on major crowdsourcing platforms shows us that European countries are still timid users of crowdsourcing platforms, in contrast to the U.S. where there is now a fairly well-established tradition of using digital platforms. Moreover, the main users are national governments, which issue challenges aimed at creating public goods with high levels of generality, while the involvement of regional and local governments is still very limited. To understand whether public administrations are involved in crowdsourcing projects outside the platforms run by the big players, we developed a vertical analysis of three major countries-Italy, Germany, and the Netherlands. This analysis shows us that local and regional governments are starting to be very active in crowdsourcing, especially with public platforms or institutional websites. While in Italy and Germany the tool is mainly used in an advisory way or to stimulate participation in public interest projects of particular categories of actors (e.g., students), in the Netherlands the tool is used quite extensively to meet the needs of producing innovative public goods and services by funding pre-commercial procurement projects.

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Risks and benefits of R&D: cases in the cities of Sejong and Daejeon

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The purpose of this article is to re-considering benefits of R&D that is majorly invested from government to private sector. In many countries, both central and local governments invest their budgets into R&D projects. However, the most of R&D benefits, such as publications, patents, royalties, employment, and increase of value has been distributed to firms rather than government sector. The underlying assumption is that the benefits of R&D is ultimately affecting local economies in some ways, such as taxes and employment. We need to figure out whether the player bear more risk get more benefits from their investment. In other words, do firms take high risk and high returns? We need to analyze how the risks and benefits of R&D are distributed into various groups, such as public and private sectors.

As Mariana Mazzucato put in 'The Value of Everything', there has been old belief of governments should bearing most of risks and not taking benefits from R&D. The benefit of R&D needs to be re-addressed, because benefits of firms' R&D is coming from various sources, such as government spending, public infrastructure, and education.

This study aims to discuss how benefits of R&D should be distributed among public and private sectors in this fast changing economic circumstances. In order to do that, the researcher analyzed distribution of R&D benefits in two cities, Sejong and Daejeon. The local governments' R&D spending and how the benefits of R&D are distributed will be the major part of the analysis. I interviewed major players which are in local governments, intermediary institutes, and local firms. The major questions that this research asking is as follows: who take the major part of risk that is in R&D? Who take the major benefits from R&D? If there are mismatch between risk taking and benefit collecting, what will be the policy tools for shorten the gap?

One example of interview with the person who is working at the regional intermediary institute show us mixed understandings. When I asked about whether the public and private sector getting more benefits from governments' R&D, he provided some answers as follows:

The governments' R&D fund is important source for start-ups rather than big companies. Moreover, the benefits from R&D went to the recipient companies, but it also increases the competitiveness of nation. It also increases the quality of public services by getting data and implying those data to public service. However, the benefits of R&D spending went mostly to recipient companies.

This example shows us that there is perspective of R&D spending has positive effects for improving competitiveness of country and increasing the quality of public service. However, I found out that there is some opinion of government' R&D spending mainly went to companies. It probably show us that there is myth about the role of private sectors in economies through making profits and creating jobs. We need to analyze more interviews how related people in R&D think about risk taking and benefit allocation between public and private sectors, and how these structures can be improved for better results for R&D investment.

The role of cultural organisations in the evolutionary trajectories of places: The case of the Pistoia Museums Foundation

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The research is part of a larger study investigating the relationship between major cities of art and surrounding territories to understand how to manage visitor flows and increase the attractiveness of smaller centres.

In particular, the research focuses on the Tuscan city of Pistoia in Italy and the role of the Pistoia Museums Foundation (PMF) in managing and enhancing the local cultural heritage to increase the attractiveness of the city and drive its sustainable cultural-led development.

In 2017, Pistoia was appointed as “Italian Capital of Culture”. The event represented a good chance to trigger an alternative path of development for the city based on cultural resources. The PMF represents a legacy of “Pistoia Italian Capital of Culture”, and today, it is an important actor in the city’s cultural ecosystem and museum cluster by managing four exhibition venues in the historic city centre. The institution has the objective of developing a high-quality cultural offer, enhancing the local heritage and increasing the flow of cultural tourism.

The research uses the case study methodology to understand the drivers and strategies adopted by the institution to develop their cultural offer and engage with visitors and the local community in the context of sustainable cultural-led city development. Data collection considers a period from 2019 to 2022. It involves several sources, such as interviews with the staff and the managers of the institution and local informant actors, data on visitors and city tourism flows, institutional reports, web site and social media.

The data analysis followed several steps. First, the interviews were analysed through the software Nvivo 20 for coding the content based on the main themes emerging from the discussion. Secondly, information was compared with data from secondary sources to allow triangulation, reducing confirmation bias and increasing accuracy. Finally, the discussion mapped and categorised the institution's activities and identified the best practices for managing cultural heritage.

Results contribute to understanding the role of cultural organisation in driving the attractiveness of places and contributing to creating alternative paths of development. Moreover, the research sheds light on the strategies that might increase the value produced by a cultural organisation for the local community and other stakeholders. Finally, it shows the opportunities and challenges for the development of alternative tourist routes, enhancing smaller towns and planning policies to support the cultural sector.

Exploring Artificial Intelligence in Creative Regions: A Literature Review

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Since '90, the studies of cultural and creative regions, industries and organisations have risen among different fields due to their increasing importance for social, economic and cultural development (Potts, 2012; Cooke and Lazzeretti, 2008; Lazzeretti et al., 2018; Cruz and Teixeira, 2021).

Recently, scholars have highlighted the potential of new technologies, such as artificial intelligence, for the growth of cultural and creative sectors and the development of regions (Lazzeretti et al., 2022b; Boix et al., 2022). This extensive digitisation process has accelerated due to the pandemic by Covid-19, both in terms of new digital forms of conservation of cultural heritage and through the implementation of new business models, innovative forms of audience development and consumers' digital participation in the creative process (Sacco et al., 2018; Lazzeretti, 2023).

This revolution has been particularly influential for specific sectors, as the case of museum organisations, the fashion industry and the tourism sector, among others (Guccio et al., 2022; Lazzeretti and Oliva, 2022; Delaplace et al., 2022). Consequently, cultural and creative organisations have developed new digital products - such as virtual tours, NFTs, apps and virtual platforms, games, augmented and virtual reality, etc. - diversifying their offer and opening to new market niches (Massi et al., 2020; Jung, 2022).

This new scenario evidences a close relationship between the cultural and creative economy and artificial intelligence technologies through the lens of the regional sciences. Based on this consideration, the research wants to analyse the literature on artificial intelligence and regional sciences with a focus on the cultural and creative

economy. The analysis has a twofold aim. First, it aims to give an overview of the evolution of the studies based on the intersection of these three pieces of literature, with a particular focus on the cultural and creative economy. Second, it wants to identify relevant topics and the journals where the debate is vibrant, as well as the main authors and the emerging trends of this promising literature.

The first step is the identification of the papers based on the intersection of these three topics: the artificial intelligence, the regional sciences and the cultural and creative economy. For this purpose, the work departs from a unique dataset of the works related to artificial intelligence and regional sciences (Lazzeretti et al., 2022a). The dataset is composed of more than 10.000 articles published in the period 1986-2022 collected from ISI – Web of Knowledge database, the analysis first selects scientific articles in the English language published in the economics disciplines - e.g., business, economics, geography, management, social issue and urban studies - and pertinent to the topic of artificial intelligence, identifying keywords from the literature and thanks to the contribution of some experts. Then, the selection was refined by identifying those articles that pertain to the field of regional science.

Using this dataset, through a keyword selection concerning cultural and creative economy research topics - such as creativity, cultural and creative industries, cultural organisations, etc. - we identified the set of articles on which the present analysis is based. The final range of articles has been analysed through a content analysis based on an in-depth reading of the papers that allowed us to systematise the literature to identify the emerging trends, the gaps and the most promising avenues of research.

The research results have value implications because they offer a timing and comprehensive overview of the evolution of artificial intelligence and related technologies in cultural and creative sectors in the regional science literature. Moreover, the research traces a future research agenda useful for managers and policymakers to drive the further development of the field.

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Bio-based industrial networks – Romanian best practice

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Purpose

Our work aims to analyze the influence that the way of collaboration between economic actors can have on the exploitation and valorization of the regional bio-economic potential; we refer to modern forms of networking, based most of the time on traditional forms (various craft groups, professional associative forms, industrial districts, etc.).

Design/methodology/approach

The methodology used in this sense is based on a complex of methods, adapted to the particular Romanian case chosen, i.e. to that of the Centru Region; the frequent approach used by specialists for this area is that of the collaborative economy, seen as a socioeconomic system built on the concept of joint use of physical and human resources.

Findings

The findings indicate that the regional economic sectors involved in Centru Region are:

- Agro Alimentary - Preservation of valuable autochthonous genetic material: creation of a bank of seeds and the maintenance of native breeds of animals,
- Establishing regional centers for the processing of agricultural products of animal origin, Stimulating the association of small agricultural producers to make their supply and sales more efficient
- Sustainable processing of wood, including the creation of sustainable rural communities by ensuring local energy independence by capitalizing on local biomass resources.

- Tourism - Creation of a regional brand in the field of mineral/salt water, Involvement of students (medicine, tourism, marketing, sociology, architecture, etc.) in the realization of revitalization projects of spa resorts),
- Sustainable Built Environment - sustainable rural community pilot project IT and creative industries - Supporting the formation of associations or hubs for cultural and creative industries.

Through the support of entrepreneurs by local and regional authorities, the regional economy is moving towards cross-sectoral cooperation, especially with the aim of achieving the objectives of sustainable development.

The realization of a sustainable and collaborative regional economy was decisively influenced by the trend of establishing and developing clusters with administrative cores in Covasna County, within the Centru Region.

Research limitations/implications

The Centru Region under discussion is propelled by the evolution of clusters as well as other regional initiatives developed within the projects financed by the Horizon Program. Thus, the major collaborative economic forms take various forms, in addition to clusters, such as thematic working groups, strategic Hubs, business incubators, accelerators supporting economic activities, etc. The paper will investigate in depth the actors involved in the promotion of these innovative forms of networking.

Practical implications

The collaboration between the various actors involved, as well as the different levels of approach (local, regional, zonal) can be promoted by encouraging local authorities, as is the case of the Centru Regional Development Agency.

Social implications

The sustainable dimension of the economic activity carried out by the clusters, at the same time, trains the population's awareness of the SDGs. A particular emphasis is

placed, in this context, on the activity of the research units, which are part of the analyzed clusters. A special concern for the creation of a resilient region is also the creayion of sustainable value chains.

Originality/value

This paper will contribute to a beter knowledge and understanding of the interactive economic environment at the regional level, formed by multiple collaboration networks in the field of bio-industries.

KEYWORDS: bio-industries, regional economy, HUBs, cross-sectoral cooperation, value chain

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Internal resources, external environment or both?

Exploring the critical determinants of innovative startup growth

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The growth of firms is a cumulative process, which can be synthesised in the capacity to use internal resources, successfully adapting to the evolution of the external environment, balancing the management of the existent (exploitation) and the entrepreneurial alertness about new opportunities (exploration) (Penrose, 1959; March, 1991). The new firms (with the exceptions of spinoff and M&A) that start their journey from scratch, explore limited niche searching to legitimise their specialisation also by the means of complementary resources that the external environment can provide (e.g. finance, talents) (Garnsey et al., 2006; Symeonidou et al., 2022). In the strategic management literature, it is well established that growth is a path-dependent process characterised not only by the ability of the firm to translate resources into competitive advantages with an entrepreneurial attitude but also by the capacity to react to idiosyncratic internal events and external shocks (Gilbert et al., 2006; Brennet and Schimke, 2015). With the increasing complexity of the current techno-economic scenario, entrepreneurship has been increasingly conceptualised as a holistic emergent complex system, where firms are self-organised subsystems embedded in broader systems (Coad and Planck, 2012; Mazzoni et al., 2022). Within this framework, theoretically embedded in the concepts of complex adaptive systems (Simon, 1962) and network economy (Castells, 1996), firms compete and cooperate, sharing similar/complementary knowledge and resources, which are distributed heterogeneously in the system (Balland et al., 2022).

At the firm level, resource-based view theory of the firm (RBV) (Wernerfelt, 1984; Barney, 1991) emphasizes the ability of successful firms to build their competitive

advantages properly using their available resources, relying on a set of dynamic capabilities (Teece et al., 1997). Resources can be tangible (e.g. assets and machinery) and intangible (e.g. patents) and evolve with experience and the structuration process of the company. Barney (1991) describes the successful set of strategic resources using the “VRIN” framework: Valuable, Rare, Inimitable and Non-substitutable. With a different degree of versatility, these re-combinations of resources (portfolio variety) increase the possibilities and modes of growth (Nason and Wiklund, 2018).

At the system level, the notion of economic complexity (EC) has emerged in the last decade as a new theoretical and empirical framework to characterize the sophistication level of economies (Hidalgo, 2021). In comparison to previous frameworks (as location quotient to capture sectorial specialization), economic complexity adopts an agnostic view on the relationships (and their strengths) occurring within a system. Economic complexity, thanks to recommendation system logic typical approach used by big platform players (e.g. Netflix and Amazon), provides a propensity score computed on the rarity and diversity of products, technologies, sectors, skills, which can be useful to predict economic development trajectories according to the extant potentiality level (Hidalgo, 2021 and 2022).

At the state of art, few studies have tried to combine resource-based theory of the firm and economic complexity into a unique approach (Ferreira et al., 2021). These two approaches share the common mission to explain the emergence of competitive advantages starting from a micro perspective - the firm as a bundle of competencies, resources and skills (RBV) and using the interaction of these micro building blocks as the final economic system result (EC). Even if there is growing literature that focus on the startup growth determinants (Protogerou et al., 2017; Symeonidou et al., 2021), few works have already investigated the environmental determinants of startups growth (Clarysse et al., 2011) in conjunction with the internal characteristics of the newborn firm (Innocenti and Zampi, 2019). This is particularly relevant for new firms as their success depends not only on the quality of the business idea, but on their capacity to find the right fit between the value proposition and the customer needs. This process sees many elements that may play a substantial role in the different phases of the startup

development. Internal factors as the quality of entrepreneurial teams (age, role in the company, education), the presence of strategic intangible assets (e.g. patents or embedded knowledge), the digital culture, financial performances, and organisational costs can provide a partial picture of the growth process. External features, as the level of sophistication and connectedness of the economic system (proxied by complexity and relatedness), which represent a fine-grained picture of the competitive environment, can provide additional insights on the growth paths of the startups.

Accordingly, the aim of this paper is to understand how the configuration of internal resources, external conditions and their interaction can affect the growth process of startups during their early stages of development. The expected contribution of this paper is twofold. Firstly, to provide a theoretical framework based on RBV and EC able to include a holistic view of the internal and external development mechanisms of innovative entrepreneurship. Second, to measure the validity of this framework with econometric estimation, using three main sources of data: (a) the Innovative Startup¹ register of the Italian chamber of Commerce, (b) ORBIS (Bureau van Dijck) to extract the performance and characteristics and (c) institutional sources (e.g. ISTAT) to build the variables aimed at measuring the quality of external environment (e.g. relatedness, complexity, incubation, institution - in particular easiness of doing business) at the smallest geographic level of investigation offered by the EU classification system for units with comparable population size, the NUTS-3 level.

The study intends to analyse the startups' cohorts born from 2011 to 2016, looking at their growth performance in different stage of development (e.g. after 3/4/5 years from their foundation), evaluating the most appropriate indicator to measure the phenomenon.²

Disentangling these kinds of relationships is important to help local policymakers, incubators and accelerators in supporting with the adequate incentives and designing the most appropriate programmes to enhance their potentialities.

1 Innovative Startups have been delineated by the in Italy Start Up Act (Decree Law 179/2021), with the aim to allow to guarantee favorable conditions of development to the more innovative new venture (in terms of input – e.g high level educated people in the team or patents holder).

2 Substantial differences in the growth process may emerge adopting different indicators, particularly in startups. Consider the example of sales and employment. Sales growth represents the progressive appreciation by customers of the products services proposed by the firms, which can be more volatile in comparison to employment growth that implies a change in the organizational structure of the new venture (Gilbert et al., 2006; Chandler et al., 2009). It is important also to stress that sales growth may or may not lead to employment growth, while employment growth rarely occurs without sustained good financial and economic performances (Chandler et al., 2009).

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Impact first: Artcast4D media release and its impact on all digital channels

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In this presentation IFAAR from Switzerland will show how the press or media release of the Horizon Europe project Artcast4D has been proactively analyzed for digital demand on all search engines, social media channels and e-shops in order to address all the users who are interested in the topic as best as possible. It will show the initial draft lead version of the media release which has been first developed by the communication partner in the project: The Battleground. This release has then been systematically analysed for impact of the wording on the “find engine” of IFAAR in order to discover where the users are already searching, which topics around immersive new technologies are already understood, which are less used and finally, which topics are only very rarely used and thus not understood by the online users.

Intermediaries in university-industry collaboration (UIC): the role of cluster organizations in collaborative platforms

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Topic importance: Clusters are generally regarded as the catalyst for local and regional collaborative platforms for related and unrelated variety relations. Furthermore, they built around close interactions between diverse stakeholders that provide a fertile ground for enhancing competitiveness (Anić, Corrocher and Morrison, 2019). The area of collaboration in clusters is attracting growing attention because of the formation of new firms and their growth and their strategies (Li, 2019). Knowledge on UIC is needed for assessment of sustainable territorial innovation ecosystems through mechanisms of cooperation and strategic alliances (Mascarenhas, Ferreira and Marques, 2019). Additionally, these mechanisms could serve as a basis to design public policies addressing emerging innovators from the V4 countries respecting variety of collaboration processes.

Knowledge gap: Despite the interest in cluster development, relatively few studies have considered UIC collaboration. It is not well understood how to conceptualise the mechanisms of UIC in cluster organizations and what role do they have in Triple Helix Model. More importantly, the research in clusters is rather skewed towards the collaboration between firms and research institutions themselves, leaving collaborative platforms out of the equation. The paper assumes UIC in cluster organizations require a multi-scalar approach that could be investigated through embedded, emergent, and engineered collaboration (Mascarenhas, Ferreira and Marques, 2019; Taabaa and Ankrah, 2019). These types of collaboration create synergies between stakeholders and

reinforce the idea of developing favourable regional innovation ecosystems (Camagni and Capello, 2013).

Study aim: The aim of this paper is to identify role of cluster organizations as intermediaries in UIC with multi-scalar approach reflecting on moderate innovators countries that are less technologically advanced. Furthermore, the paper will provide an insight into mechanisms of UIC concerning strategic alliances in Triple Helix Model in the V4 countries and their territorial innovation ecosystems. This paper focus on transformation of UIC through intermediaries (Bodas Freitas and Verspagen, 2017; Mascarenhas, Ferreira and Marques, 2019; Alexandre et al., 2022). Additionally, the paper sheds some light on diverse collaboration mechanisms to mitigate barriers in UIC (Alexandre et al, 2021).

Methods: The paper will use evidence from the V4 countries and their territorial innovation ecosystems reflecting various policies, programmes, and practices affecting UIC. The objects of the study will consider the different phases of clusters and their life cycles. The multi-scalar approach to identify mechanisms of UIC will be used to address strategic alliances in tripple helix framework (Marques, Marques, Bragaand Ratten, 2021). The paper is based on data triangulation with different respondents, and spaces using multiple data sources to answer the research questions. The method will explain the barriers and motives for conceptualising UIC mechanisms transforming regional innovation systems in the V4 countries. Empirical analysis will employ both semi-structured in-depth interviews with cluster organization managers and representatives from research organizations. Discrepancies in codes are compensated by their frequency distribution in the codebook to support rigor of the study. Subsequently, codes and their distribution are grouped into more abstract representation to develop a comprehensive framework.

Contribution: The paper will conceptualise mechanisms of UIC by exploring the role of cluster organizations as a collaborative platform for development of territorial innovation ecosystems in countries regarded as moderate/emerging innovators (EIS). Additionally, the contribution is reflected in an overview on motives, factors, and

challenges influencing strategic alliances for innovation based on variety of collaboration practices to mitigate barriers in UIC. The conceptualisation could provide an insight for sustainability of strategic alliances and their role in transformation of lagging regional innovation systems among emerging innovators in technologically less advanced regions.

Keywords: collaboration, cluster organizations, innovation, mechanisms

DUI drivers of innovation in lagging regions

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In lagging regions, small and medium-sized enterprises (SMEs) predominate and can be key players for innovation-driven structural change (Hervás-Oliver et al., 2021). However, SME innovation is characterized in particular by non-R&D- driven, often informal learning and innovation practices, which are strongly anchored in what Jensen et al. (2007) label the DUI innovation mode, as opposed to the STI mode (Thomä and Zimmermann 2020; Runst and Thomä, 2021). Taken together, this suggests that the DUI mode is relatively more important for lagging regions than for leading regions, a hypothesis supported by recent empirical studies. For example, Hervás-Oliver et al. (2021) directly examine innovation modes from a (heterogenous) regional perspective and find that innovation in lagging regions is strongly influenced by SMEs and their DUI-based learning and innovation processes.

Therefore, innovation policy and measurement based on the linear model of innovation with a focus on R&D neglects (SME) innovation activity in lagging regions. While it has been increasingly recognized that a broader perspective is needed to understand and explain the heterogeneity of regional innovation patterns (Isaksen and Trippl, 2017), there is a lack of systematic and granular measurement of the DUI innovation mode, which is important in this context.

Building on a recent comprehensive qualitative analysis of the DUI mode of SMEs by Alhusen et al. (2021), we conduct a quantitative survey among SMEs from ten lagging NUTS3 regions in Germany, which we use i.) to validate the indicator set of Alhusen et al. (2021) and ii.) to investigate DUI innovation drivers for lagging regions in a differentiated manner by distinguishing between the drivers themselves as well as between innovation outcomes.

Starting from the finding that the DUI mode is essential for innovation activity in lagging regions, we perform probit regression using comprehensive, validated, and differentiated variables for DUI drivers of innovation, as well as a composite STI indicator as our main explanatory variables. Hereby, differentiating among DUI drivers allows us to determine which of these drivers are particularly important for innovation activity in lagging regions. The dependent variable is innovation, either in a broad sense or taking into account the different types of innovation outcomes (product, service, and process innovation) or the degree of novelty, in order to additionally determine which drivers are of particular importance for which type of innovation in lagging regions. We control for firm size and include sector- and region-specific effects. A preceding validation exercise consists of comparing the performance of three models with DUI variables based on i.) the empirical literature, ii.) a compromised set of Alhusen et al.'s (2021) DUI indicators derived from PCA, and iii.) a selection of the indicators using lasso.

Our analyses show that the set of indicators introduced by Alhusen et al. (2021) can be sensibly condensed to reflect different components of the DUI mode. Further, preliminary results from the probit regressions show that while the STI innovation mode remains important for all types of SME innovation in lagging regions, the same holds for the innovation driver related to gaining internal knowledge via training or internal exchange. Moreover, external networking has a positive impact on the probability of being a product innovator, whereas cooperation and contact with customers increase the probability of process innovation. This suggests that measures of innovation drivers in lagging regions should go beyond the external interaction component of DUI that has been used predominantly in the empirical literature.

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The role of clusters in addressing societal challenges in European regions

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Clusters can play an important role in helping regions to address transformative innovation policies in Europe focusing mainly on (i) sustainability (ii) smart specialisation, promoting diversified specialisation and (ii) reshoring/regionalisation of value chains to secure economic sustainability and resilience. Clusters can be considered key change agents in aligning cluster policies with transformative policies and repositioning their role in the innovation policy landscape.

A place-based approach to the sustainability orientation of fashion firms: exploring the industrial district effect

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Sustainability issues are increasingly influencing business models and entrepreneurial decisions, and scholars from different disciplines are progressively focusing on the role of place and space as essential components of firm strategies. Industrial districts, as archetypal locally embedded socio-economic systems, are a fundamental unit of analysis in place-based approaches. Yet, we know little about how being located in specific places relates to firms' orientation towards sustainability.

Do firms located in industrial districts show a higher sustainability orientation?

This is an important question to be answered because industrial districts, as socio-economic systems strongly embedded in places where they operate (with evident associations with the local community and the cluster of firms) as well as entities highly involved in international networks of production and consumption and relevant parts of (fashion) global value chains, are strongly interrelated with both global and local sustainability. Despite this, the literature on industrial districts mainly investigated economic sustainability, while the social and environmental components of sustainability, only recently emerged in this stream of research (Sedita and Blasi, 2021).

An industrial district is inherently linked with social and environmental aspects by its very nature. In fact, it was originally defined as “as a socio-territorial entity which is characterized by the active presence of both a community of people and a population of firms in one naturally and historically bounded area. In the district, unlike in other environments, such as manufacturing towns, community and firms tend to merge.” (Becattini, 1990, p. 38). Such systems are places of life and work with dense and frequent

overlapping of activities, behaviors, and habits of local families with those of companies located in the same place (Becattini, 2004). Thus, in well-functioning industrial districts, also a “conscience of place” (Becattini, 2015) diffuses and it is likely to carry and stimulate local care to social and environmental sustainability (Bellandi et al., 2021).

Coming back on the firm side, they are certainly inclined to communicate activities they do well, and this is true also for firms operating within industrial districts with the addition that in the latter case, firms are likely to reach high- quality levels in their products and benefit from differentiation strategies precisely because they work within such a socio-economic system (Dei Ottati, 2018). If in the past productive know-how was communicated as their flagship, now relevant know-how can be interpreted in terms of sustainability, to such an extent that communicating sustainability is a new competitive advantage. Sustainability has become an intrinsic value of the product, often reported to attract the demand, being it a final consumer or companies in the next phase of a value chain (Blasi et al., 2020).

This dynamic is enhanced by knowledge diffusion and learning process by imitation and interaction typical of industrial districts, and it can be reinforced by the presence of material and immaterial specific public goods (Bellandi, 2006). When dealing with social and environmental sustainability in industrial districts much depends on the industry dominating the system. In this paper we focus on fashion firms since mechanisms stated above can become stronger when they involve fashion companies precisely because of the close relations between the fashion industry and general, social, and environmental sustainability. For example, knowledge about sustainability themes can be easily and efficiently shared within industrial districts, and specific public goods can be specific to sustainability. Thus, we propose the following hypothesis:

Hp1: Fashion companies operating in industrial districts show a stronger broad orientation towards sustainability than those operating outside industrial districts.

Grounding on the literature about sustainability, which usually disentangles environmental and social aspects, we also aim at testing the following two more specific hypotheses.

Hp2: Fashion companies operating in industrial districts show a stronger orientation towards environmental sustainability than those operating outside industrial districts.

Hp3: Fashion companies operating in industrial districts show a stronger orientation towards social sustainability than those operating outside industrial districts.

Looking at both the environmental and social side of sustainability is important here as highlighted by both theoretical contributions about sustainability and districts and clusters (Porter and Kramer, 2009) and specifically on SME's systems operating in the fashion industry (Battaglia et al., 2014).

This work aims at testing these hypotheses by means of an original and novel database with information about around 1300 Italian fashion firms. Their sustainability orientation is measured using QIBA (Quantitas Intelligent Business Analyzer), an original Natural Language Processing-based data mining technique, which allows scraping firms' websites and analyze their content adopting a Term Frequency–Inverse Document Frequency weighting scheme.

For the analysis we implement a Propensity Score Matching (PSM) method . It is a popular methodology to estimate treatment effects (Caliendo and Kopeining, 2008). It allows to make comparisons of all-conditions-but-one being equal in a semi-parametric way (Abadie and Imbens, 2006). This methodology creates groups of objects of interests (in our case fashion firms) which are very similar regarding a set of relevant characteristics, except for the characteristics of primary interest – the treatment effect (in our case the fact that they are located within or outside industrial districts). Then the two groups are contrasted for the estimate of treatments effects and the resulting difference can be positive (fashion firms withing industrial districts are more likely to commit to sustainability) or negative (they are less likely to commit to sustainability).

The estimation of the district-treatment effect through a propensity score matching methodology suggests the existence of a positive association between general, social and environmental sustainability orientation of fashion firms and their localization in industrial districts, thus all our hypotheses are confirmed. Moreover, after standardizing

variables on sustainability, findings show a higher value of the coefficient in the case of environmental sustainability, followed by the general and social sustainability coefficients.

Fashion firms operating within industrial districts seem to benefit from a plus in terms of sustainability orientation. In addition to their internal capability to meet sustainability challenges, they also enjoy a territorial advantage that led them to higher sustainability orientation. However, it is not all just about being in the right place, because a valuable and effective sustainability orientation requests a proactive approach. In fact, on the one hand, cooperation typical of industrial districts is likely to be associated with the spread of sustainability-based knowledge; on the other hand, competition among the same set of companies is likely to push them to invest more in sustainability commitment as another, more and more relevant, competitive advantage.

This work contributes to different streams of research. First, it originally investigates and detects a sustainability driven district effect for firms operating within such socio-economic systems in comparison to those located outside them; thus, advancing our knowledge on increasingly relevant aspects in industrial districts' studies as their associations with social and environmental sustainability. Second, looking more closely at the firm side, it suggests that sustainability can be interpreted as a new competitive advantage to be communicated to relevant stakeholders. Third, it offers a new measure of firms' orientation towards sustainability basing on QIBA, an original Natural Language Processing-based data mining technique, which allows scraping firms' websites and analysing their content adopting a Term Frequency–Inverse Document Frequency weighting scheme. This is important because it goes beyond the traditional limits and absence of reliable information about sustainability commitments of firms especially when not collected from secondary sources.

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Exploring the Nature of European Renewable Energy Clusters

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The global environment is currently confronting a plethora of challenges that pose a significant threat to the well-being and health of both the planet and its inhabitants. These challenges include climate change, air and water pollution, deforestation, and the overexploitation of natural resources, among others. In conjunction with current exogenous events, such as wars or political conflicts, these situations have the potential to stimulate a sustainable transition by prompting countries to adopt sustainable practices that also minimize their dependence on other countries for energy resources and promote the development of domestic renewable energy industries. The interconnectedness of these challenges is such that they have far-reaching impacts on the ecosystems, economies, and societies worldwide. Addressing them requires a collective effort from individuals, organizations, and governments to promote policies that prioritize sustainable practices. Energy clusters have been touted as a means of accelerating this transition by promoting collaboration among energy stakeholders.

In light of the current imperative for the energy sector to reduce its dependence on unsustainable sources, this paper undertakes an analysis of the evolution of European Renewable Energy Clusters by exploring the nature of some exemplary clusters. To this end, the paper employs a novel patent-based methodology to identify regional technological clusters in Europe involved in the production of renewable energies, based on the local agglomeration of innovative entities and their technological intensity and specialization. The level of internal and external collaborations of each cluster is also estimated. This approach aims to evaluate the ability of a cluster to confront global

challenges by expanding their global connections and avoiding technological lock-in, thus maintaining competitiveness.

Our analysis explores the nature of these clusters, which despite their apparent insularity and reluctance to collaborate in terms of patents, have managed to establish themselves as pioneers in the field of energy production. Nevertheless, in a rapidly evolving global market, it is crucial for these clusters to maintain their competitiveness by fostering external collaborations, expanding their global connections, and sharing technological knowledge. While they may have achieved success thus far, to continue to thrive, renewable energy clusters in Europe must remain open to collaboration and constantly adapt to new developments in the industry. This paper seeks to explore the underlying reasons for the apparent insularity of these clusters and propose strategies to enhance collaboration and competitiveness in the global market.

Keywords: renewable energy, global clusters, cluster collaboration

Unlocking the Potential of Entrepreneurial Discovery in the Smart Specialization Strategy: An Exploration based on patent data at the Regional Level

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The smart specialization strategy has been a cornerstone in the European framework program 2014- 2022. This strategy has been grounded on five pillars (Balland et al., 2019; Boschma, 2017; McCann & Ortega-Argilés, 2016). First, history and geography are critical sources of growth. That is, economic growth can be only built upon historically and geographically grounded regional specializations and competencies. Second, innovation and regional diversification in new areas of development are seen as the main drivers of regional development and growth (Balland et al., 2019; Antonietti and Montresor, 2021). Third, inter-regional collaboration is a crucial facilitator for the development of innovative competencies across regions (De Noni et al., 2017). Fourth, a bottom- up approach based on the process of entrepreneurial discovery to elicit stakeholders' knowledge in defining smart specialization priorities (Radošević et al., 2018). Fifth, unifying within a unique framework of innovation and cohesion policy (McCann & Ortega-Argilés, 2016).

Despite the great effort made by the EU Commission in leading the project and achieving the objectives set, the operationalization of this strategy at the regional level has been already largely criticized (Capello & Kroll, 2016; Marrocu et al., 2023; Balland et al., 2019). More specifically, most of this criticism focused on the bottom-up process of identifying regional targets (smart specialization priorities) through entrepreneurial discovery (Marrocu et al., 2023;). The lack of operational guidelines leading the governance and management of this process leaves too many degrees of freedom to local stakeholders and policymakers with the consequences of strengthening rather than

weakening the risk of regional lock-ins (Marrocu et al., 2023). This risk is even higher in peripheral and lagging-behind regions where the strength of the regional innovation systems, the quality of the governance, the availability of competencies in knowledge-based sectors, and the level of integration between local markets and global value chains are still lacking (Boschma, 2014; Iacobucci & Guzzini, 2016; Capello & Kroll, 2016; Hassink & Gong, 2019).

As lately suggested by Marrocu et al. (2023), this debate about the operationalization of the smart specialization strategy, although very lively, has remained mostly speculative, with limited evidence-based analysis. Only recently a few studies attempted to assess the coherence of the actual policy action with the principles of the smart specialization strategy as originally conceived by the EU commission (D'Adda et al., 2020; Gianelle et al.; 2020; Trippi et al., 2020; Di Cataldo et al.; 2022, Deegan et al., 2021; Biagi et al., 2021). However, these studies concentrate on disparate sets of regions, employing distinct methodologies and datasets to evaluate the consistency of outcomes stemming from the regional process of entrepreneurial discovery. Two exceptions can be noted in terms of sample size and data type: Marrocu et al. (2023) and Gianelle et al. (2020) who conducted their assessments based on patent data at the Italian and EU levels.

Even though the results of those studies provide very significant insights on how to improve the operational efficiency of the smart specialization strategy, we believe that a more in-depth understanding of how the process of entrepreneurial discovery can be supported in a specific regional setting is also required. This is because it can provide us with additional information on the kind of difficulties policymakers and stakeholders may encounter in trying to apply methodologies and theoretical constructs developed at the scientific level and often informing policy design at the EU level. For this purpose, in this paper, we provide the tools to design of a smart specialization strategy based on patent data for the Veneto region. In so doing, we assess to what extent patent data can better support policymakers and stakeholders in the design of the regional smart specialization strategy. Thus, we define the relative technological advantages of the regions, the smart specialization priorities based on technological relatedness, and the interregional collaboration strategies based on technological complementarities/similarities. We

contrast our results with those in the smart specialization strategy of the Veneto region. Furthermore, it provides us with the opportunity to review the result of the smart specialization strategy in the Veneto region. We use patent data because is a data source typically used in regional studies to assess the technological specialization and relatedness of regions. Furthermore, the same data are used to assess the degree of interregional collaboration. However, those data are used at the macro-level, as a synthetic indicator for the technological specialization and relatedness of the regional technological base of knowledge. Differently, in this paper, we operationalize those concepts in a specific regional setting to define the specific rank of smart specialization priorities and interregional collaborations. Our emphasis on the Veneto region stems from the fact that several of us possess firsthand knowledge of the area, having conducted numerous studies and established connections with local firms. As a result, we offer a unique perspective on this region, enabling us to provide tailored instruments for designing a smart specialization strategy based on patent data specific to the Veneto context. This allows us to account for the complex interplay between tacit and codified knowledge required to embed those concepts in a specific regional setting. The structure of the paper is the following. In the next section, we review the literature on smart specialization strategy operationalization to define the main limitations and criticisms. Section 3 defines the methodology we implement to design the smart specialization strategy based on patent data. In section 4, we first introduce the case study providing a historical account of the economic and technological development of Veneto. Then, we complement the outcomes of our analysis based on patent data with the results contained in the smart specialization strategy of Veneto. Finally, section 5 summarizes the main results and implications and defines possible future research directions.

Life cycle effects in new technologies – in which locations do German bioeconomy patents appear?

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The literature provides clear evidence that the kind, amount, and location of innovation activity changes during the life cycle of industries. However, the relevant literature focuses on large, long-existing industries such as the automobile industry. It is unclear whether smaller technological fields show similar influences of life cycle processes on the location of innovation activity. Hence, we analyze the life cycle stages of various fields in the bioeconomy and the location of the respective innovation activity in Germany. Within the three fields of biomass, biotechnology, and biomaterials, subfields were built through a keyword-driven approach. We conducted a logit regression model using the following explanatory variables: population density, the area of forestry and agriculture, German Federal subsidy data, topic-specific patents, and publications, as well as the overall patent and publication activity.

The first energy self-sufficient town (Feldheim) in Germany is located not far from Berlin in the state Brandenburg. The idea came up as early as 2010 but of course it needed some time and many dedicated people. The citizens reached their aim of a totally green energy self-sufficient town in 2020. The advantages are apparent, but why did the first German energy self-sufficiency evolve exactly there and not somewhere else? Since many green energy sources have been invented/discovered long ago, the political will and the citizens' engagement might be of greater importance for such a project than innovations. Nevertheless, a high density of inventions related to the topics biomass and green energy can be found in the surrounding region.

Endeavors in this direction can be subsumed under the term bioeconomy, which biomass is one part of. Another part, besides biotechnology, is biomaterials, meaning for example

the production of rubber from dandelions, which is currently examined by the German tire company Continental in the small city of Anklam. These two examples show that technological developments in the bioeconomy occur often in places outside of innovation hotspots, following their own spatial structure. Therefore, it is interesting to study this spatial structure and its correspondence to the existing theories on technological life cycles and regional innovation systems.

Bioeconomy is a concept which has rapidly gained attention over the last two decades and is despite or even because of this not easy to define. Since the turn of the millennium, politics, society, and science have progressively faced the depletable of resources while simultaneously searching for solutions (Juma and Konde, 2002; Wynberg et al., 2023, Prochaska and Schiller 2021). Developing a (sustainable) bioeconomy is one of the strategies to meet the growing need for resources, to ensure food security, protect the climate, environment, biodiversity and, especially, to use the fossil-based resources more consciously. The bioeconomy aims to reduce or, at best, substitute as many of the fossil-based part(s) of the economy as possible with biobased, new, or re-used materials. This makes the bioeconomy essential for the future social and economic development as some resources are unlasting (Bauer et al., 2018).

The bioeconomy is a fitting research object for our endeavor because it contains many technological developments that are clearly differentiated from the praxis before and, nevertheless, they do not constitute a new industry. Research on the laser industry has shown that new technological developments within industries causes industry life cycle developments to be more complex (Buenstorf 2007). Furthermore, Dalum et al. (2005) show that new technology life cycles might endanger the economic development in existing clusters and industry hot-spots. The bioeconomy provides such disruptive technological developments to many industries. Hence, we will study the location of innovation activities in various fields of the bioeconomy and the applicability of the life cycle concept.

The paper at hand takes a start to locate places, where innovation in bioeconomy topics is taking place. While an extensive literature on the location of innovation processes in

general, theoretical as well as empirical, exists, the location determinants for innovation activity in the bioeconomy have not gained sufficient attention. The specific characteristics of the bioeconomy, outlined above, make it scientifically interesting to study the different determinants in the context of the respective technological life cycles. Patent data is one established way to study innovation activity and its location. Since we are interested in the development of new technologies, we do not study the entire bioeconomy but focus on various subfields as elaborated below. The main aim of our study is to identify the determinants of the location of innovation activities in various subfields of the bioeconomy, their dynamics over time and how this relates to the concept of technological life cycles.

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Comparing innovation in the Marshallian industrial districts of Spain and Italy: a causal approach

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The fundamental aim of the industrial district is the welfare of the local community, for which its priority instrument is not the generation of goods but the production of innovations. From this point of view, the industrial district can be conceptualized as a social system of knowledge production, highly coordinated and linked to a local community. The intense and continuous generation of innovations in the origin of the so-called iMID or innovation-district effect (Boix & Galletto, 2009). The iMID effect defines the fact that Marshallian industrial districts (MIDs) exhibit higher innovative intensity than the rest of the national economy where they are placed (Boix & Galletto, 2009; Boix-Domenech et al., 2019). Strong evidence of the iMID effect has been found for the Spanish and Italian economies. The most recent works using time series place the (unconditional) innovative differential of the MIDs with respect to the country average between 24% and 42% for Spain and between 36% and 48% for Italy (Boix-Domenech et al., 2019, 2022).

In this paper we contribute to the extant literature on the industrial districts and the iMID effect by providing a causal measurement of the iMID effect simultaneously in Spain and Italy. The causal mechanisms are introduced through a Directed Acyclic Graph (Pearl & Mackenzie, 2018) that allows to control what part of the greater innovative intensity of the MIDs is due to the nature of the industrial district itself and what part is due to other factors. DAGs make it easy to introduce the effects of variables such as economic policy, physical and human capital, or inertia in innovation, among others. The paper measures the iMID effect in the MIDs of Spain and Italy during the period 2001-

2015 using patents as indicators of technological innovation, and compares the differences between the MIDs and other types of LPSs. The iMID effect estimates use Machine Learning methods, which provide greater flexibility and accuracy than traditional estimation methods.

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When local goes global. Modes of innovation and diffusion in the micro and meso level of wine clusters

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In this research, we study the exchange of information and open innovation practices towards sustainability, between companies (micro level) and their environment (meso level), through comparative case studies. The scope of the research is the wine business and its geographical institutions, wine DO, and the subject are innovative Spanish wineries active in global markets. We propose that exposure to a global and dynamic macro environment implies a change in the local flows of information at the meso level, and the dissemination of innovative practices at the micro level. Evidence shows that leading companies develop cooperation mechanisms, generating supra-regional networks. These networks can increase asymmetry in the industry by hindering imitation and diffusion at the micro-meso level. On the other hand, they facilitate both the exploration and exploitation of sustainable innovation and practices, by bringing together partners with similar resources and capabilities. The corollary of the proposition is the loss of value and influence of traditional meso-level institutions, and their necessary transformation towards the achievement of global goals, such as sustainable vineyards and wines.

Key Words: Open Innovation, Territory, Clusters, Wine DO

Rethinking the role of corporate governance as a channel for innovation with an impact on the community

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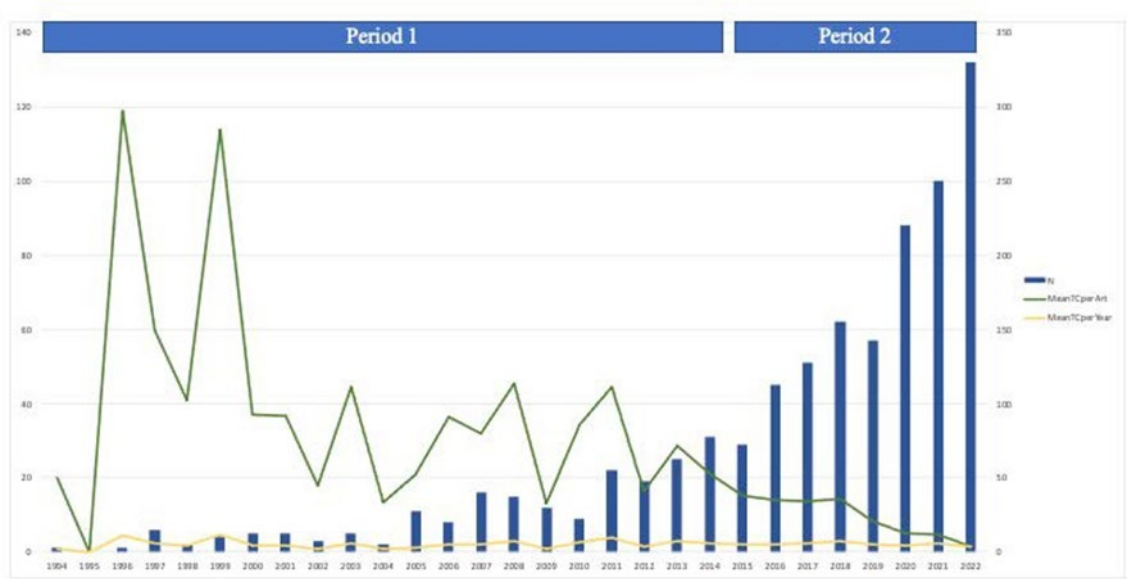
Ángeles Montoro-Sánchez (Complutense University of Madrid)

Innovation is a significant factor for business sustainability and results in immediate impact in society in general and in industrial districts and their incumbent local community. Corporate governance of firms steers policies addressing all the challenges innovation implies and faces a responsible role to be fostered by policy-makers and accounted for before the society. Based on qualitative and quantitative bibliometric analyses, we identify the main themes that cover this joint construct in order to review the extant relevant research literature about innovation and corporate governance, and to propose a reshaped role of corporate governance mechanisms from the previously defined relationship landscape.

To select the relevant research literature, we performed several step in the realm of bibliometric methods (Diodato, Virgil P.; Gellatly, 1994; Eck & Rousseau, 2014; van Oorschot et al., 2018; Zupic & Cater, 2015), which provides an objective starting point for selection (Alegre et al., 2023; Thomas & Tee, 2022; Wagenschwanz, 2021). In the first stage, we retrieved information on articles based on keywords. Then we applied filters by category and reviewed each one of the documents to secure they belonged to the topic. In the second stage, the resultant sample was subject to several bibliometric techniques. We computed and depicted the evolution of publications to identify potential periods, which is essential to analyze the evolution of topics. In this case we identified two periods: 1994-2015 and 2016-2022 (Figure 1). To identify the most important works we computed total citations and h-index for authors, and reinforce the outcome by using the same measures for journals. Thus, we selected the top ranked works according to those classifications for the next stage. To identify the main topics

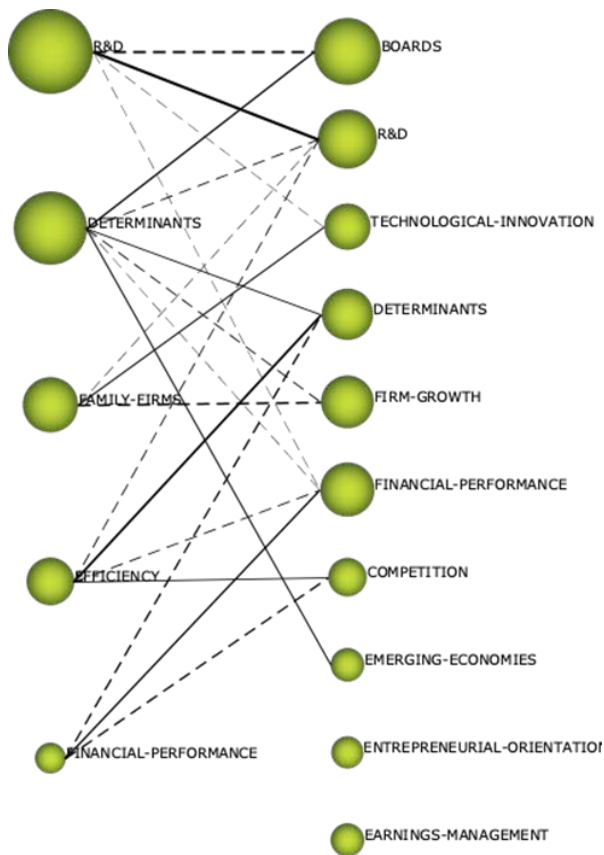
that were related to innovation and corporate governance, we perform clusterization of keywords which resulted in the identification to the relevant themes (in terms of the density and centrality of the strategic diagrams, and associated clusters’s network), their evolution, and their mapping (Figures 2 and 3) (Cobo et al., 2012). To understand the intellectual framework, we computed co-citation of references and map them, which led us to find the main underlying theories and topics related to them. In the third stage of the methodology, each author coded an initial sub-sample in order to align concepts considering the results obtained in the previous step. Then coding was applied to the relevant by each author and discussed afterwards.

Figure 1: Evolution of literature on innovation and corporate governance and period identification



Source: Own elaboration

Figure 2: Evolution of areas and stability between period

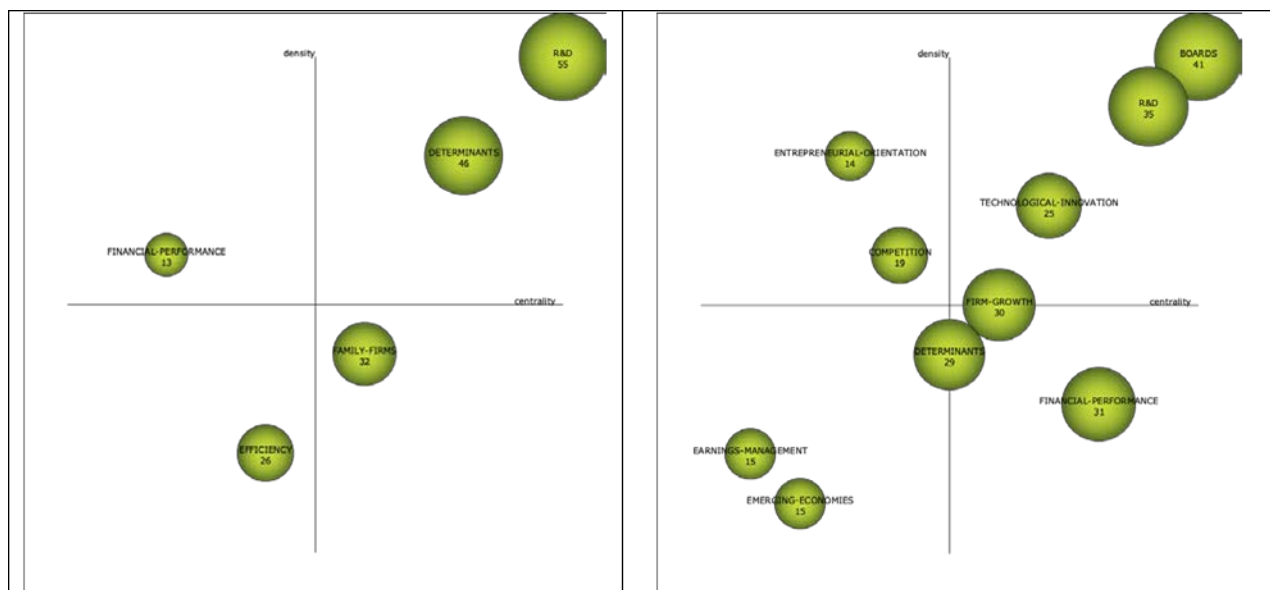


Source: Own elaboration with SCImat

Figure 3: Strategic diagram by period

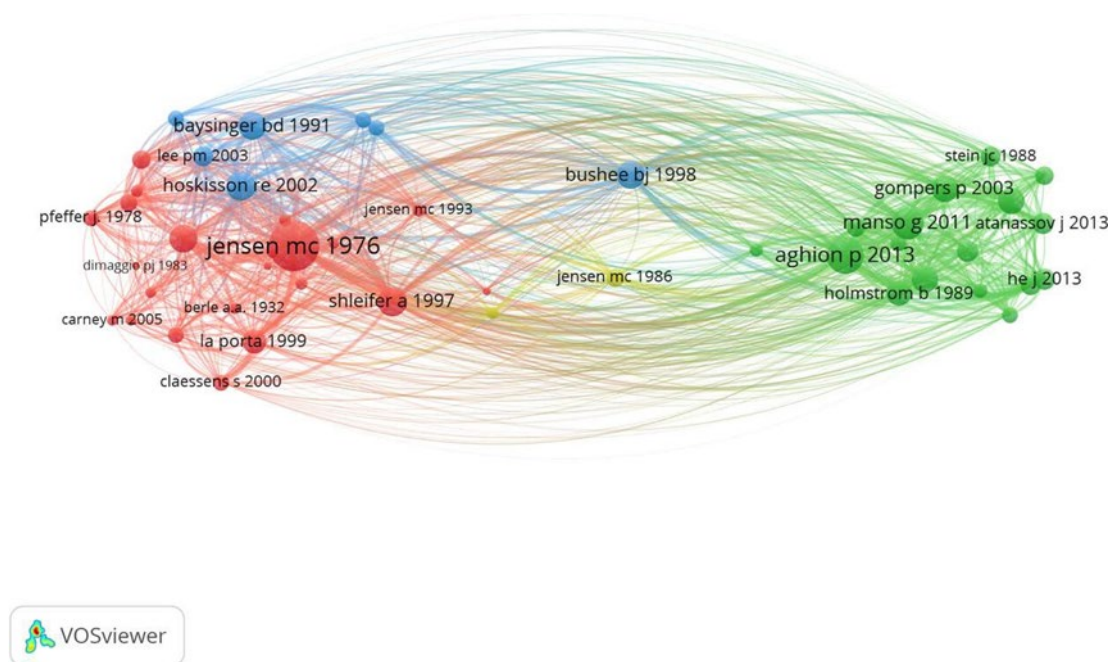
(a) 1994-2015

(b) 2016-2022



Source: Own elaboration with SCImat

Figure 4: Co-citation map of references: intellectual framework on innovation and corporate governance



Source: Own elaboration with R-biblioshiny and VOSviewer. Top co-cited references are shown. Proximity and color of the nodes represent clusters configuring intellectual framework.

Traditionally, innovation has confronted situations where it is seen as a factor that may need additional efforts in the monitoring role of the board of directors and is subject to potential misalignment of incentives across the ownership structure and the management of the company. Hence, the consideration of the size of the firm, the type of ownership (state-owned, family firm, institutional investors, foreign, managerial, individuals) drives significant part of the literature which highlights agency-originated issues, costs, and incentives and solutions proposed to overcome them.

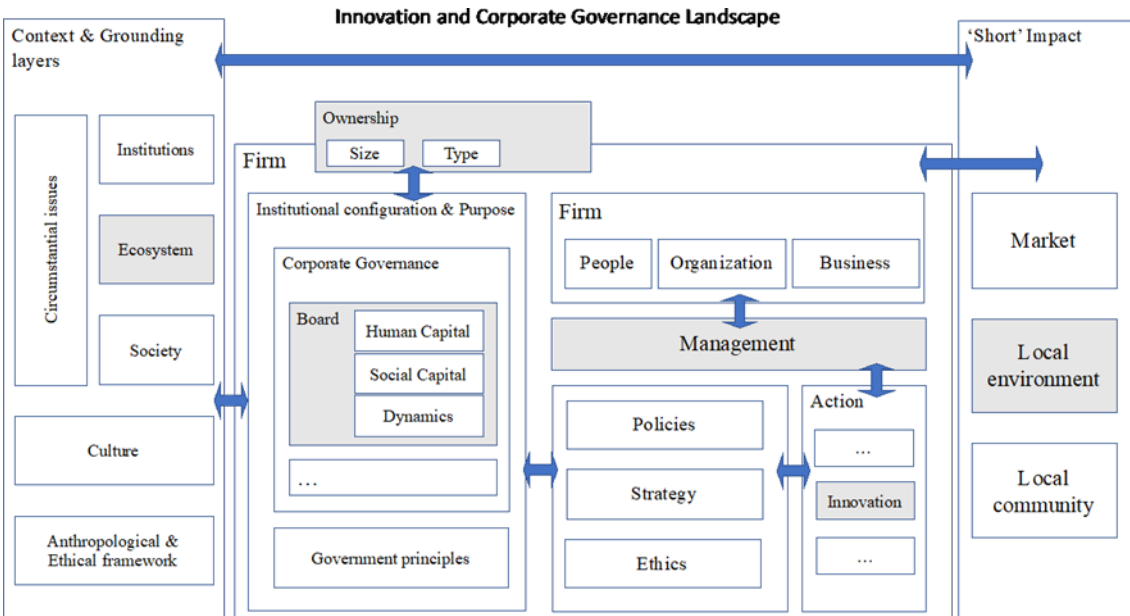
In fact, in the first period we identified, determinants are mainly linked to the way boards as corporate governance mechanisms relate to the ownership structure (Baysinger et al., 1991), FDI, and risks. Also, emerging economies are mentioned, often to label special economic contexts. The second period, however, introduces more themes delving into the board composition (diversity, independence), shows central role of determinants (linking capital structure, CSR, green innovation, and disclosure), adds absorptive capacity in relation with technological innovation human capital and family firms, and keeps the theoretical focus on the agency theory. When considering the impact, financial performance stays as a basic theme.

Consequently, we review the main themes. They refer to the institutional environment (Cumming et al., 2021), industry (Cumming & Leung, 2021), regulation (La Porta et al., 1998; La Porta, Lopez-de-Silanes, et al., 1999; La Porta, Lopez-De-Silanes, et al., 1999), and ecosystem (Cumming et al., 2019); international contexts (Sun et al., 2021; Wright et al., 2021); the ownership structure (Hoskisson et al., 2002) and its link to family firms (Berrone et al., 2012; Chrisman & Patel, 2012; Gomez-Mejia et al., 2014; Scholes et al., 2021), institutional investors (Aghion et al., 2013); the importance of corporate social performance (Johnson & Greening, 1999); or the firm's strategy surrounding technology (Tihanyi et al., 2003, 2009). Then, we move to the governance mechanisms and, specifically, to the board in different perspectives (Zona, 2014; Zona et al., 2013; Zona & Zamarian, 2022), considering the impact of its composition (Arzubiaga et al., 2018; Hernández-Lara & Gonzales-Bustos, 2019, 2020; Torchia et al., 2011).

As regards the intellectual framework, we revisit the main theories in this arena, paying special attention to the Agency perspective (Claessens et al., 2000; Demsetz & Lehn, 1985; Eisenhardt, 1989; Fama & Jensen, 1983; Filatotchev & Wright, 2011), the agency costs (Francis & Smith, 1995; Holmström, 1989; Jensen, 1986) and the ownership structure (Jensen & Meckling, 1976), framing the involvement of institutional investors (Chaganti & Damanpour, 1991). Also, we consider how other theories fit in this overall intellectual framework. That is the case for RDT (Hillman & Dalziel, 2003; Pfeffer & Salancik, 1978), absorptive capacity (Cohen & Levinthal, 1990), or institutionalism (DiMaggio & Powell, 1983).

Once the main themes and theories have been reviewed, we draw a framework (Figure 5) which gives the board of directors a central place, integrates different theories to cover ‘traditional roles’, and moves towards considering that impact in society starts by impacting community who is side by side with the firms and their clusterized configuration.

Figure 5: Innovation and corporate governance landscape



Source: Own elaboration.

We think that the theoretical framework should integrate elements from extant contributions and cover 'empty' areas. Thus, agency issues are to be considered aligned with the perspective of seeking the suitable combination of resources and capabilities that best fits firm's strategy. At the same time, the institutional context plays a key role in defining rules, adopting issues.

There are many topics that need to be covered or analyzed more in depth. Therefore, in our study, we make propositions related to the interaction of the 'Short impact' and the grounding layers, the different 'short impacts', other corporate governance mechanisms, the framing role of ethics in context, purpose, and within-firm execution lined to innovation.

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How do industrial district companies cope with sustainability? A focus on strategies and business relationships

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This paper investigates the sustainability-driven strategies of companies in industrial districts and delves into the resulting dynamics of business relationships.

Industrial districts play a crucial role in the global economy, serving as hubs for manufacturing activities and innovation in many sectors. However, their operations, especially in the case of traditional industries such as textile and leather, often have significant environmental impacts (Bellandi et al., 2021), such as resource depletion, pollution, and greenhouse gas emissions. For these reasons, there has been a growing recognition of the need to incorporate sustainability principles into industrial district practices. Sustainable industrial districts aim to minimize their ecological footprint while maintaining economic growth and social well-being. These goals can be achieved in many ways, such as resource efficiency, the development of sustainable infrastructure, waste management, and community engagement. Resource efficiency regards the optimization of the use of energy, water, and raw materials through various measures such as implementing cleaner production techniques, adopting circular economy practices, and promoting the use of renewable energy sources. Developing sustainable infrastructure involves designing and constructing buildings, factories, and transportation systems that are energy-efficient, environmentally friendly, and resilient to climate change. Effective waste management concerns the implementation of recycling programs, promoting waste reduction and reuse, and establishing proper disposal methods that can help minimize the amount of waste generated (Bressanelli et al., 2022). Additionally, encouraging the adoption of eco-design principles among

businesses operating within industrial districts can lead to the creation of products that are easier to recycle or have a reduced environmental impact throughout their life cycle. While all these activities regard the environmental aspects of sustainability, social and economic aspects are relevant as well. Thus, community engagement is an integral part of sustainable industrial district development. Industrial districts should consider the social and economic well-being of the surrounding communities by providing employment opportunities, supporting local businesses, and ensuring a safe and healthy living environment (Cappellaro et al. 2020).

Reaching sustainability goals in industrial districts involves many actors with different roles. Governments, for example, can play a crucial role through the implementation of supportive regulatory frameworks and incentives.

The leading role is played by companies that can set sustainability-led strategies. However, these can increasingly rarely develop within a single company, but acquire relevance if developed by leveraging the main business relationships and in relation with other district actors (Guercini and Woodside, 2012). Collaboration and knowledge sharing among actors within industrial districts are vital for developing and promoting sustainability (Barakat et al., 2023). Companies, government entities, research institutions, and community organizations can work together to develop and implement sustainability strategies, share best practices, and conduct research on sustainable technologies and processes. Such networks can foster innovation and create a supportive environment for sustainability initiatives (Harrison et al., 2023).

The sustainability of industrial districts is not a new topic (Da Ronch et al., 2013), with reference, for example, to sustainability certifications for products and processes, traceability, waste management, and circularity. What in recent years appears different from the past is the growing attention and pressure from end consumers towards virtuous behaviour on the part of companies (Hanss and Böhm, 2012; Nguyen and Johnson, 2020), with sustainability that more and more permeates the company not only at a technical, product and process level but also at the level of marketing and governance.

This evolution raises the question of how companies are facing these processes of change in terms of sustainability-driven strategies and how these strategies involve business relationships in industrial districts.

To answer this question, this paper – exploratory in nature – adopts the case study method to investigate the development of sustainability-driven strategies of industrial district companies. The paper proposes two cases of companies in two Italian fashion districts. Fashion has been selected as the empirical context of the study because the sustainability of the fashion industry has become an increasingly urgent concern in recent years.

Traditionally, the fashion industry has been associated with practices that are harmful to the environment, such as excessive resource consumption, pollution, and unethical labour conditions. However, there is a growing recognition of the need for change and a shift towards more sustainable practices (Akrouit and Guercini, 2022). One key aspect of sustainability in the fashion industry is the adoption of eco-friendly materials and production processes. Another crucial element is promoting ethical and fair labour practices throughout the supply chain. This includes ensuring safe working conditions, fair wages, and the elimination of exploitative practices. Transparency and traceability are also vital, allowing consumers to make informed choices about the products they purchase and supporting brands that prioritize social responsibility. Additionally, the fashion industry is embracing circular economy principles, which aim to minimize waste and maximize resource efficiency. This involves designing products for durability, repairability, and recyclability. Consumers play a significant role in driving sustainability in the fashion industry. As awareness grows, consumers are increasingly demanding transparency and sustainability from brands (Granskog et al. 2017). This shift in consumer preferences is encouraging companies along the fashion pipeline to adopt sustainable practices to remain competitive in the market. Thus, many fashion companies are implementing sustainability-driven strategies that often involve business relationships between buyers, suppliers and other actors, and are based on more or less formalized networks. Collaboration and innovation are essential for achieving

sustainability in the fashion industry. Actors across the supply chain need to work together to drive systemic change.

In the first case, Alpha is a fabric manufacturing company, a leader in a textile district in central Italy, and develops a sustainability-driven strategy through shared protocols with buyers and suppliers linked to the development of vertical systems for sustainability, formalized networking and a focus on branding. In the second case, Beta is a wool mill in an industrial district in the north and develops sustainability-driven strategies based on vertical integration and mergers and acquisitions. The cases allow us to understand different approaches to sustainability, different strategic trajectories, and the role of business relationships in shaping sustainability-driven strategies. The paper concludes with theoretical and managerial implications for industrial district companies engaged in sustainability initiatives.

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It takes two to tango: an analysis of the effects of Entrepreneurial Ecosystems on Italian clusters

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Clusters and Entrepreneurial Ecosystems (EE) are closely related concepts broadly used to explain entrepreneurship's spatial dynamics. However, there is a lack of empirical studies that examine the relationship between these two phenomena using a systemic approach. In this paper, we propose an econometric model that measures the effects of EE elements on cluster performance in Italy from 2011 to 2019. We operationalize EE elements, and we use data on clusters from the Italian cluster mapping project. Our results show that clusters can benefit from the agglomeration of related activities and well-performing EE, but the impact of EE elements varies depending on the type and status of clusters. We contribute to the literature by providing quantitative evidence of the differences and complementarities between clusters and EE and by highlighting the policy implications for initiatives to improve EE elements and enhance cluster performance.

Testing cluster life cycle approaches on the evolution of the Trafalgar Garment District of Barcelona. From canonical to adaptive models

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With the rise of the evolutionary perspective in geography, there is a growing interest in cluster evolution, the conditioning factors that shape each stage of its trajectory and the mechanisms that enhance competitiveness (Belussi, 2018; Boschma & Fornahl, 2011; Fornahl et al., 2015; Martin & Sunley, 2011). The cluster life cycle model (Bergman, 2008; Menzel & Fornahl, 2009) – henceforth CLC - pretends to explain the endogenous evolutionary mechanisms that condition its "aging process". In this way, the CLC contributes to shedding light on why some clusters adapt themselves better than others. However, clusters are open systems, subject to exchanges of inputs of different natures and competence for surviving to other clusters (Bathelt et al., 2004). Therefore, several authors point out the rigidity of the CLC approach for analyzing the renewal, adjustment or decline of clusters outlining the lack of adaptation stages that break the CLC canonical bell model (Martin & Sunley, 2011), and the role of multi-scalar external shocks as explanatory factors of cluster dynamism (Trippel et al., 2015). In this way, Boschma and Fornahl (2011) outline the need to combine the CLC and the adaptive life cycle models (Martin and Sunley, 2011) to deepen on alternative cluster trajectories that explain more accurately the response of clusters and, particularly, of firms to different shocks.

The conference focuses on the trajectory of the Trafalgar Garment District (TGD) in Barcelona from 1887 to 2016. The TGD take-off began at the beginning of the 20th century, with textile headquarters and garment wholesalers progressively locating together within the district. Simultaneously, clothing manufacturing and trade firms (CMT) were concentrated to a lesser extent. Since the mid-1950s, a gradual disappearance of headquarters and the prominent presence of clothing and home-linen

wholesalers transformed the district into a leading national garment wholesaling center. Currently, the TGD is marked by the decline of garment specialization, which has been replaced by knowledge-, creative-, and tourism-based activities. By analyzing and discussing the conditioning internal and external factors in each stage of the life cycle, it is possible to conduct a comprehensive examination of the nature of the different phases in the trajectory of the TGD. Thus, the conference presents an assessment of the extent to which the CLC canonical and adaptive theories enable us to understand the district's path. The research question explores the feasibility of the joint application of both theories in explaining the trajectory of clusters.

Through a qualitative methodology combined with a bibliographic and documentary review, the results firstly show the importance of internal and external factors in shaping the trajectory of the district, highlighting the coherence of applying both theories. Secondly, in tracing the phases of evolution, the adaptive theory proves to be more suitable for explaining this process. Starting in the second half of the 20th century, the TGD undergoes a transformation in its productive structure. As a result, it does not transition directly into a maturation phase but rather goes through a mutation phase followed by maturation and stabilization. Finally, the combination of intrinsic industry competition (macro dynamics) and local forces driving the TGD to become a central urban space (micro dynamics) has led to the complete dissolution of the district's specialization.

The utilization of this empirical case not only expands the existing empirical literature on cluster evolution but also highlights the advantages and disadvantages of both theories in understanding this phenomenon.

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From territorial to digital creative-based innovation ecosystems: how Florianópolis evolved from the magic island to the Silicon Island

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Introduction

As technology advances, we witness ecosystems transitioning from territorial-based to digital-based characteristics in some regions. This metamorphosis occurs as visionary entrepreneurs combine creativity and technical expertise to create an interconnected and dynamic digital environment. Once based on physical spaces and in-person interactions, innovative ecosystems thrive in vibrant online communities, where ideas are instantly shared, and collaborations transcend geographical boundaries. This transformation brings numerous opportunities and challenges but also promises a new era of innovation and progress, where technology acts as the fuel driving ecosystem evolution into new digital frontiers. Within this context, our objective is to examine how the territorial-based entrepreneurial-innovation ecosystems undergo transformation over time. Our research approach is grounded in the historical research method (Welch et al., 2022). Historical research conventionally constructs a comprehensive narrative that is both explanatory and chronological, embedded within the historical context (Welch et al., 2022). The city of Florianopolis, situated within the Santa Catarina province of Brazil, has been chosen as a representative case to thoroughly examine the historical transformation process of its entrepreneurial-innovation ecosystem.

Findings and Discussion

Between 1950 and 1980, the paradisiac city of Florianópolis, Brazil, where known as the “Magic Island”. Despite being a regional touristic pole, the city, with over 90% of its territory located on a seashore, had institutional and geographical constraints that prevented the construction of factories, leading to a technology-based entrepreneurial-innovation ecosystem. Besides, as the Santa Catarina state capital, a significant workforce was government employees. In response to such restrictions, resource limitations and strict government regulations fueled the creativity of entrepreneurs, forcing them to find alternative and efficient solutions for industrial production in the industrial regions adjacent to Florianópolis. Although the technologies available then were limited compared to the present, the constraints encouraged the search for efficiency and automation through innovative machinery and mechanical systems. The lack of developed infrastructure in some geographical regions also led to the development of technology solutions adapted to local conditions. Thus, these institutional and geographical constraints, although challenging in terms of infrastructure, provided the necessary impetus for forming a territorial-based innovation ecosystem to meet industrial production needs, contributing to significant advancements in different sectors during that period. In sum, Florianópolis found its role as the nascent technological ecosystem to nurture other industrial regions in Santa Catarina state. (Table 1).

The geographical proximity promotes and facilitates cooperation between regional players (Boschma, 2005) and therefore enhances the regional capacity to innovate (Letaifa & Rabeau, 2013). Through geographical proximity (Boschma, 2005; Letaifa & Rabeau, 2013) territorial-based entrepreneurial-innovation ecosystems play a fundamental role in technology development and attracting skilled workforce from different locations. These ecosystems create an environment conducive to collaboration between companies, academic institutions, and entrepreneurs, facilitating the exchange of knowledge and experiences (Stam & Spigel, 2016)

On a social level, by concentrating diverse talents in a specific territory, these ecosystems stimulate the formation of synergies and strategic partnerships (Stam & Spigel, 2016), promoting innovation (Letaifa & Rabeau, 2013), and the development of emerging

technologies (Appio et al., 2019). Despite the challenge of providing talent to develop a healthy ecosystem (Novani et al., 2022), an attractive and vibrant territorial-based entrepreneurial-innovation ecosystem can attract qualified professionals from different locations. Creating a diverse and skilled group of talents contributes to economic growth (Stam, 2015) and technological advancement (Appio et al., 2019). This cultural and intellectual diversity enriches the work environment, driving creativity, idea exchange, and complex problem-solving (Florida, 2014; Appio et al., 2019). Therefore, territorial-based entrepreneurial-innovation ecosystems are crucial for creating a stimulating environment capable of attracting and retaining the best talents and driving technological transformation locally.

However, the formation of the territorial-based entrepreneurial-innovation ecosystem in Florianópolis emerged not from geographical and institutional restrictions but from their overcoming, fostering a cognitive dimension in developing the territorial innovation ecosystem. Historical elements of the population's formation (Miller & Acts, 2017) and the entrepreneurial vision of local leaders (Ben Letaifa, 2014; Stephens et al., 2019; Foss et al, 2023) played a fundamental role in overcoming these limitations. The European migration influenced the history and culture of Florianópolis. This condition may have shaped a resilient, adaptable, and creative population capable of facing challenges and finding innovative solutions. In addition, local leaders with an entrepreneurial vision (Stam & Spiegel, 2016) and commitment to territorial development created a favorable environment for innovation by establishing partnerships between academic institutions, businesses, and the public sector. This collaboration allowed knowledge exchange, access to resources, and the stimulation of creativity and entrepreneurship. Thus, by valuing history and local resources combined with an entrepreneurial spirit, a cognitive perspective emerges on forming an innovative and dynamic nascent ecosystem on the island.

At the core of the formation of this territorial-based entrepreneurial-innovation ecosystem, three fundamental dimensions converged, infrastructure, social, and cognitive. Well-developed infrastructure, with advanced communication networks, collaborative spaces, and cutting-edge research centers (Stam & Spiegel, 2016), provided

a conducive environment for technology-focused firms to emerge (Stephens et al., 2019). Simultaneously, the social dimension was essential in fostering a culture of collaboration, knowledge sharing, and an entrepreneurial mindset (Stam & Spiegel, 2016). Visionary leadership and an engaged community drove the creation of support networks (Miles, & Morrison, 2020), events, and training programs that attracted talented professionals from diverse backgrounds. This cultural and subsequent gender diversity enriched the ecosystem, stimulating the exchange of perspectives and co-creating innovative solutions (Appio et al., 2019). Lastly, the vibrant nightlife emerged as a reflection of the entrepreneurial spirit and creative atmosphere, offering spaces for gathering and inspiration, where ideas flow freely. Thus, the convergence of these dimensions allowed the formation of a multicultural, inclusive, and vibrant territory driven by a territorial ecosystem that transcended conventional borders, becoming a creative ecosystem.

From 2010 to 2020, the three dimensions - infrastructure, social, and cognitive - were propelled by available technologies, transforming the island into an innovative ecosystem with digital characteristics, represented by enhanced infrastructure with high-speed internet networks, cloud technologies, and advanced digital infrastructure. This robust technological foundation allowed constant and fast connectivity, which is essential for developing innovative digital solutions (Novani et al., 2022). The social dimension benefited from social networks and online platforms, enabling virtual communities to form and facilitate remote collaboration, transcending physical barriers (Appio et al., 2019; Surie, 2017). Knowledge and experience could be shared swiftly and efficiently, enabling the collective growth of the ecosystem (Foss et al., 2023). The cognitive dimension was propelled by artificial intelligence, machine learning, and data analysis advancements, enabling more profound insights and data-driven decision-making. These technologies also facilitated the creation of personalized and scalable solutions, catering to the specific demands of users and clients. Thus, the available technologies between 2010 and 2020 catalyzed the convergence of dimensions, providing a digital environment conducive to innovation, collaboration, and ecosystem

growth, solidifying the island as a digital-based innovation ecosystem, earning Florianópolis the epithet “Silicon Island,” about Silicon Valley.

Table 1. Transformation Process Phases: Florianópolis towards Silicon Island

Phases Dimensions	Until 1980 Territorial-Based entrepreneurial- innovation Ecosystem	Transition 1980 to 2010 Enabling triggers	From 2010 Digital-Based Innovation Ecosystem
Infrastructure	<ul style="list-style-type: none"> • Institutional restrictions • Geographical restrictions 	Technology development of technology-oriented companies	Digital connectedness
Social	<ul style="list-style-type: none"> • Entrepreneurial culture • Work labour deficit 	Talent technology workforce attraction	Attracting specialized, multicultural and geographically dispersed labour
Cognitive	<ul style="list-style-type: none"> • Entrepreneurial migrant heritage • Political leadership 	Tolerance <ul style="list-style-type: none"> • Multiculturalism • Gender diversity • Nightlife 	Connection with the tourist and gastronomic tradition of the city

The wealth of talent in the digital-based innovation ecosystem fostered the formation of a multicultural population with connections to different parts of the world. Through this global network, talented and visionary professionals were drawn to this vibrant community, bringing people diversity, perspectives, and skills (Appio et al., 2019). This interaction among individuals from diverse backgrounds enriched the ecosystem, stimulating collaboration, knowledge exchange, and the emergence of innovative ideas (Stam, 2015). Digital technologies played a crucial role in connecting these talents, enabling instant communication, video conferencing, and real-time information sharing, regardless of geographic distance (Appio et al., 2019). This global connection strengthened the digital-based innovation ecosystem creating a dynamic and

multicultural community where geographic boundaries were overcome, and opportunities for collaboration and growth expanded (Lazzeretti & Oliva 2020).

The presence of this new multicultural and interconnected population from around the world in the digital-based innovation ecosystem has played a crucial role in transforming Florianópolis into an international destination for tourism and gastronomy. The city, known for its natural beauty, stunning beaches, and diverse culture, has become a technological and innovation hub. The presence of talented professionals and entrepreneurs has driven economic growth, generating jobs and business opportunities, fostering the creation of startups, and attracting investments. Evidence of this transformation is the increase in domestic and international visitors drawn to the unique combination of an innovative ecosystem and a charming city. Additionally, the construction of an international airport in the region has expanded connectivity and facilitated access for travelers worldwide, strengthening tourism and promoting the discovery of rich local gastronomy. Thus, the presence of this multicultural population in the entrepreneurial-innovation ecosystem has contributed to transforming Florianópolis into an attractive region that combines technology, entrepreneurship, natural beauty, and a unique gastronomic experience.

The transition from an entrepreneurial-innovation ecosystem based on territorial characteristics to an innovative ecosystem with digital characteristics reflects the role of the so-called “creative class” (Florida, 2014) that enabled it. The convergence of technology, talent, and tolerance played an essential role in this transformation (Lazzeretti et al., 2022). Technology, and significantly advanced digital solutions, have provided a platform for geographically unrestricted innovation, enabling talent and ideas to flow freely. Talent, in turn, has become the core of this ecosystem, attracting creative professionals, entrepreneurs, and visionaries from various fields and backgrounds. Furthermore, finally, tolerance, which refers to openness to different cultures, ideas, and ways of thinking (Florida, 2014), has been crucial in creating a welcoming, diverse, and collaborative environment (Appio et al., 2019).

Fundamentally, the convergence of critical elements that drive a creative class - technology, talent, and tolerance (Florida, 2014) - emerges as the essential triggers for converting territorial-based entrepreneurial-innovation ecosystems into a digital creative ecosystem. According to Novani et al. (2022), a Digital Creative Ecosystem refers to a place with a dynamic environment where stakeholders actively participate in fostering the growth and advancement of the digital creative industry. As technology continues to evolve, providing digital platforms for global collaboration, creative talent becomes the engine of this transformation, bringing forth innovative ideas and driving progress. Tolerance is equally vital, creating an inclusive environment that values diversity and stimulates the exchange of perspectives. By embracing these elements, entrepreneurial- innovation ecosystems can reinvent themselves, creating new possibilities for growth and positively impacting local and global communities.

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The Circular Economy in the Context of Industrial Clusters: Cases of SMEs from the Tanning cluster of Arzignano, Italy

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Circular Economy (CE) is the paradigm shift of production mainly through the 4Rs activities, i.e., reduce, reuse, repair, and recycle. CE impacts large companies and multinationals more than SMEs (Thorley et al., 2019; Pereira et al., 2022). The effect of CE on SMEs is an emerging research topic that has begun to be covered by some current research (Lawrence et al., 2006; Johnson & Schaltegger, 2016; Prieto-Sandoval et al., 2018; Ferasso et al., 2020; Holzer et al., 2021; Sharma et al., 2021; Howard et al., 2022; Sohal & De Vass, 2022). The main identified actions of SMEs toward CE are those related to recycling (Ferasso et al., 2020). CE implementations occur at different paces within SMEs than big companies (Holzer et al., 2021). The CE is studied by three layers: i) the micro level (comprising companies and consumers), ii) the meso level (industrial parks or agglomerations in which inter-organizational relations take place), and iii) the macro level (city or region-level) (Ghisellini et al., 2016; Kirchher et al., 2017; Prieto-Sandoval et al., 2018). This research focuses the micro and meso-level as a multilevel phenomenon to understand the effect and how SMEs react to CE influences in a meso-level approach, i.e., the agglomeration context of industrial clusters. Multiple case studies focused on industrial clusters' SMEs were conducted (Yin, 2005, 2014). The tanning cluster of Arzignano, Italy, was chosen because of the relevance of the Veneto Region regarding industrial cluster over decades, and this cluster was the first to be a self-declared cluster linked to CE. The data collection procedures involved interviews and documentation. The interviews target the strategic level of 10 SMEs due SMEs' CEOs are the main information source regarding strategic matters of the companies they manage (Usunier et al., 1993). Documentation comprised reports, websites, SMEs' social media profiles, and news about the cluster and the companies. Preliminary findings revealed actions at both micro

and meso levels. The most common initiatives related to CE of the studied companies are actions for energy saving from renewable sources (solar panels), heating water saving for manufacturing processes, and the reuse of such water. The companies in isolation are pursuing sustainable certifications because their clients request them. These actions are taken in isolation by the studied SMEs. At the meso level, we identified waste management as common CE action, a sensitive issue due to the strict pollutant regulations in the tanning field. Chemicals products and by-products used by tanning companies are hazardous for nature and humans, and the cluster governance helps SMEs with collective waste treatment. Therefore, the sustainable actions of the studied SMEs toward CE are at the initial stage and highly focused on cost-benefit assessments. Public policies at the cluster level are needed to support SMEs in expanding the adoption of more CE activities by creating incentives to reduce environmental costs and foster other CE actions, such as reuse and repair. Further analyses are still being conducted and can enrich the suggestions for practitioners and policymakers.

Keywords: Circular Economy; Small and Medium-sized Enterprises; Industrial Clusters; Sustainability; Competitive Advantage.

The economic effect of the cultural and creative industries: an input-output analysis for 66 countries using inter- country input-output tables

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1. *Motivation*

Since the mid-1990s, the Cultural and Creative Industries (CCIs) have gained prominence as a sector with which to foster the progress of regions. The first country in the world to call itself a "Creative Nation" was Australia (1994). However, it was not until the publication of the "Creative Industries Mapping Documents" by the UK Government (1998), when the concept of creative industries would begin to spread to the rest of the world, and CCIs would position themselves as a vector of development. Since then, successive creative economy plans have been implemented in different countries, from Colombia to South Korea, Mexico, the United States, India and Brazil. The proliferation of these CCI-based development policies is due, above all, to the impetus that international organisations such as UNCTAD, UNESCO and UNPD have had over time. (Vlassis & De Beukelaer, 2019). In this sense, the UN itself conceives of the as a cross-cutting element of several Sustainable Development Goals (CGLU, 2018). This makes CCIs a key element of new economic development strategies.

From an academic point of view, the idea that CCIs generate positive impacts on the economy has been ratified. A multitude of authors have supported that a greater presence of creative industries has positive effects on per capita income (Marco-Serrano et al., 2014), hourly wage (Lee, 2014), employment generation (Gutierrez-Posada et al., 2023), as well as labour productivity (Boix-Domènech, De Miguel Molina, et al., 2021; Boix-Domènech, Peiró-Palomino, et al., 2021) and total factor productivity (Hong et al., 2014). In addition, these industries produce knowledge spill-over effects, through the

export of new ideas to other productive sectors (Potts & Cunningham, 2008), and generate positive effects as leisure service providers (Lee, 2014), attracting skilled labour and high value-added companies to the territory where they are located. CCIs also have a positive impact on innovation, as the evolutionary services they provide stimulate the innovation system and facilitate changes in the production system as a whole (Potts, 2009).

In terms of spatial distribution, the impacts of CCIs are significant regardless of the territorial level referred to. Whether it is an urban area, a region or a country. Following the perspective of input-output multipliers, studies find values between 2 and 3 for value added multipliers (CEBR, 2019; CRD, 2018). However, although these impacts are mostly positive, the intensity of these impacts is not evenly distributed over space. (Boix-Domènech, De Miguel Molina, et al., 2021). In this sense, there seems to be a positive relationship between the impacts of CCIs and the level of development of the territory on which they are based. Seen from a strictly theoretical angle, the economic success of a country lies in taking advantage of the comparative advantage it has over other countries.

Therefore, is it feasible to say that CCIs can promote economic development in all territories? Or, on the contrary, do CCIs function as a sector that increases inequalities between more advanced and developing countries? Following the findings of the literature, this paper hypothesises that, although the economic impact of CCIs is relevant, their distribution across space is not homogeneous. In order to answer these questions and verify the hypothesis, the following research objective is proposed: to quantify the economic impact of CCIs on value added and employment at the national level. To this end, this paper estimates a closed Global Multi-Regional Input-Output Model (GMRIO), based on the OECD Inter-Country Input-Output (ICIO) Tables for the year 2018. Based on this model, the total multipliers of CCIs on value added and employment are analysed for a set of 66 countries at different stages of development.

2. Data and Methodology

The database used is the OECD Multi-Country Input-Output Tables (2021). These tables have information for 66 countries in the world at different stages of development, and with a temporal scope that covers the period 1995-2018. The CCIIs are identified as an aggregate composed of 3 of the 45 economic sectors included in the tables for each country. Specifically, following the ISIC rev. 4 classification, they are *Publishing, audio-visual and broadcasting activities (58-60)*, *Information technology or other information services (62-63)*, and *Arts, entertainment and recreation (90-93)*.

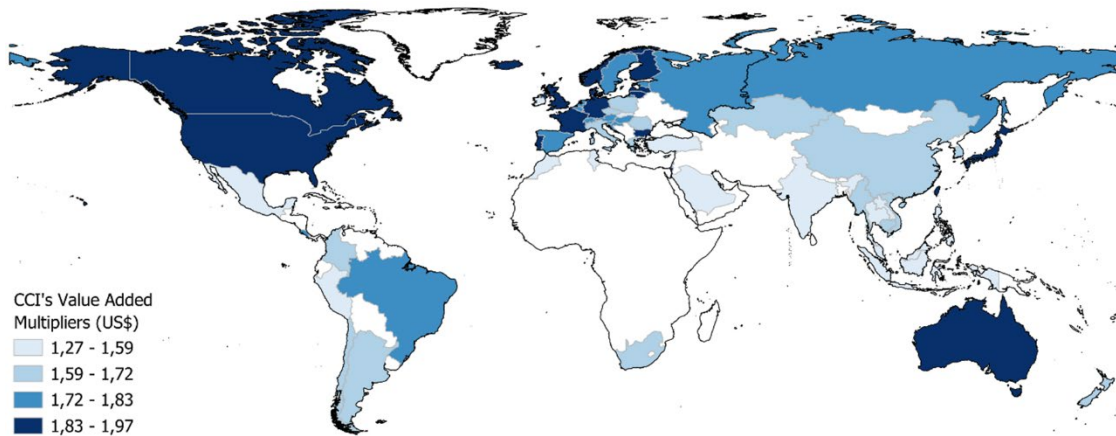
From this database, a closed GMRIO model is estimated. (Miller & Blair, 2009). Input-output models are systems of linear equations that reflect the inter-industry relations of an economy. Compared to the basic model for a single country, multi-regional models add several regions or countries. They have the advantage of internalising trade flows of intermediate goods between different regions. Therefore, the estimated impacts are more realistic. Likewise, a model closed to households is estimated, which makes it possible to incorporate three types of economic effects: a) the direct effects on the sector, b) the indirect effects on the rest of the productive system, and c) the induced effects derived from household consumption in accordance with the income generated in the productive process. Finally, based on the GMRIO, total value added and employment multipliers are estimated for the CCIIs. These multipliers are summary measures of the economic impact generated in the economy as a whole for each additional dollar of final demand on CCIIs.

3. Results and Conclusions

The total impact multipliers for CCIIs in 2018 are shown in maps 1 and 2. At the global level, the average multiplier on the value added of CCIIs is 1.71. That is, for every dollar spent on CCIIs, the economy generates \$1.71 on average. The countries with the highest impact capacity are Israel and Canada (1.97), Latvia and France (1.94), while the lowest impacts are recorded in Morocco (1.27), Brunei (1.37), Saudi Arabia (1.41) and Mexico (1.42). In terms of employment generation, the median employment multiplier stands at 37.7. This means for every million dollars spent in CCIIs, 37.7 full-time equivalent jobs are created in the whole economy. The leading country in this indicator is India (228.4),

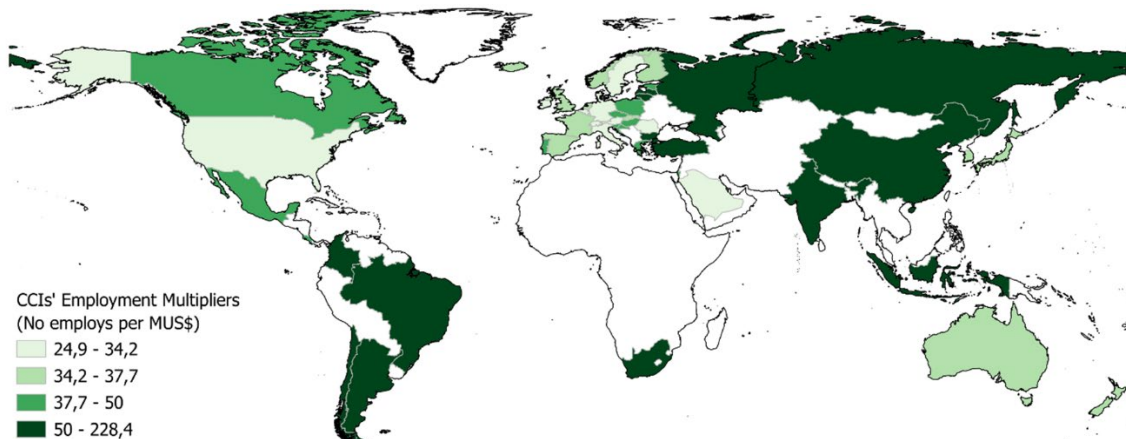
followed by Colombia (170.4), Brazil (100.4) and Chile (91.4). In contrast, the lowest impacts are in Ireland (24.9), Saudi Arabia (25.7), Malta (29.6) and the United States (30.6).

Map 1. CCI Multipliers on value added in 2018.



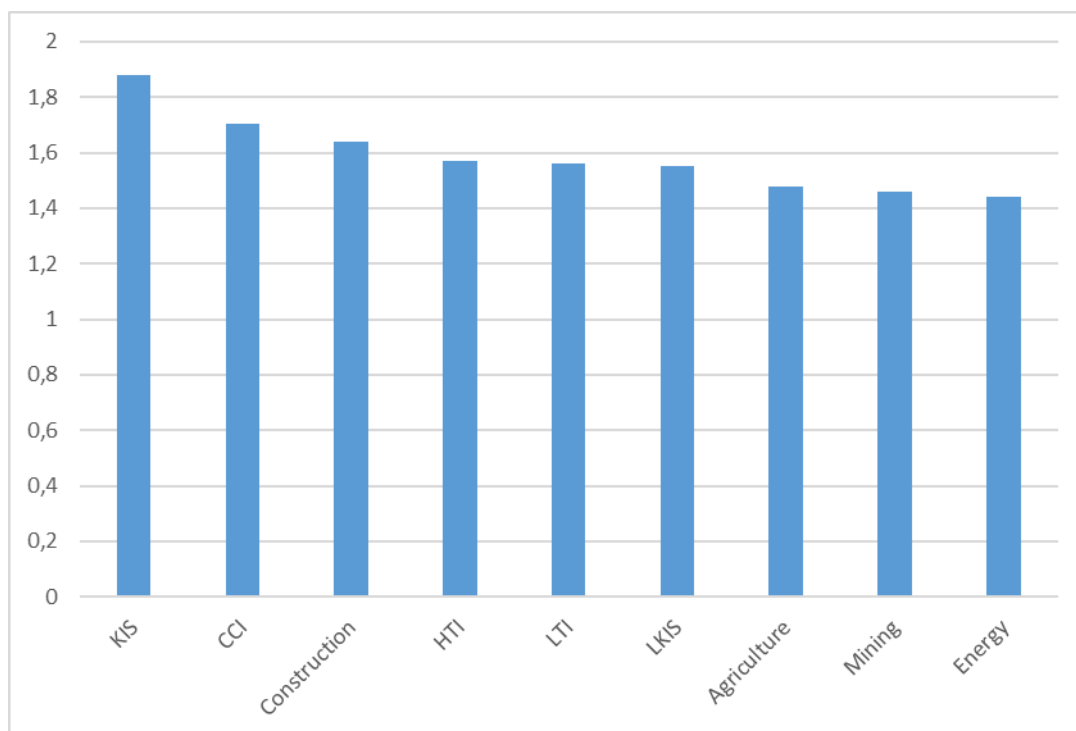
If we look at the spatial distribution of the impacts, heterogeneity can be seen in both multipliers. In this sense, the value added multiplier is high in the more developed areas of the planet, such as North America, Europe and Australia, while the less developed areas obtain lower impacts, such as Latin America, Asia and African countries. For the employment multiplier, the results are reversed. Less developed areas register higher effects of CCIs, while these impacts are lower in more developed areas.

Map 2. CCI Multipliers on employment in 2018.

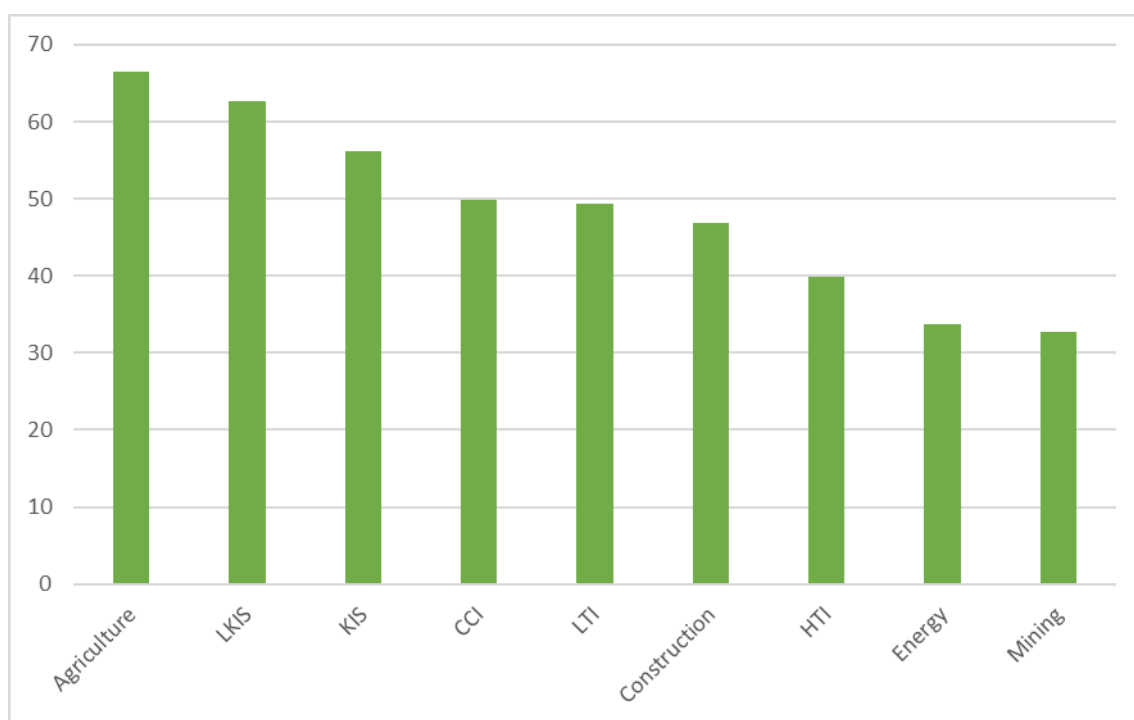


Once the territorial distribution of impacts is analysed, now it is shown what would happen if the additional euro were spent in another sector. To compare the Creative Industries with the rest of the economic sectors, the 45 economic sectors are reduced to 9 aggregates, which are: Agriculture, Energy, Mining, Construction, Low Technology Industry (LTI), High Technology Industry (HTI), Low Knowledge Intensive Services (LKIS), Knowledge Intensive Services (KIS), and CCIs. First, in terms of value added, Creative Industries show the second highest multiplier, following the Knowledge Intensive Services, and followed by Construction. The lowest values are registered by Agriculture, Energy and Mining. Second, referring to employment multipliers, Creative Industries move between the third and fourth position, having converging values to Low Technology Industries. The highest impacts on employment are registered by Agriculture and Low Intensive Knowledge Services, where the lowest are for Mining and Energy.

Graph 1. Value added multiplier's sectoral comparison in 2018



Graph 2. Employment multiplier's sectoral comparison in 2018



To conclude, this study ratifies the findings of the literature regarding the heterogeneity in the distribution of the impacts of CCIs (Boix-Domènech, De Miguel Molina, et al., 2021). Developed countries benefit more in terms of value added generation, while developing countries achieve larger values in terms of job creation. In other words, policies supporting CCIs are not effective in achieving the two main economic objectives of growth and job creation at the same time; in relative terms, more developed countries can improve effective growth in value added through the use of CCI policies, while less developed countries are in a better position to increase employment. To this respect, the applicability of a culture-led growth strategy depends on the policy objective prioritised by each country. Moreover, compared to other industries, CCIs have a high capacity to

generate value added, and an above-average capacity in terms of job creation. This positions CCI-based economic policies as a feasible alternative for fostering economic development at the national level.

Keywords: *cultural and creative industries, input-output analysis, regional development, multiplier analysis, economic impact*

JEL codes: C67, F63, R11, Z11

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Reflections on narrative context and diverging paths in cluster evolution

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This article is inspired by recent concerns that history and context has not been taken into proper account in evolutionary economic geography, and that the field is weakened by lack of studies of agents' interpretations and experiences. It is, moreover, inspired by a call for narrative approaches to assess processes of path development, in our case more broadly processes of cluster evolution. We conduct a narrative study of globalization in the maritime cluster in Møre and Romsdal in Western Norway and ask how narratives and antenarratives are voiced to make sense of, and merge, regional and global considerations (processes in phenomenological time). We address how narratives interact with and shape materiality as they connect to historical and contemporary developments (processes in cosmological time). We propose that thick longitudinal explorations of narrative contexts, connected to different temporalities, highlight a need for re-reflecting on central concepts in evolutionary cluster studies.

Environmental Challenges and Innovative Responses of Local Agri-food Systems: a Theoretical Approach and Research Agenda

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Food production systems face significant environmental challenges. For example, they are responsible for a substantial proportion of global greenhouse gas emissions. Indeed, there is a consensus in the literature on the need for changes in food systems in order to achieve more sustainable forms of production. This article studies these transformations from a territorial perspective, analysing local agri-food systems, examining their environmental challenges and describing what kind of innovative responses these systems offer to these challenges. To this end, the paper proposes a theoretical framework that combines three strands of literature that have advanced separately, with little dialogue between them.

First, the literature on clusters and industrial districts, with a focus on the agri-food industry. In particular, we build on the local agri-food system approach, which adopts the general principles of industrial districts and innovative milieus to analyse food production systems at the local level. Second, we draw on the literature that analyses the environmental problems associated with the agri-food industry. In particular, studies from environmental economics, ecological economics and industrial ecology with a focus on food production. Third, we employ the literature on the characterization of agri-food systems innovations with a particular interest on the interplay of green and digital technologies on "twin" digital and green transitions.

Seeking the intersection between these three streams of literature, we propose a categorisation of agri-food production systems that considers two dimensions: (1) the intensity of local embeddedness and (2) the intensity of the inter- and intra-sectoral network. Subsequently, we analyse the environmental challenges faced by the different forms of agri-food production, focusing on the case of local systems. This typology allows us to differentiate the origin of the environmental problem from the impact of the problem at different territorial scales. Finally, we analyse and classify the innovative responses of agri-food systems to these environmental challenges, focusing on innovative responses from the territory, both to local problems and to global challenges.

We illustrate our theoretical conceptualisation of the challenges and responses by drawing on different cases analyzed in the previous literature, considering cases in different sub-sectors of food production. Although we analyze some cases in developed countries, our main focus will be on studying local agri-food systems in Latin American countries, a developing region where these production systems are particularly relevant to local economies. To conclude, we raise an agenda of problems and questions on the subject that can help to guide future research.

As a result, the paper seeks to make a novel theoretical proposal that helps to delimit the environmental challenges and the responses that are given, from a territorial development approach, in the form of green and digital innovations. In this way, the paper aims to contribute not only to the literature on clusters and industrial districts, but also helps to build bridges between this field and other streams of research more focused on studying environmental problems and the challenges of the twin transition.

Keywords: Local agri-food systems; environmental challenges; sustainability; green technologies; eco- innovation; digital technologies.

The impact of fostering digital transformation in SMEs through a multi-actor collaboration process on the territorial innovation system: The case of 'PYME Digitala' in the province of Gipuzkoa

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Digital transformation is radically changing the management of business, generating new opportunities for competitive improvement and creation of new added value. Firm competitiveness depends on the adaptation to this fast-changing scenario, so the introduction of information and communication technologies should be part of their strategic roadmap. Smaller size firms, however, face several barriers during this process and show lower levels of digitalization.

To overcome this gap, the Provincial Council of Gipuzkoa launched in 2021 a program called 'PYME Digitala' (*Digital SME*) which is framed within the 'Laboratory of Territorial Development', an initiative that arises within Etorikizuna Eraikiz and aims to contribute to territorial development of Gipuzkoa improving the competitiveness of SMEs, through a collaborative governance model in which they co-design and apply industrial promotion measures with the network of Local Development Agencies of the territory. These Local Development Agencies are an important instrument in the territorial development of Gipuzkoa. They currently play a role of process facilitation of local development and generation of social capital in their respective areas of action. This is executed by facilitating the interrelation between the multiple local socioeconomic

agents and promoting trustworthy environments for the construction of collective solutions that respond to shared challenges².

The program 'PYME Digitala' aims to deepen the work that develop the agencies in favour of the competitiveness of the SMEs promoting their digital transformation as lever of change, innovation and creation of greater value added, facilitating the execution of itineraries that contemplate a diagnosis, an action plan, a project definition and enabling its implementation.

The Local Development Agencies play a central role in the definition, development, and monitoring of the process. But as Bellandi and colleagues (2020)³ argue, specialized intermediary agents such as knowledge-intensive business services (KIBS/KIS) can play a relevant role in making knowledge available to firms. Being this knowledge not as accessible for SMEs through markets, mainly due to its high costs, the program also allows Local Development Agents to collaborate with other entities, mainly providers of specialized (technology) services (called *bidelagunak* or *journey friends*) in the process to provide expert knowledge.

To monitor the actions provided within the agreement between the Provincial Council of Gipuzkoa and the ten Local Development Agencies of the province, they hold coordination workshops four times a year to follow up actions, exchange experiences and learning with the rest of the Local Development Agencies and broaden knowledge through experts.

In its first two editions, about 150 SMEs already benefited from the program. Thus, a direct result of the process was the definition of 150 action plans and enabling their implementation. However, some indirect results may also emerge from this multi-actor

² For more details see, for example, Miren Larrea & Miren Estensoro (2021): Governance of Industry 4.0 policies: making knowledge services accessible for SMEs, Regional Studies, DOI: [10.1080/00343404.2021.1954612](https://doi.org/10.1080/00343404.2021.1954612)

³ Bellandi, M., Chaminade, C., & Plechero, M. (2020). Transformative paths, multi-scalarity and Industry 4.0. In L. De Propris, & D. Bailey (Eds.), *Industry 4.0 and regional transformations* (pp. 62–83). Routledge.

collaboration process where policymakers, Local Development Agencies, firms, providers of specialized services and academia are involved.

Based on the evaluation of the process currently at place, the aim of this paper is to identify those other impacts of the process on the territorial innovation system. This evaluation is based on data collected from different actors involved in the process. On the one hand, firms and providers of specialized services are asked to fill a questionnaire designed to measure their level of satisfaction with the program. On the other hand, the researchers are interviewing the technical staff of all the Local Development Agencies and representatives of the Provincial Council of Gipuzkoa (both technical staff and politicians) to gather their views on the process in terms of governance, knowledge co-generation and results.

The preliminary results of the evaluation show that beyond the direct effects on the participating firms, the process also has some positive impacts on the territorial innovation system. Among others:

- Participating in the process has a positive impact on the knowledge and capabilities of the technical staff in Local Development Agencies
- It provides examples of good practices to other SMEs in the territory.
- The process also contributes to the reinforcement of the local innovation ecosystem by developing new capabilities in providers of specialized services in the local area.
- Finally, the analysis of the coordination workshops and the results of this evaluation may also contribute to the policy learning process.

Cluster management and policy learning: The value of strategic intelligence and multi-actor collaboration

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Cluster policies are an important element of the competitiveness policies of many countries and regions around the world. Their rationale is based on the argument that the benefits of clustering can be enhanced and/or accelerated by facilitating cooperative dynamics among the firms and other agents that make up a cluster. As with other public policies, in the case of cluster policy, there is also a general interest in developing and applying evaluation methods, with the aim of adapting the policy to the new challenges identified through those processes. Despite this interest and need, evaluating cluster policy presents significant challenges when seeking to measure and define the impact of these policies on competitiveness.

Cluster policies typically fund cluster associations or collaborative projects where a key input becomes the facilitating skills of cluster managers. Although policymakers have recognized the key role that cluster managers play in the successful implementation of cluster policy – as evidenced for example by training and networking initiatives for cluster managers such as the European Commission’s Cluster Excellence Initiative – there has been surprisingly little research into the role that cluster management plays in cluster policy success. Thus, in the specific case of cluster policy, to evaluate the efficiency of implementation and development of these policies, one of the aspects to be analysed is the activity of the cluster management organizations (CMOs), testing the relationship between this activity and greater economic development.

The aim of this paper is to advance knowledge on competitiveness (i.e. cluster) policymaking, focusing on policy learning processes. For that purpose, the paper

analyses the different stages of a six-year cluster policy evaluation process in the Basque Country, a pioneer region in cluster policy. We hold that strategic intelligence or evaluation tools can play an important role in this process and present the 'User's voice' as a policy learning instrument. This questionnaire was developed in collaboration between researchers, policymakers, and cluster managers with the specific objective of: (1) better understanding how users perceive the cluster cooperation services and actions offered by the cluster management organizations; and (2) examine the perception that the users have about the impact of these services and actions on the competitiveness parameters of companies. We gathered information on different aspects related to cluster management among the members of the 16 cluster management organizations supported by the regional cluster program, with 597 responses in 2018 and 788 responses in 2022.

Based on the process, first we reflect on how knowledge about the key areas for cluster users contributed to policy learning. The analysis of the users' perceptions in two different time periods, 2018 and 2022, enables the researchers to identify the changes in their priorities contribution, thus, to policy learning. Second, we also looked at the role of multi-actor collaboration in these types of processes, analysing the interaction and collaboration between policymakers and cluster management, together with researchers, while co-designing and co-implementing the evaluation tools. The analysis of the case also finds that multi-actor (i.e. academy, cluster management, and policy) collaboration for competitiveness policymaking has generated policy learning and has promoted changes in policy that could foster cluster competitiveness in the future.

PROMIXITY, RELATIONAL RESOURCES AND SUSTAINABLE COMPETITIVE ADVANTAGE: INSIGHTS FOR BIOTECH STARTUPS

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Introduction

The firm's resources became relevant to literature since the Penrose's work (1959), who defines firm as administrative unit to coordinate a bound of resources to achieve economic activities and generate profit. From this perspective, it is essential to emphasize the relevance of the firm's internal resources, which can be divided into intangible assets, such as equipment and infrastructure, as well as intangible resources, such as knowledge, skills and experiences accumulated by the actors inserted in the organization.

The Penrose approach laid the groundwork for the resource-based view (RBV). The central argument of RBV is that competitive advantage is given by the set of resources and competencies, which are developed over time by the firm (Wernerfelt, 1984; Barney, 1991). According to its path dependence, firms can develop resources and capabilities that are valuable, rare, imperfectly imitable, and non-substitutability, will be able to achieve a sustainable competitive advantage over competing firms (Barney, 1991). The RBV emphasizes that competitive advantage stems from resources and capabilities owned and controlled by a single firm. Accordingly, the analysis primarily focuses on internal resources (Dyer & Singh, 1998). However, a firm's strategic resources extend beyond the internal sphere. The firm can also develop resources derived from interactions with external entities, such as suppliers, buyers, or even competitors (Dyer & Singh, 1998; Lavie, 2006). The relational resources are made possible by

complementary resources, which are the distinctive resources of actors that collectively generate higher incomes than that the sum of incomes obtained through the individual resources of each partner (Dyer and Singh 1998; Dyer, Singh, and Hesterly, 2018). However, why explain the strategic use of these resources? Why do some firms obtain a sustainable competitive advantage?

The theoretical perspective of the relational view emphasizes the significance of relationships and interactions among economic actors in the quest for creating relational resources that result in sustainable competitive advantage for the firm. The literature on proximities also holds a pivotal role in comprehending how interactions among actors are formed. The key point of the discussion is that proximities can serve as a facilitating factor for interactions to take place (Boschma, 2005; Ponds et al., 2007; Broekel & Boschma, 2011). We argue that proximity dimensions (Boschma, 2005) can foster interaction, trust, knowledge sharing, and resource sharing, thereby propelling the firm's sustainable competitive advantage. Hence, proximity dimensions can complement the relational perspective discussed in Dyer and Singh (1996), establishing a more comprehensive and intricate theoretical discourse on the role of relationships. This research aims to analyze the influence of different types of proximities on relational resources and, consequently, on sustainable competitive advantage.

Literature Review

Until the 1990s, the literature on proximities primarily focused on examining the significance of spatial/geographical proximity in the formation of clusters and the creation and transmission of knowledge. However, Boschma (2005) argued that evaluating geographical proximity in isolation is insufficient and emphasized the need to consider other dimensions of proximity. Consequently, the discourse on proximities has gained a multidimensional character. In his seminal work, Boschma (2005) introduced a typology encompassing five dimensions of proximity: cognitive, organizational, social, institutional, and geographical.

Cognitive proximity can be defined as the degree of similarity in the knowledge bases of actors involved in an interaction (Nooteboom, 2000). According to Boschma (2005), the

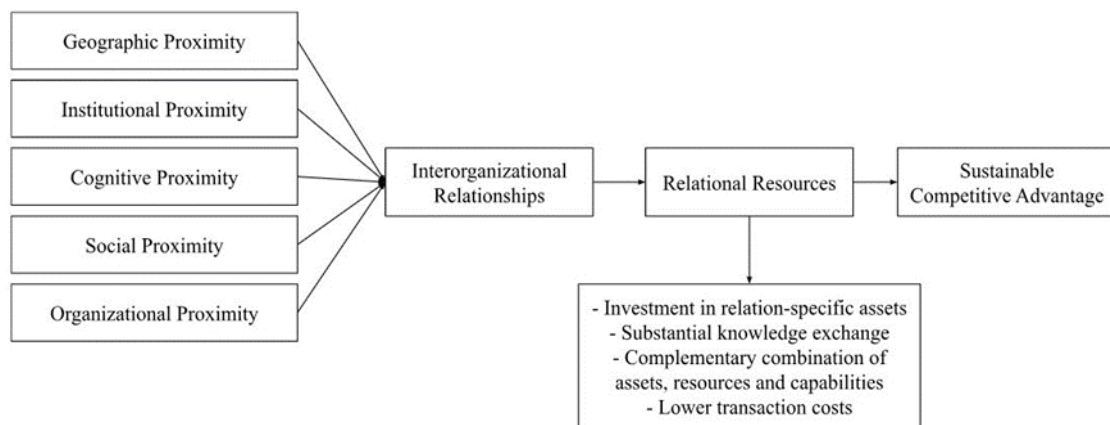
absorptive capacity of actors to assimilate new knowledge is closely linked to cognitive proximity with their partners. Thus, the existence of cognitive proximity implies that the actors involved in the relationship share the same knowledge base and experience. Organizational proximity is based on similarities in incentives and routines between organizations. The presence of organizational proximity can reduce opportunism and uncertainty in partner relationships (Balland, 2012). Social proximity is defined in terms of social relationships among actors, involving factors such as trust, friendship, kinship, and personal experiences. Institutional proximity refers to informal constraints (norms, habits, culture, codes of conduct, etc.) and formal rules (laws and regulations). Ponds et al. (2007) define institutional proximity as organizations and actors operating under the same "institutional logic." Lastly, geographical proximity refers to the spatial or physical distance between actors (Boschma, 2005). Geographical proximity facilitates face-to-face interactions among actors, contributing to contacts and information exchange, thereby facilitating the exchange of tacit knowledge.

Dyer and Singh (1998), through the theoretical perspective of the relational view of sustainable competitive advantage, extend the unit of analysis from the firm (the central focus of the RBV) to the discussion of the relevance of the firm's interorganizational network of relationships. In the face of globalization, it becomes increasingly important to consider how collaborations and cooperative networks can influence the generation of resources and capabilities that are essential for improving firm's competitive performance (Hervás-Oliver & Albors-Garrigós, 2007; Bonatto et al., 2017). The relational view emphasizes the significance of interorganizational relationships for firms' competitive success in complex and dynamic environments. Interorganizational relationships can generate competitive advantage through four mechanisms: (i) investments in relationship-specific assets, (ii) substantial knowledge exchange, including knowledge exchange that results in joint learning, (iii) complementary combination of assets, resources, and capabilities, and (iv) lower transaction costs compared to competing alliances due to more effective governance mechanisms (Dyer & Singh, 1998).

The geographically bounded nature of innovation ecosystems in cities provides access to tangible and intangible resources. Its territorial roots allow the agglomeration (Martins et al., 2019) and proximity between actors, which can encourage co-creation (Presutti, Boari and Majocchi, 2013) and open innovation processes, the transfer of tacit knowledge, and engaging in partnerships. Moreover, co-location effects promote the concentration (Jacobides et al., 2018; Thomas, Sharapov, and Autio, 2018) and better access to complementary resources in the environment, which favors the sharing of resources between actors and the building of relational resources (Dyer, Singh, and Hesterly, 2018).

Based on these two theoretical frameworks, we propose a central hypothesis that the proximities discussed by Boschma (2005) can foster cooperation, increasing the likelihood of resource sharing among firms to create sustainable competitive advantages. The core idea revolves around the notion that, for the creation of sustainable competitive advantage, firms require relational resources, which are generated through interorganizational relationships with other firms, relationships that can be influenced by proximities. Studies that have explored the integration of these two bodies of literature are scarce, with few attempts such as Knobens' (2011) article, which solely investigates the role of geographic proximity within the RBV perspective, without extending to the role of non-spatial proximities. Figure 1 below presents the theoretical model to be investigated.

Figure 1 - Theoretical Model



Source: Based on Dyer and Singh (1998) and Boschma (2005)

Method

Based on the research question, "how do dimensions of proximity influence relational resources in the formation of competitive advantage?", we adopt a qualitative approach and conduct an in-depth case study analysis. We will undertake an exploratory investigation involving four biotechnology startups located in the state of Rio Grande do Sul, Brazil. These startups were identified through the mapping conducted by the Brazilian Association of Startups (ABSTARTUPS) in 2022.

1 Mapping that can be accessed through the following link:
<https://app.powerbi.com/view?r=eyJrIjoizDMwZDgyNjQtMDg5OS00YWRhLWEzMzQtZmViZTQyN2QzZDUwliwidCI6ImRmZjNkYTc0LWRhNzEtNDY5ZS04ZTcyLTdlNGZlNmQ1MzY5ZCJ9>

We have selected a high-tech and knowledge-intensive sector. We did this considering that, in innovation environments, relational resources can be more effective than simply providing individual resources, such as physical infrastructure and services (Fernandes et al., 2017). The analyzed startups are located within or have relationships with university technology parks. This aspect assumes fundamental relevance, considering the context of the biotechnology sector, characterized by its dependence on advanced technological inputs. The interaction between these emerging companies and academic institutions plays a crucial role in promoting research and development (R&D) and generating innovative products with high added value. These biotechnology startups are located in southern Brazil, and have a validated business solution for the market. Data collected with analysis of documents, videos and webinars and interviews with founders and experts in new biotechnology ventures.

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DYNAMICS OF URBAN INNOVATION ECOSYSTEMS IN DEVELOPING COUNTRIES: A comparative study

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Introduction

Innovation ecosystems (IEs) can be defined as the result of the interaction between multiple networks of actors, encompassing both the resources and the dynamics of cooperation, competition, and relationships between them. Territorial IEs are open, dynamic, and geographically bounded environments (Rabelo & Bernus, 2015), permeated by cyclical flows of tangible resources - such as human and financial - and intangible resources - such as information - whose actors, structured in networks, interact in a complex way, competing, but also cooperating and sharing resources to co-create value and innovate (Shaw & Allen, 2018).

The literature presents different approaches to analyzing IEs, however, all of them have a common element: a network of interconnected organizations based on open innovation mechanisms. Zen et al (2023) identified two main approaches – Spatial and Non-Spatial Perspective. The territorial or spatial approach focuses on inter-organizational relationships and the process of developing relational resources, thereby creating value that can be shared across the territory. Hence, the platform or non-spatial approach emphasizes relationships with a hub firm and value co-creation in the network.

At the city level, an Urban Innovation Ecosystems (UIEs) can be defined as a set of interdependent actors with conflicting technical, social, economic, and political interests, but also converging goals, priorities, expectations, and behaviors that

cooperate and compete concomitantly in a specific geographical location. Cities have different potentials, and the development of an ecosystem is usually complex and gradual, resulting from a long period and a process of continuous evolution adapted to contextual conditions (Rabelo & Bernus, 2015).

Therefore, it is necessary to understand, from a dynamic perspective, how IEs develop over time, and adapt to new contextual configurations (Spigel, 2017), what these elements are, and how the dynamics occur. The governance processes performed by different actors are central to ecosystem health and stability, since they drive collective performance, allowing and facilitating the creation of value and collective gains (Cusumano & Gawer, 2002; Autio & Thomas, 2014).

The paper seeks to answer the question: How do the dynamics of governance in UIEs in developing countries occur? Thus, this paper aims to analyze such dynamics of governance in the UIEs in developing countries, more specifically Porto Alegre (Brazil), Medellin (Colombia) and Cape Town (South Africa).

Based on the understanding that governance plays a key role in the successful implementation and development of IEs (Durst & Poutanen, 2013), we contribute to research on UIEs, discussing the governance and the role of different actors. We also contribute to policymakers presenting a broader view of their role in the stages of UIEs evolution.

Theoretical Background

The ecosystem concept has been adopted by various emphases and perspectives (Thomas & Autio, 2020). Moore's (1993) seminal work addresses the business ecosystem as an interdependent network of actors. In this way, the focus of analysis is the firm and its relationships in delivering value to customers. Adner (2006) coined the term IEs and highlighted the importance of these relationships in the development of innovations, as well as the risks associated with interdependence in the value-generation process.

In the last decade, the role of the territory has been explored by several authors (Scaringella & Radziwon, 2018). Scholars also point out that proximity is an essential

feature in the ecosystem co-creation dynamics since it encourages knowledge spillovers and promotes the concentration of tangible (e.g. human and financial) and intangible resources (e.g. knowledge) (Jacobides et al., 2018). UIEs must engage all the groups of actors to create a clear (Thomas & Autio, 2020) and comprehensive value proposition (Walrave et al., 2018).

According to Valkokari et al. (2017), the balance between the interests of the actors involved is fundamental to creating collaborative configurations that induce the different parties to develop together and put their best efforts into a joint effort. The actors have resources and interact in a territory; therefore, there must be the proper orchestration to generate innovation. These inter-organizational relationships in the ecosystems evolve through repetitive waves of cooperation, conflict, and commitment, changing the positioning of the actors and creating a new role.

The literature on the life cycle of IEs seeks to understand the development and evolution of these ecosystems and highlight the roles played at each stage of the life cycle (Scaringella & Raziwon, 2018). Rabelo and Bernus (2015) point out that the life cycle of IEs comprises the stages of birth, development or growth, consolidation or maturity, and renewal or dissolution prevails. According to Moore (1993), the evolutionary stages of a business ecosystem are birth, expansion, leadership, self-renewal, or death. Recently, Piqué, Miralles, and Berbegal-Mirabent (2019) argue that the evolution of IEs occurs in four stages: conception, launch, growth, and maturity. The conception and launch stages depend on a strategy to create the innovation ecosystem, as actors and resources are scattered, and mobilization is required. In the growth stage, the ecosystem becomes more competitive, and collaboration among actors accelerates, resulting in greater governance challenges. In the final stage, interactions begin to flow more organically, and the ecosystem becomes internationally competitive (Santos, Zen & Bittencourt, 2021).

Rabelo and Bernus (2015) point out that in the birth phase, the emergence of an innovation ecosystem does not begin with an explicit trigger, as it generally involves a long process of nurturing a diversity of actors and conditions. Given the dynamism of the

life cycle stages of IEs, actors can perform many different functions, and there may even be an overlap in their capabilities. Therefore, throughout the life cycle, they assume multiple roles that are not fixed or predetermined (Rabelo & Bernus, 2015; Valkokari et al., 2017).

Therefore, according to Santos, Zen and Bittencourt (2021), there is a need for more control in the first stages of the innovation ecosystem to align the actors and their interests. In the inception stage, IEs call for a formal coordination system. Given its dynamics are not well organized, trust among actors must be built from scratch, and actors and resources must be mobilized. In the launch stage, there is an evolution since the necessary infrastructure is ready. However, actors still need to be articulated, and trust still needs to be built; thus, centralized coordination is better. However, in the subsequent stages, the networks become more complex and require a coordination mechanism that allows decentralization. During the growth stage, the orchestration of actors enables an adequate degree of decentralization, reaching multiple orchestrators' development. Finally, in the last stage, maturity, it is possible to have choreography as an organic coordination mechanism, in which leadership is shared in a self-organization process.

Methodology

We conduct qualitative research based on multiple case studies: Cape Town (South Africa), Porto Alegre (Brazil), and Medellin (Colombia). Cross-countries research can shed light on the challenges and opportunities for UIEs in developing economies from Global South. Cooperation projects between countries of the South are presented as an alternative to North-South cooperation and are important to reinforce ties between developing countries, through collaboration in different sectors.

For data collection, we are employing the techniques of document analysis, non-participant observation, in-depth interviews, and triangulation. Document analysis is based on documents, records, materials, and artifacts to help the researcher in understanding the central phenomenon of the study. Through it, the researcher can

know the background of an environment, experiences, or everyday situations (Sampieri, Collado & Lucio, 2013). We present our dimensions of analysis in Table 1.

Table 1 - Dimensions of Analysis

Dimensions	Elements
Life cycle of innovation ecosystems	Inception Launching Growth Maturity
Coordination mechanism	Governance Orchestration Multi-orchestration Choreography

Source: Based on Santos, Zen and Bittencourt (2021)

Preliminary Results

This section describes the general characteristics of the three UIEs in the data collection in Cape Town (South Africa), Porto Alegre (Brazil) and Medellin (Colombia).

Cape Town (South Africa)

Cape Town, located in the Western Cape, serves as the legislative capital of South Africa and boasts a culturally diverse environment, with over 14 official languages spoken in the country, including Afrikaans and English as the predominant ones. It has emerged as a leading hub for entrepreneurship within the African continent, earning the top rank in terms of startup performance and quality in Africa (Startup Genome, 2020). Notably, 60% of South Africa's startups are based in Cape Town. With a population exceeding 4 million inhabitants, the city hosts a multitude of stakeholders, encompassing universities, research centers, incubators, accelerators, venture capitalists, large corporations, startups across various sectors, as well as both national and local governmental bodies, and Technology Transfer Offices (TTOs).

However, as an emerging economy, Cape Town faces a critical challenge in overcoming disconnected innovation systems (Bogers et al., 2019). While the ecosystem boasts a

diverse array of actors, interactions among them remain limited. Collaboration both within and between helices is lacking, hindering the potential for intrahelical alliances, such as those between the universities within the ecosystem, and interhelical collaboration to promote open innovation among different stakeholders. Consequently, the absence of actors leading the orchestration of resources and fostering collaboration poses a substantial obstacle for the development of a sustainable innovation ecosystem that facilitates resource sharing and fosters the creation of new ventures. Therefore, although the city facilitates multiple entrepreneurship and innovation initiatives, there is currently limited co-creation and suboptimal resource utilization.

Nonetheless, Cape Town features specialized incubators catering to diverse sectors such as edtech, health and biotech, fintech, and travel tech, actively nurturing and accelerating the growth of technology-based startups that offer solutions to both national and global societal challenges. For instance, UVU Africa, the continent's oldest tech incubator, was established in Cape Town more than two decades ago.

Porto Alegre (Brazil)

The city of Porto Alegre is the capital of Rio Grande do Sul, Brazil's southernmost state. Its population is estimated at 1.48 million people and is known by traits like diversity and multiculturalism (Prefeitura de Porto Alegre, 2019). Porto Alegre's Gross Domestic Product (GDP) worth R\$ 73.5 billion, the seventh-largest in Brazil, corresponding to a GDP per capita of approximately R\$ 49.5 thousand per year (IBGE, 2019). Brazil's democracy has frequently been described as unconsolidated, its citizens as apathetic and uninterested in politics. However, Porto Alegre has a history of social engagement. The city hosted the World Social Forum and Participatory Budgeting (Orçamento Participativo), allowing thousands of ordinary citizens to participate in local governance, making binding decisions on urban policy daily.

Since the 1990s, Porto Alegre has been experiencing four important project cycles with high society's engagement to transform the city into a world-class innovation ecosystem (Pacto Alegre, 2019): Porto Alegre Technopole (PAT), CITE Movement (Citizens, Innovation, Technology, and Entrepreneurship), Municipality Office of Innovation

(InovaPOA) and Alliance for Innovation. In 2018 the three most prominent universities, UFRGS, PUCRS, and Unisinos, the first one public and the other two private, receiving the Porto Alegre City Hall support, created the Alliance for Innovation. This Alliance had the purpose of fostering the innovation ecosystem of Porto Alegre.

The purpose of Pacto Alegre is joint efforts for a more innovative city, with more knowledge generation, social cohesion, attractiveness for investors, better infrastructure, opportunities, friendly for entrepreneurs, culturally richer, cleaner and, especially, with a better quality of life for its citizens, then turning into a world-class innovation ecosystem (Pacto Alegre, 2019). In November 2018, the Alliance for Innovation, together with the Porto Alegre City Hall and entities representing the capital, held a formal signing ceremony for the Pact for Innovation, called Pacto Alegre (Pacto Alegre, 2019). The purpose of creating the Pacto Alegre refers to the enhancement of high-impact actions aimed at the development of the city.

Medellin (Colombia)

The history of Medellin was linked to drug trafficking and crime throughout the 1980s, but it began to change with the introduction of an ecosystem of innovation. In 2004, the theme of innovation gained relevance with the "City Development Plan 2004-2007" and the design of a culture program aimed at creating new companies based on knowledge and with the strengthening of existing companies in the city. Since then, Medellin began to engage citizens in the processes of creating new initiatives for improvements. A OECD (2015) report entitled "Promoting the Development of Local Innovation Systems: The Medellín Case" points out the process of transforming a deprived capital into an innovation capital. The city was also chosen in 2013 as the most innovative in the world by the City Of The Year contest, conducted by the Wall Street Journal in partnership with Citigroup (STARTSE, 2019).

This international recognition is mainly related to the various social innovations implemented in the city, such as the renowned integrated public transportation system, the transformation of the violent Comuna 13 into a tourist attraction that receives hundreds of thousands of visitors, as well as investments in parks and libraries. These

actions exemplify the reasons for the improvement in the quality of life of the population and represent successful cases of collaboration between public actors, universities, and companies.

One of the main positive aspects of the Medellín ecosystem is the support of the University-Industry-State Committee (CUEE), which has been meeting monthly for 20 years and coordinates the actors of the ecosystem to build a common shared vision aimed at generating socioeconomic growth based on science, technology, and innovation. The CUEE has provided visibility to the actions of the actors, sharing successful cases of universities, startups, research groups, and the government. Therefore, the strategy is to generate appropriate stimuli and inputs for the ecosystem to continue developing. The current challenges of Medellín's innovation ecosystem lie in creating adequate stimuli for the ecosystem to connect investors, research groups, universities, and the government "within the same narrative" and strengthen the local context to be able to create connections with ecosystems from other regions.

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MECHANISMS OF VALUE CREATION AND CAPTURE IN INNOVATION ECOSYSTEMS: an analysis of platform and territorial perspectives

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An innovation ecosystem is an arrangement of universities, companies, civil society and government. These actors aim to create and capture value from collaborative innovation activities around a joint value proposition (Adner & Kapoor, 2010, Ritala et al., 2013; Jacobides et al., 2018). Value creation and capture of actors could explain the success of innovation ecosystems in the long term and have increasingly been researched in the literature (Radzivon et al., 2017, Khademi, 2020) in two perspectives of analysis: territorial and platform (Santos & Zen, 2022). The territorial perspective has emphasized regional innovation ecosystems (Rehm et al., 2021) and urban innovation ecosystems (Oomens & Sadowski, 2019). The platform perspective analyzes the study of firms from different sectors (Adner, 2006, Dattée et al., 2018). Despite the relevance of this subject, there is a lack of empirical studies that exploring similarities and differences in the value creation and capture between a territorial innovation ecosystem and a platform innovation ecosystem. This paper aims to analyze and compare the mechanisms of creation and capturing of value in innovation ecosystems in the platform and territorial approaches.

We conducted a case study in Serra Gaúcha region, in the Southern of Brazil. This region allows the research of the innovation ecosystem through territorial and platform approaches. Innovation ecosystem A (Inova RS), coordinated by the state government to develop the region, was analyzed by territorial approach. Through the Inova RS program, the Serra Gaucha region prepared strategic plans to be a global reference for innovation through an intelligent specialization strategy to transform the experience in tourism, smart cities, technological education, and industry 4.0 (Inova RS, 2022). Innovation

Ecosystem B, managed by Helix Institute, structured processes to support the growth of high-potential companies through its network, strengthening the innovation ecosystem of these companies (platform approach). We conducted 20 semi-structured interviews with managing directors and CEOs of universities, companies, government, and civil society actors of the Serra Gaucha innovation ecosystem (876 minutes of interviews and 320 pages of transcriptions). We analyzed the secondary and primary data by categorization into three theoretical dimensions: value creation mechanisms, value capture mechanisms, and the critical factors of success evolved.

The preliminary results show that the territorial innovation ecosystem and the platform innovation ecosystem have similar value creation mechanisms: meetings, alignment of objectives, collaboration/competition relationships, joint research, and development activities. In the territorial innovation ecosystem, despite the efforts to create value, the actors captured intangible value: institutional visibility of the government, universities and municipalities, internal training, approximation between the actors, and initial development of the innovation culture. The absence of capturing tangible/financial value resulted in disengagement by the actors in the innovation ecosystem. On the other hand, the value capture was planned jointly with value creation mechanisms in the platform innovation ecosystem. In addition, the strategy of attracting actors started with four large hub firms with an emphasis on cost reduction, revenue increase, internal training, and product development. In this way, the ecosystem increased the number of members, with the entry of small and medium-sized companies. These leveraged the engagement of actors throughout the innovation ecosystem. In addition, the study describes in detail the actors' perception of the critical success factors for creating and capturing value in territorial (rivalries between municipalities and microregions, the complexity of articulating regional actors, university-business interactions) and platform innovation ecosystems (cultural resistance of entrepreneurs).

The findings show that territorial and platform innovation ecosystems present different development trajectories. The territorial innovation ecosystem has a more complex and slower development process. The platform's innovation ecosystem is more dynamic, with short-term financial returns. In this way, the analysis of value creation and capture

mechanisms is a critical factor for actors' engagement and the success of the innovation ecosystem. Therefore, value creation and capture may plan differently according to each type of ecosystem.

This research contributes to improved decision-making of public policies that stimulate regional innovation ecosystems in an early stage of development. The findings help public, university, business, and civil society managers plan value creation jointly with value capture at the firm and ecosystem levels. Failure to capture value by actors can disengage the actors and reduce the chances of success of the territorial innovation ecosystem. In the platform innovation ecosystems, managers have the challenge to capture value in the long term to develop a sustainable competitive advantage of the ecosystem.

Further research can analyze how to reduce internal and external barriers to value creation and capture in early-stage innovation ecosystem development. Second, develop and propose techniques to measure the performance of social value and cultural value of innovation ecosystems (cultural gains, social gains, and cultural changes of innovation in the region). Finally, we highlight the importance of understanding the local culture to plan and develop innovation ecosystems.

KEYWORDS: Value Appropriation; Quadruple Helix; Value Co creation; Regional Innovation.

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Innovation in I4.0 and firms performance in Italy

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The impact of Industry 4.0 (I4.0) paradigm on techno-economic systems is at the centre of a wide and extensive debate in the literature and have received considerable interest in recent years from both business managers and policy-makers (Capone and Innocenti, 2023; Mariani and Borghi, 2022; Piccarozzi et al., 2018).

Since the origin of the term I4.0 (Kagerman et al., 2011), the literature has emphasized the significant impact that I4.0 enabling technologies can have on firms (BCG, 2015, etc.), but also on countries, regions, up to clusters and industrial districts (Hervás Oliver et al., 2021; Götz & Jankowska, 2017).

After about a decade since the introduction of the I4.0 concept, a growing number of studies has started to empirically assess the phenomenon. Part of this literature has focused on investigating the performance of firms based on the adoption, development, and implementation of I4.0 technologies (Mariani & Borghi, 2022).

However, the same literature has remained relatively silent on the firm-level impact of I4.0 technology implementation. Benassi et al. (2022) point out that empirical evidence on the impact of I4.0 technologies on enterprises is scarce. Similarly, Raj and Seamans (2018) highlight the need for enterprise-level data on I4.0 and AI-related technologies.

One of the few works that specifically addresses the topic is the study by Benassi et al., (2022) which analyses the link between innovation in I4.0 technologies and firms' performance. The study finds a positive correlation between innovation in I4.0 and firm

productivity, but does not reach satisfactory results in relation to firm or market performance.

The aim of this paper is to contribute to this debate investigating the link between innovation in I4.0 technologies and firm's performance. The ability to produce innovation in I4.0 can bring a twofold benefit. The first is the ability to implement technological solutions and product/process innovations within enterprises and the second is to be able to sell these technological solutions in the market.

Other studies have shown that knowledge developed by firms over time can influence economic performance (Nesta and Saviotti, 2005; Artz et al., 2010; Cohen, 2010). Using the study by Benassi et al. (2022) as a benchmark, we will carry out a long-term analysis in order to highlight whether the spillovers of innovation in I4.0 can also be confirmed on business and market performance.

The study is based on patents related to I4.0 developed by companies in Italy during the period 2010- 2016, we ask how these have influenced company performance in the subsequent period (before Pandemic) (2017-2019).

The research question is: What is the impact of innovation production in I4.0 on firm performance?

Specifically, in this article we will focus on the creation of new knowledge and innovation processes in I4.0 technologies and not on the impact of I4.0 technology adoption in firms (Agostini and Nosella, 2019; Ortt et al., 2020). We used patents realised by firms as a proxy for innovation (Griliches, 1990). Patents also allow us to measure how the stock of knowledge and skills has developed over time.

Like other studies in the literature (Corradini et al., 2020; Benassi et al., 2020; 2022, etc.), we identified patents in Industry 4.0 technologies made by Italian inventors and applicants, through the methodology developed by EPO (2017). We then searched for firm-level information for each applicant in the AIDA Bureau van Dijk database in order to investigate the relationship between patents in I4.0 and firm performance.

Through a series of scatter-plots and regression analysis, a positive relationship was found between the ability to make patents in I4.0 and firm performance. The results remain stable even when changing the period of analysis and performance indices, but are limited to the sample analysed, which is predominantly represented by large enterprises.

Keywords: Innovation, Industry 4.0, patents, firms performance.

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Microeconomics of Resilience: Cluster Organizations and the COVID-19 Pandemic

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Clusters and cluster organizations are strongly embedded in the narrative on key current issues such as economic development, competitiveness, innovation, and sustainability. This list can be extended by adding resilience – a concept generating a significant amount of coverage and fuelling discussion due to the effects generated by the COVID-19 pandemic.

The COVID-19 pandemic has brought about major disruptions and shaken up the world economy. Nowadays, one of its most visible economic effects is inequality. The unequal impact it has brought on different clusters is a significant issue worthwhile studying in order to extend the knowledge and understanding of the reasons why these differences exist and how can they be minimized.

The paper discusses the role of cluster organizations in Poland in building economic resilience in the age of the COVID-19 pandemic. In particular, it analyses the scope of their actions undertaken to boost economic resilience of their members. The study employs data from semi-structured individual interviews with cluster managers as well as a survey among cluster companies.

Cluster organizations in Poland, whose initial role was to serve as platforms of cooperation between business, academia, and the state, have employed similar but nonidentical approach to addressing the issues brought about by the COVID-19 pandemic. The paper identifies different degrees of the depth and width of their engagement and tests to what extent being a member of a cluster organization can translate to their members being more or less resilient.

How can public policies foster cross-sectoral innovation? Testing a model of Creative Hubs to promote creativity-based innovation within Textile industry in the MED region

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Recent literature on Cultural and Creative Industries (CCIs) addresses their relationship with the economy and local/regional growth (Boix-Domenech & Soler-Marco, 2017; Boix et al., 2013; de-Miguel-Molina et al., 2012; Potts & Cunningham, 2008). It is argued that CCIs stimulate innovation through their interactions with other businesses, facilitating knowledge transfer (Bakhshi & McVittie, 2009) and playing an important role in the regional innovation system (Yum, 2020). However, how can policymakers foster these interactions and connect the resulting knowledge into the regional innovation system? InterregMED Creativewear project tested the introduction of 5 Creative Hubs as a way to promote creativity-based innovation in the Clothing and Textile sector (T&C) in five MED Regions. This paper analyzes the potential role of Creative Hubs as mediators of CCIs in the new scenario of regional innovation policies defined by the RIS3 in the Mediterranean. CreativeWear provided an experimental framework resulting in the definition of a Creative Hub model and its functions, which could be scaled to other regions/sectors.

Keywords: Intermediary organization, Creative Hub, RIS3, creativity-based innovation.

How open innovation drives the intensity of use of Industry 4.0 technologies among Spanish firms

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The paper has two novelties. On the one hand, we want to consider the role of open innovation in the adoption of Industry 4.0 technologies among firms. Previous literature considered several drivers (and barriers) of the adoption of Industry 4.0 technologies but did not take into account the firms' strategic approach to innovation and in particular the role of open innovation. On the other hand, we want to focus on the intensity of use of Industry 4.0 technologies. We define intensity of use as how much a company uses a given technology for running its business. Previous literature focuses mainly on the adoption of Industry 4.0 technologies due to the difficulties to estimate the intensity of use. Past research identified the breadth of adoption defined as the number of Industry 4.0 technologies adopted as a proxy of the intensity of use. We think that this assumption is too abstract and does not capture all the nuances.

In consideration of those two elements, the paper aims at disentangling the role of open innovation on the intensity of use of Industry 4.0 technologies.

Our study utilizes the Encuesta Sobre Estrategias Empresariales (ESEE) (Spanish Survey on Business Strategies), curated by SEPI Foundation (Ministry of Industry, Spanish Government). The survey presents, on a panel basis spanning from 1990-to-2018, Spanish manufacturing firms and their strategies (innovation, commercial, industrial, financial, etc.), participating only those with more than 10 workers. In the year 2018 were surveyed 1,191 companies and were asked, for first time, about Industry 4.0 adoption, using different technologies and their intensity of adoption. Our baseline

sample presents, after cleaning data and controlling for adds/drops of firms, 904 firms with all data available.

Our results show that the role of open innovation changes if we take into account adoption and intensity of use. In particular, the proactiveness of firms in terms of technological scouting and readiness to adopt new technological solutions does not influence the intensity of use while it is in terms of just adoption. Moreover, when consider firms that do not have internal R&D, we find that proactiveness of firms becomes relevant in terms of intensity of use. In addition, we found that size of the firms is relevant if we consider the adoption of Industry 4.0 while it is not if we consider the intensity of use.

Museums' online reputation for places' reputation: the case of the Uffizi Galleries in Florence

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Over the last few years, in the context of the digital revolution, reputational capital has become increasingly crucial for the economic development of places, cities and regions. In this context, it might represent an important factor in attracting new residents, companies and investments, as well as new talents, creative industries, and tourists. According to the academic literature and practitioners, cultural aspects, including cultural institutions and museums, contribute to the place's reputation, which is its collective representation made up of perceptions, opinions and beliefs of the place's stakeholders.

Online communication channels are crucial in shaping the reputation of both museums and places. Museums increasingly use online communication to pursue their cultural mission by expanding their influential area, being more attractive and ensuring financial sustainability. By doing this, they contribute to the online reputation of their own and the places in which they operate. Communicating through social media, museums stimulate online cultural participation, boosting visitors to create new and original content. Moreover, blogs and web platforms help visitors describe their experiences and share opinions on the museum's activities. Therefore, online reputational capital might become a resource for both museums and places.

While the power of museums to positively impact the reputation of places is recognised, it is often underestimated and untapped. In this sense, there is a lack of studies examining the role of museums and their digital dimension in the city's reputation. In order to fill this gap, this research aims to understand how the museum's online

reputation can influence the city's online reputation by analysing the case of the Uffizi Galleries and the city of Florence.

The Uffizi Galleries are one of the world's most famous and visited museum complexes. Since 2014, they spent much effort managing their online and offline reputation to become increasingly recognisable and present online. This strategy has positively influenced their image as a contemporary international museum, stimulating content creation and online discussions, with an impact on Florence's visibility.

Using the Topic modeling technique, the analysis explores the topics associated with the Uffizi Galleries and the city of Florence in online discussions and categorises them according to the city's reputation dimensions identified in the literature. Using the programming language Python, a dataset was created collecting data through web scraping techniques from Twitter, TripAdvisor, local, national and international newspapers. These sources have been selected to collect the opinions of locals, tourists, and Italian and international press, both in English and Italian. The period taken into consideration goes from January 2018 to January 2022.

The analysis followed several steps. After setting up the dataset, data were cleaned through tokenisation, filtering, lemmatisation, and stemming. Then, the Latent Dirichlet Allocation (LDA) probabilistic clustering algorithm allows the extraction of thematic information (topics) in the online discussion. Using text mining techniques, it was possible to identify the main topics and the semantic associations between the Uffizi Galleries and the city of Florence. The emerging topics were categorised according to the different dimensions identified in the literature on city reputation.

The research contributes to the literature on place reputation, shedding light on the contribution of museums to the reputation of places. The research has implications for cultural policies, as it highlights a new function of museums which, if exploited and recognised by local authorities, can help territories' economic, social and cultural development. Finally, the research has implications for the communication strategies of museums, as it highlights how greater online visibility through institutional

communication can not only make the museum more accessible and close to society by perpetuating its mission but also reaffirm its crucial role in the development of the city.

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Playing with "Phygital" Culture

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The paper explores the transformations in the gaming industry and the intersection of cultural and creative industries (CCIs) with the gaming industry.

The aim is to provide a comprehensive examination of this complex subject, which involves multiple interdisciplinary fields of study, and to engage in a deep discourse on the topic by drawing from a large number of studies. In particular, the study aims to examine the trends, challenges and opportunities of digital games in CCIs, including the impact of new technologies, globalisation and changing consumer behaviour.

More specifically, the research question is: what is the role played by digital games within the creative and cultural industries?

The evolving relationship between culture, creativity, and technological innovation presents fresh challenges for cultural organizations in the digital age. The gaming industry, deeply rooted in culture and media, offers interactive experiences that can bridge the gap between cultural heritage and its audience. The gaming industry's growth now surpasses other industries like music and film in terms of revenue and circulation. This consolidation underscores the significant influence of the gaming industry on culture, knowledge, language, and the economy (Lazzeretti, Oliva, Innocenti & Capone, 2022).

Using video games as a catalyst for innovation and cultural promotion can rejuvenate cultural domains and engage users. By adopting digital technologies, including serious games, these organizations can enhance access to cultural heritage, engage audiences, and promote culture in the digital age. For the identification of relevant literature, a literature review was carried out, in which two scientific databases were searched, namely Scopus and Web of Science (WoS), which were chosen for the reason that they

index all of the other potentially relevant databases, for example ACM, IEEE, Springer, and the DBLP Computer Science Bibliography. To ensure rigor and clarity, it is generally preferred to conduct searches in a limited number of comprehensive databases rather than multiple ones (Paré & Kitsiou, 2017). After developing several possible search queries, the one that most closely matched was selected to collect review studies that cover digital games, gamification and serious games in general, as well as those pertaining to specific outcomes such as cultural and creative industries, motivation, behavior, and learning. The aim in using these search queries was to encompass academic literature, within the selected databases, that pertains to digital games in the context of creative and cultural industries (CCIs).

The review adheres to the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) methodology, which has become a new standard for narrative, qualitative, and mixed methods syntheses that emphasize quantitative data synthesis (Maraolo, 2021). As the PRISMA methodology envisages, the work is based on well-structured and standardised steps, such as: protocol development, i.e., outline the research question, inclusion/exclusion criteria, search strategy, data extraction methods, and analysis plan; identification of relevant studies in electronic databases, gray literature, and other sources; study selection, where, the full texts of potentially relevant studies are assessed against pre-defined inclusion and exclusion criteria to select studies that meet the review's objectives; data extraction, in which relevant data from selected studies are extracted using a standardized data extraction form; quality assessment that helps in assessing the strength of the evidence and potential sources of bias in the included studies; data synthesis that may involve statistical techniques such as meta-analysis if appropriate; reporting the title, abstract, introduction, methods, results, discussion, funding, and conflicts of interest; and finally the risk of bias assessment, that allows the reviewers to evaluate the internal validity and quality of the evidence.

The article is structured as follows. An introduction reflect on heritage fruition through museums and the possibilities of technological innovation in the museum sector. The paper also analyzes the production logics of CCIs and the digital game industry, emphasizing the importance of "circulation" over "distribution" (Kerr, 2021).

In addition, the research delves into the gaming industry, including digital games, their history, and their current state. It examines the global video game markets and the undeniable reality of the esports ecosystem, which has become inseparable from the gaming industry. The study also explores the various job opportunities within the gaming industry and analyzes its business model, including a discussion on unsustainable gaming behaviors.

Theoretical foundations related to the research topic are explored, including game theory, game science, and the connections between them. The paper examines the theoretical underpinnings of game psychology, encompassing concepts such as flow, agency, and motivations. It also explores the self-determination theory (Deci & Ryan, 2002) and provides an overview of gamification, its definition, and principles.

Furthermore, the research investigates what happens during the act of playing, focusing on fostering a cycle of involvement through the MOAR scheme (Viola & Cassone, 2017). It explores the user experience and audience engagement in gaming and emphasizes the importance of planning a human-centered process in game development and design.

Through a comprehensive analysis of the gaming industry, CCIs, and theoretical frameworks, this paper aims to provide insights into the dynamic relationship between culture, technology, and gaming. The findings contribute to the understanding of the evolving landscape of digital entertainment and its impact on cultural heritage, user experiences, and audience engagement.

Findings show that the intersection of video games and the cultural and creative industries is a rapidly expanding and multifaceted field. Video games have become significant elements of popular culture, with franchises becoming cultural phenomena and game concepts and characters permeating mainstream references. This transformation has led to a redefinition of play and a new societal paradigm. The video game industry has emerged as a prominent force, blending cultural and technological elements and engaging diverse groups (Lazzeretti, 2022).

One crucial aspect is the use of video games as a form of storytelling and expression on an individual and community level. Many games feature intricate narratives and well-developed worlds that function as interactive storytelling experiences. This, in turn, has led to video games being studied on the one hand as a means of increasing engagement, and on the other hand as a means of communication and expression. Within the cultural and creative industries, it is not uncommon to find video games designed as interactive art, exhibited in museums and galleries.

The educational and training sectors have also embraced video games. Institutions offer game design and development programs, while companies use games for employee training. The therapeutic and health-related applications of video games are expanding, aiding in physical rehabilitation, mental health, and promoting healthy behaviors.

From a business perspective, the video game industry has grown to become one of the largest entertainment industries worldwide, with significant revenue projections. This growth has spurred research on the economic and business aspects of the industry, including market analysis and monetization strategies.

Despite the growth of the industry and its global employment opportunities, comprehensive empirical studies on video game development work are relatively limited. Challenges in accessing the field and the industry's culture of secrecy contribute to this scarcity.

The paper concludes with reflections on the implications of the study's findings and potential future directions for research and practice in this field.

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