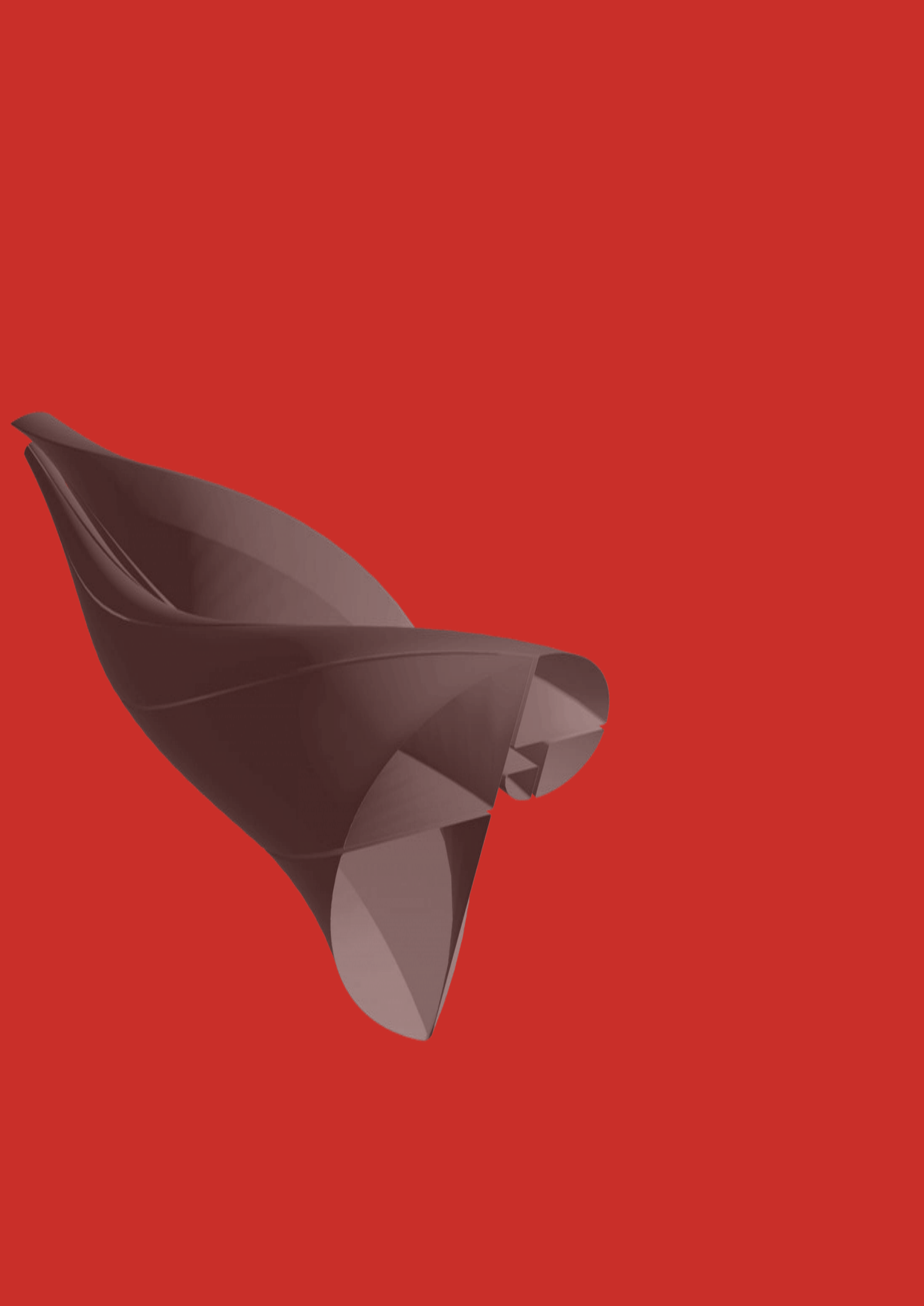


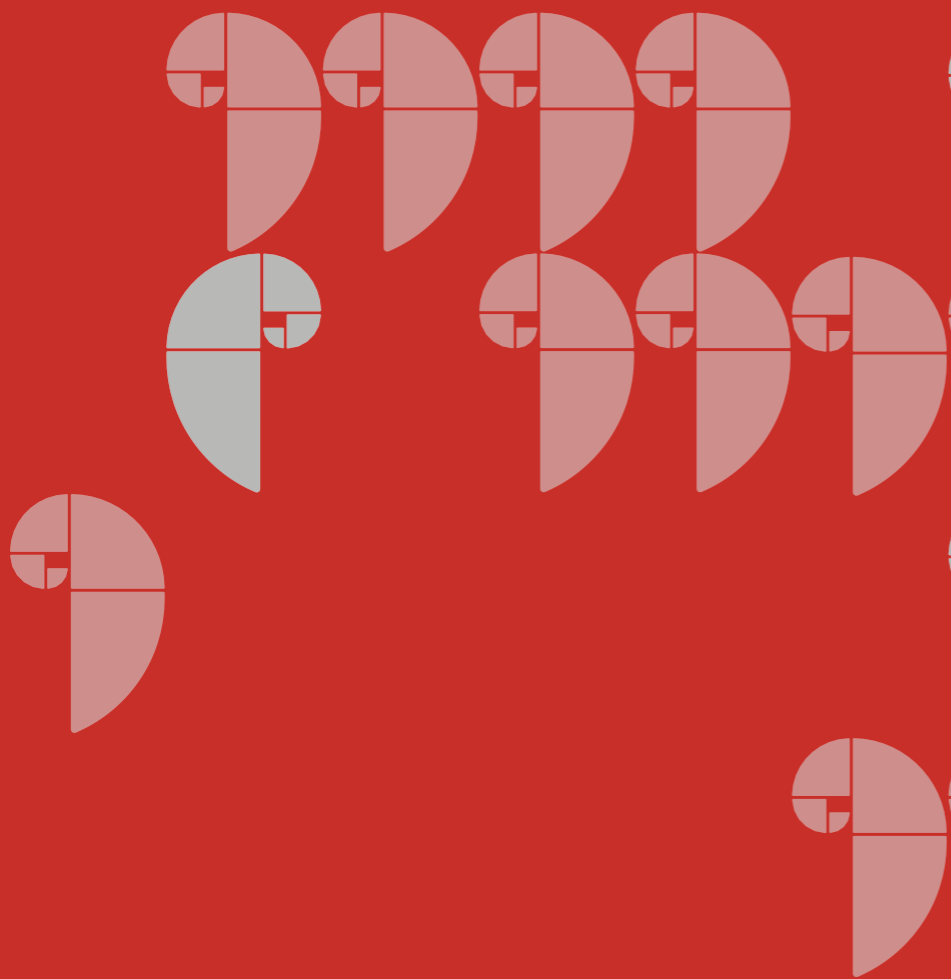
IX Regional

HELIX 25

Transforming regions through
innovation, sustainability
and collaboration

Bragança . 2025





TOPICS

Management
Innovation
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Book of Extended Abstracts

IX Regional Helix'25

Transforming regions through innovation, sustainability and collaboration

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Acknowledgement and Gratitude

On behalf of the Organising Committee, we would like to extend our sincere thanks to everyone who contributed to the success of the IX International Regional Helix'25 Congress, held from 26th to 28th June at the School of Technology and Management of the Polytechnic Institute of Bragança (IPB), and organised by the Applied Management Research Unit (UNIAG).

The event demonstrated the essential role of collaboration among the four key actors of the Quadruple Helix model - academia, industry, government, and civil society - as a driver of sustainable regional development. We were especially pleased to count on the participation of members from the STARS EU consortium and the Thematic Interest Group (TIG) on Entrepreneurship & Innovation, whose contributions to the organising and scientific committees, as well as to the scientific programme, reflected a strong commitment to cooperation and innovation.

A particularly memorable moment of the congress was the round table "Transforming Regions through Innovation, Sustainability and Collaboration", which fostered critical dialogue on the challenges and opportunities of collaborative innovation and the role of the Quadruple Helix in regional transformation. We thank all speakers for their valuable contributions and for enriching this important session with meaningful perspectives.

The programme also included a Doctoral Forum, offering PhD students a valuable platform to present their research and receive feedback from experienced academics. This initiative supported scientific quality, intergenerational exchange, and the visibility of emerging researchers in an international context.

A total of 62 papers were submitted, representing over 150 authors and addressing a wide range of themes, including management, digital transformation, tourism, cultural heritage, entrepreneurship, regional economics, sustainability, and green transitions. Eleven of these papers were recognised during the closing session for their scientific excellence.

The quality and impact of the congress are a direct result of the outstanding work presented and the depth of discussion led by all participants, researchers, keynote speakers, and moderators. With participants from Albania, Brazil, Chile, Colombia, Mexico, the Netherlands, Spain, and Portugal, the congress reinforced its international dimension and its role as a platform for knowledge sharing, collaboration, and regionally focused innovation.

We are grateful to the Presidency of the Polytechnic Institute of Bragança, the Management Board of the School of Technology and Management, the Vice-Presidency for Communication, and the IPB Image Services and IT Technical Services for their support, as well as to the Foundation for Science and Technology, UNIAG, and all sponsoring organisations, both public and private, for making this event possible.

A special thank you goes to the Scientific Committee and the Steering Committee, whose valuable guidance and support were instrumental to the success of Regional Helix'25. Last but not least, heartfelt thanks to the Organising Committee and its dedicated team for their commitment, professionalism, and enthusiasm throughout what was both a challenging and rewarding mission.

As this chapter closes, we reaffirm our belief in the relevance and future potential of the Regional Helix initiative. We hope it continues to inspire reflection, foster meaningful debate, and open new paths for cooperation, knowledge transfer, and shared development.

Many thanks to all!

Paula Odete (General Chair)
UNIAG, Instituto Politécnico de Bragança, Bragança, Portugal

Awards

Best Paper Award Certificate

Session: Doctoral Symposium

Paper: The University as an Ecosystem: Exploring Relationships with Environment and Stakeholders

Authors: Paula Marchant-Pérez, João Ferreira, & David Urbano

Session: Collaboration and Networks

Paper: Defining Industrial Tourism in the Cross-Border Region of Portugal and Spain

Authors: Elaine Scalabrini, Francisco Alves, Reginaldo Neto, Felipe L. Teixeira, Joaquín Garcia, Miguel Velasco, João Paulo Teixeira, Roberto Ivo Vaz, & Paula Odete Fernandes

Session: Digital Transformation

Paper: Does Virtual Reality Tourism Have a Future? An Application of the PPM Framework

Author: Sonia San-Martín

Session: Innovation

Paper: What's Behind China's Technological Paths? A Study on Green Patents in Nuclear Energy

Authors: Frederico Donadon, Geciane Porto, & Alexandre Dias

Session: Management

Paper: The Impact of Corporate Governance on the Debt: The Hospitality Industry

Authors: Barbara Pereira, Jorge Alves, & Nuno Moutinho

Session: Regional Economy

Paper: Motivations to Interact with Industry and Academic Engagement

Authors: Alexandre Dias, Camilly Ferreira, & Flávia Vicentin

Session: Sustainability

Paper: Enhancing Renewable Energy Utilization Through Residential Peer-to-Peer Trading

Authors: Paulo Borges, Maria Varanda Pereira, & Ângela Ferreira

Session: Tourism and Cultural Heritage

Paper: Within the Walls: An Augmented Reality and Serious Game to Engage Generation Z in Historical Sites Visits

Authors: Roberto Vaz, Márcia Vaz, Paula Odete Fernandes, & Hélder Gonçalves

Honourable Mention Award Certificate

Session: Digital Transformation

Paper: Big Data Analysis in Cost Management: Opportunities and Challenges in a Regional SME

Authors: Joaquim Leite, Cecília Carmo, & Virgínia Guedes

Session: Entrepreneurship and Regional Economy

Paper: AI-Driven Sustainable Alliances for Regional Innovation: Strategic Governance and Digital Transition

Authors: Diederich Bakker & Daniela Naydenova

Session: Tourism and Cultural Heritage

Paper: Growing Younger through Travel: Senior Tourism Strategies for Well-Being in Ageing and Low-Density Territories

Authors: Jessica Ferreira, António B. Fernandes, & Sofia Cardim

Regional HELIX'25 Programme

26 . 27 . 28 June 2025

Day 1

26 June • Thursday

09h30 Participants Reception | Escola Superior de Tecnologia e Gestão (ESTiG)

09h45 Doctoral Symposium | Eng. Alcínio Miguel Auditorium

12h30 Lunch | IPB Canteen

14h00 Secretariat for Registration | Eng. Alcínio Miguel Auditorium

14h30 Musical Moment | Eng. Alcínio Miguel Auditorium

14h45 Opening Session | Eng. Alcínio Miguel Auditorium

Orlando Rodrigues, President of the Instituto Politécnico de Bragança
Nuno Ribeiro, Head of the Escola Superior de Tecnologia e Gestão
Luís Farinha, Member of the Steering Committee of Regional Helix'25
Paula Odete Fernandes, General Chair of Regional Helix'25

15h15 Round Table: "Transforming regions through innovation, sustainability and collaboration" | Eng. Alcínio Miguel Auditorium

Luís Pais, Vice-President of the Instituto Politécnico de Bragança and STARS EU
Coordinator at IPB
Raquel Meira, Director of the Regional Planning and Development Unit, Northern Regional
Coordination and Development Commission (CCDR-N)
Marina Ranga, Manager of the Ulyseus Innovation Hub, University of Seville
Augusto Oliveira, CEO of C-Pack Creative Packaging Portugal
Moderator: António José Rodrigues, Mensageiro de Bragança

16h45 Coffee Break | Auditorium Foyer

17h25 Parallel Sessions

20h15 Gala Dinner with D'Alma Fado | Pousada São Bartolomeu

Day 2

27 June • Friday

09h30 Social Programme – Bragança: Walk, Feel, Discover | Meeting Point: Praça da Sé, Bragança
13h30 Free time for lunch

09h15 Participants Reception | Escola Superior de Tecnologia e Gestão (ESTiG)

09h30 Parallel Sessions

11h00 Coffee Break | Auditorium Foyer

11h30 Parallel Sessions

13h00 Lunch | IPB Canteen

14h30 Parallel Sessions

16h30 Awards Ceremony Regional Helix'25 | Eng. Alcínio Miguel Auditorium

17h00 Closing Session | Eng. Alcínio Miguel Auditorium

Dionísio Gonçalves, President of the General Council of the Polytechnic Institute of Bragança
Orlando Rodrigues, President of the Instituto Politécnico de Bragança
Pedro Lima, President of CIM Terras de Trás-os-Montes
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Paula Odete Fernandes, General Chair of Regional Helix'25

17h40 Musical Moment | Eng. Alcínio Miguel Auditorium

18h00 Port of Honour | Auditorium Foyer

Day 3

28 June • Saturday

09h30 Social Programme – Bragança: Walk, Feel, Discover | Meeting Point: Praça da Sé, Bragança

13h30 Free time for lunch

Index

Doctoral Symposium Session	15
Cooperation networks and environmental sustainability in the automotive industry: a case study in Bragança	16
The university as an ecosystem: exploring relationships with environment and stakeholders	20
Sustainable Growth in the Stone Sector: Innovation, Internationalization and the “Sustainable Stone by Portugal” agenda	24
Youth entrepreneurship: a bibliometric analysis, collaboration networks and new trends	28
Improving tourism demand forecasting with online data: a literature review	32
The linkage of green entrepreneurial intentions on social change in university students	36
Management	41
Institutional work to legitimize digital banks: documentary research of XP Investimentos in Curitiba, Paraná, Brazil	42
Turnover: a survey with professionals from software companies of a technology-based incubator	46
The interrelation between environmental, social, and governance (ESG) and transparency: a bibliometric analysis	50
How may crowdstrike it outage affect tourism firms and destinations?	54
From students to entrepreneurs: the forces that shaped entrepreneurial intentions in higher education institutions	58
Innovation	63
Smart specialisation strategy and its effects on regional innovation: insights from northern Portugal	64
New residents and emerging dynamics: social innovation processes in rural territories	68
Study of the Determinants of Innovation in Portuguese Companies: Application to the Engineering & Tooling Cluster	72
Changing the mindset for circular economy, through its benefits	76
Mapping user needs in the competitive trading card game community	78
Sustainability	81
Enhancing renewable energy utilization through residential peer-to- peer trading	82
Digital Transformation	86
Adoption of wearables: a UTAUT2 perspective	87
Does virtual reality tourism have a future? An application of the PPM framework	91
QualyTools: an online collection of tools for quality management and control	95

Collaboration and Networks	99
Open innovation and co-creation in home care services. A case study for regional inclusive innovation	101
Defining industrial tourism in the cross-border region of Portugal and Spain	104
The reciprocal dynamics of internationalization and quality of life: an institutional and resource-based perspective	108
Empowering entrepreneurship in Ibero-American HEIs: training needs assessment and strategic framework	114
Entrepreneurship	119
Transcultural and adaptive entrepreneurship: social status challenges and fear of failure among Brazilian entrepreneurs in Portugal	120
Albania's role and Western Balkans in green transition: green finance and eu partnership	125
Tourism and Cultural Heritage	129
Enhancing cohesion and long-term competitiveness with circular economy strategies in the hospitality industry. The case of the Costa del Sol tourism ecosystem	130
Trends and thematic insights into educational technologies: a focus on tourism and hospitality education	134

Doctoral Symposium Session



COOPERATION NETWORKS AND ENVIRONMENTAL SUSTAINABILITY IN THE AUTOMOTIVE INDUSTRY: A CASE STUDY IN BRAGANÇA

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Abstract

Despite increasing scholarly attention to environmental sustainability, empirical research remains limited regarding the functioning of cooperation networks within intricate industrial environments. This study investigates the role of cooperation networks in promoting environmental sustainability specifically within the automotive industry, focusing on a qualitative case study conducted in Bragança, Portugal. Drawing upon Resource Dependence and Transaction Cost theories, the research utilizes six interviews and ten supporting documents for analysis. The findings highlight practices consistent with circular economy principles and underscore the critical roles of strategic leadership and effective information sharing. Results reveal that operational integration and strong relational ties significantly support successful environmental initiatives. Nonetheless, persistent challenges such as resource asymmetries, misaligned priorities, and communication breakdowns were identified. The study proposes a theoretical model connecting governance mechanisms with environmental outcomes, enriching the understanding of sustainable environmental cooperation in industrial networks. It concludes that structured networks, grounded in mutual trust and commitment, are instrumental in accelerating the ecological transition.

Keywords: Cooperation Networks; Environmental Sustainability; Automotive Industry

1 INTRODUCTION

The growing global concern with climate change, the scarcity of natural resources, and environmental degradation has intensified pressure on firms to adopt more sustainable and environmentally responsible practices [1]. Industry, particularly the automotive sector, is at the center of this challenge. Due to its high operational complexity, strong international integration, and extensive supply chains, the automotive industry has been increasingly targeted by stringent environmental regulations, such as the European End-of-Life Vehicles Directive and the EURO 6 emissions standard. The automotive sector is currently undergoing a profound restructuring process, driven by the urgent need to reduce its overall environmental impact. There is a growing international mobilization toward integrating circular economy (CE) principles throughout the entire vehicle lifecycle, as the previous model is increasingly seen as unsustainable in light of the Paris Agreement's climate goals [2].

The theoretical foundation of cooperation networks can be strengthened by two widely recognized approaches: Transaction Cost Theory (TCT) [3] and Resource Dependence Theory (RDT) [4]. TCT argues that firms select organizational structures that minimize the costs associated with negotiating, monitoring, and enforcing transactions. This rationale is especially relevant in contexts involving high asset specificity, as is often the case in complex industrial sectors. Asset specificity tends to increase the risk of opportunistic behavior, thus requiring the use of formal governance mechanisms, such as long-term contracts, or relational strategies based on trust [5]. Meanwhile, RDT posits that no organization is self-sufficient, and all depend on the external environment to ensure their survival and access to critical resources. This perspective justifies business cooperation as a response to resource scarcity and the need to reduce environmental uncertainty. The greater the mutual dependence between organizations, the higher the likelihood of stable collaboration and benefit-sharing, even in scenarios of power asymmetry [6]. These two theoretical approaches offer complementary perspectives. TCT focuses on organizational efficiency and transaction control mechanisms, while RDT emphasizes the role of interdependence and relational vulnerability as drivers of cooperation [7].

In this context, cooperation networks between firms play a strategic role, enabling the sharing of resources, capabilities, and innovations that support the implementation of circular economy practices [8]. Such networks foster environmental gains by reducing emissions, improving energy efficiency, and promoting integrated waste management [9]. Specifically in the automotive industry, cooperation is critical for encouraging sustainable practices along the value chain, promoting ecodesign, and enhancing the recyclability of components [10]. This study thus seeks to provide a deeper understanding of the potential of cooperation networks as enablers of sustainable transition, demonstrating that working in networks enhances the effective and accelerated adoption of sustainable practices by fostering synergies that would be difficult to achieve in isolation. Moreover, such networks help optimize logistics processes, reduce waste, and improve energy efficiency, offering a viable pathway toward meeting stringent environmental targets [11].

Empirically, there is a scarcity of studies applied to territorial and multifunctional networks in complex industrial contexts, such as the automotive sector [1]. This study aims to fill that gap through an in-depth case study, seeking to illustrate how cooperation among firms can be translated into concrete environmental sustainability actions, with a particular focus on waste management and the promotion of circular economy practices.

2 METHODOLOGY

2.1 Type of study

This research adopts a qualitative and exploratory approach, focused on an in-depth analysis of a complex phenomenon situated within a real organizational context. The selected method is the case study, as it is well-suited to the objective of understanding how business cooperation networks contribute to environmental sustainability, considering the contextual and relational specificities of the organizations involved. In the context of research on cooperation networks, the case study is particularly valued for its ability to capture temporality, relational embeddedness, and the dynamic evolution of interfirm cooperation [12].

2.2 Justification for the Case Selection

The case selected for this study is the cooperation network led by Forvia, located in the industrial park of Bragaça, Portugal. This network integrates several partner firms, namely PreZero, Farboque, and ICA People & Food (ICA), which operate in coordination with Forvia, providing specialized services in the areas of industrial production, logistics, maintenance, and food services. The simultaneous presence of a multinational corporation and local firms enables the observation of how global dynamics articulate with territorially grounded cooperation practices, fostering geographic proximity synergies. This logic of shared responsibility among multiple actors is also emphasized, pertaining that sustainability can only be achieved through cooperation networks [13]. This approach provides an effective analytical framework to understand the relationship between global and local actors and how this interplay can be leveraged to promote sustainability [14].

2.3 Data Collection

The data collection for this study followed a qualitative and interpretive approach, using semi-structured interviews as the primary data collection technique [15], and document analysis was used to further validate the findings. The interview script was theoretically grounded. A total of six in-person semi-structured interviews were conducted with employees from the network firms. The participants were selected based on their active involvement in collaborative processes and environmental practices developed within the network. The sampling followed a purposive strategy, aimed at ensuring representation from different hierarchical levels and organizational functions relevant to cooperative sustainability practices [16]. The sample thus included individuals from all firms in the network, from intermediate and technical management positions (E1, E2, E3) as well as operational roles directly involved in logistics, waste management, and food services (E4, E5, E6), enabling a cross-sectional analysis of the phenomenon. The decision to end data collection after six interviews was based on the observation that no new relevant themes were emerging during data analysis, indicating theoretical saturation [17], in line with the theoretical and purposive sampling logic adopted. In addition to the interviews, ten internal institutional documents (D1-D10) were also collected and analyzed, with emphasis on organizational communication materials, operational reports, and environmental cooperation protocols.

2.4 Data Analysis

The data were analyzed following the principles of thematic analysis, adopting an inductive and reflexive approach [18]. This approach enables the identification of recurring patterns of meaning in participants' testimonies. The analytical process followed the six phases of thematic analysis [19] which ensures a rigorous and transparent treatment of qualitative data and the coding processing assisted by MAXQDA Analytics Pro [20]. To strengthen internal validity and deepen understanding of the phenomena studied, methodological triangulation was employed, combining the primary data with secondary data from institutional documents and internal communication materials.

3 RESULTS

The cooperation among firms in the network is characterized by informal yet highly functional relationships. As one participant described, "We work side by side every day, we're inside their facilities, we're almost like an extension of their internal team" (E3). This day-to-day integration is facilitated by constant, face-to-face communication and immediate problem-solving, fostering a collaborative culture that supports operational agility. Although not all relationships are formalized through contracts, all partners are required to meet strict environmental and safety standards. As noted by E2: "We have very clear internal processes for managing external firms; all must be evaluated, approved, and comply with environmental and safety requirements". Environmental initiatives within the network are largely driven by Forvia's "Blue Effect" program, which aims to achieve carbon neutrality by 2045. This initiative necessitates full alignment among all partners, regardless of their size or role. According to E2, "For the Blue Effect we need everyone to be aligned, from the biggest partners to the smallest ones." PreZero, Forvia's core environmental partner, plays a particularly strategic role through its direct involvement in waste management, environmental training, and ongoing performance monitoring. As E3 explains, "It's not just about collecting trash. It's about thinking of the best way to prevent waste from existing in the first place." The results also show a shift in workplace culture, with increased environmental awareness among employees. "There are more zones with proper separation, fewer errors. And Forvia's own workers now ask if they're doing it right," reported E4, highlighting the success of internal education efforts. Despite these achievements, the study identifies several challenges that limit the full realization of environmental goals. One major barrier is the asymmetry of resources and priorities among partners. "Sometimes there's a mismatch between what's a priority for us and what's a priority for them," observed E2. Smaller firms often find it difficult to meet the pace and expectations set by Forvia. As E5 noted, "We can't always move at the speed they want." Behavioural issues at the individual level also pose obstacles, with some workers showing resistance or lack of engagement. "The biggest issue is people not sorting waste properly. [...] The worst are those who just don't care," stated E4.

4 CONCLUSIONS

The case study shows that when a powerful lead company such as Forvia sets ambitious, non-negotiable sustainability targets, it can draw a circle of firms into a cooperative network that materially reduces waste and carbon emissions. Clear strategic leadership from the central firm is only the first step; day-to-day gains come from dense, trust-based interaction on the shop floor, where joint teams mobilize informal knowledge and solve problems in real time. That relational proximity works in tandem with more formal, contract-based controls, reflecting an underlying blend of RDT and TCT logics: partners need each other's resources, but they also need governance to limit opportunism. When the context (leadership, proximity, shared goals) is right, the network adopts common practices, integrated waste-sorting stations, shared training modules, cross-firm eco-innovation projects, that steadily lift resource efficiency and burnish collective reputation. Yet progress is uneven. Smaller partners will struggle with the cost of new equipment and training, power asymmetries draw out negotiations, and worker-level engagement can fade unless supervisors keep reinforcing simple visual cues and on-the-spot coaching. Managers therefore learn to treat environmental KPIs as supplier-selection criteria even when greener options cost more up front, and policymakers see value in subsidizing capacity-building for the weakest links in the chain.

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The university as an ecosystem: exploring relationships with environment and stakeholders

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Abstract

As a complex organisation, universities create and generate value through their relationships with the environment and stakeholders, requiring a relational perspective supporting an interconnected ecosystem in various contexts, actors and stakeholders. This study, based on a qualitative methodology involving semi-structured interviews conducted at universities in Chile and Portugal, analyses the characteristics of the external ecosystem of universities and their interactions with stakeholders. The results show that universities face different contexts supported by their strategic plans and linkage policies, using the ecosystem strategy to align and balance actors, stakeholders and activities. Relationship priorities with the environment and stakeholders are guided by the strategic plan and the needs of the academic units, taking into account barriers, facilitators and external and internal factors that influence these relationships. To establish connections, universities use agreements, promote activities, and implement communication strategies that are shaped by various contextual factors. The study makes theoretical and practical contributions, serving as a basis for future research.

Keywords: university ecosystem, university-ecosystem relationship, university-stakeholder relationship

1 INTRODUCTION

A contemporary university is a complex organisation that benefits from designing and implementing an integral and systemic approach [1]. It is embedded in diverse contexts that vary in scale, scope, quality of research, history and culture, location and local networks, resources and capacities [2]. The university's functions are interlinked with the economic, social and environmental priorities of the community or society in which it is located [3], and it continually adapts to the dynamics of the underlying economic forces [4]. In this sense, a university's ability to create value is directly related to the quality of its interactions with stakeholders [5], identified as strategic actors within the focal ecosystem [4]. An actor is defined as someone who occupies a structural position within an ecosystem, whether it be a university, company, consultant, academic, among others, performing functions such as transferring knowledge, solving problems and establishing new connections with other actors, thereby expanding networks of collaboration and contacts [6]. Ecosystems involve collaboration between public and private actors, resulting in shared resources, priorities and joint solutions [7]. That context is shaped by activities, institutions and relationships that lead to the emergence of interdependencies between actors and stakeholders [8]. Universities, with a variety of internal and external actors [4], require a relational approach that can sustain a broad and interconnected ecosystem [6], implementing strategies that facilitate the construction of networks and strengthen resources in dynamic environments [9]. In this

sense, helix models [7] seek to identify and highlight the relationships between the different participating actors [4], analysing the underlying dynamics of these interactions [7]. However, helix models are sometimes criticised for their lack of context and oversimplification of stakeholder relations [1], resulting in a disconnection from the influence of the external environment. On the other hand, the relationship mechanisms between universities and their external ecosystems, along with the actors and stakeholders that comprise them, remain largely unexplored and, therefore, represent an emerging area that requires further research [5]. Although the literature provides evidence on some mechanisms of technology transfer networks, where different actors act as intermediaries in the transition between knowledge and business ecosystems [6], this evidence does not fully cover the contexts and factors that can facilitate or create barriers in these interaction processes. The relationships established by universities with ecosystems influenced by volatile, changing, and ambiguous external contexts [1,2] require more attention.

Therefore, to address these gaps, this study seeks to answer the following research question (RQ): How do universities relate to their external ecosystem and interact with their actors and stakeholders? Therefore, this study aims to examine the characteristics of the external ecosystem of universities and their interactions with stakeholders. To address the RQ and achieve the proposed objective, a qualitative methodology based on semi-structured interviews was employed, focusing on public universities in Chile and Portugal. This study contributes to the literature by defining the ecosystems in which universities participate and the relationship between universities and actors/stakeholders, providing a classification for the activities involved. From a practical view, this study outlines the characteristics of the relationships and interactions with the ecosystem and stakeholders that could assist in the decision-making process.

2 METHODOLOGY

This empirical study employed a qualitative approach based on semi-structured interviews with key informants from public universities in Chile and Portugal. This methodology enabled the examination of a phenomenon while considering adaptations to its embedded context [10], fostering a deep and detailed understanding of the data collected [11]. In addition, analysing multiple cases allowed for the identification of differences and similarities between the universities studied, contributing to a more robust assessment and facilitating the analysis of the conclusions [12]. The cases were selected intentionally based on the researchers' judgment and the sources needed to obtain the information [11]. Chile and Portugal are member countries of the OECD (Organisation for Economic Co-operation and Development) and follow parameters, standards and policies that promote prosperity and solutions to social, economic and environmental challenges [13]. This criterion guarantees the unification of similarities in the objectives and indicators that OECD countries must report. Another criterion adopted was the exclusive public funding of the universities included in the sample. The names of the universities were obtained from each country's higher education legislation [14,15]. The final sample consisted of universities that accepted the invitation by email to take part, seven from Chile and six from Portugal. The key informants of the selected universities were the heads or representatives of the community liaison, institutional relations or strategic management departments.

Data collection was based on 18 semi-structured interviews with key informants, which allowed the study to explore experiences, opinions, and knowledge, yielding detailed information [16]. The literature review guided the formulation of the questions, which were organised under the dimension of Ecosystem and Relationship with the external ecosystem and stakeholders, guiding the subsequent analysis. The information collected in the interviews was analysed using NVivo coding software, applying a deductive approach to the coding process.

3 RESULTS

3.1 Ecosystems

3.1.1 Contexts

Regarding the contexts with which universities interact, the most challenging are related to the regional context due to its interior location, low population density and little innovation; the school system, due to the gaps that students have when entering higher education; the social context due to its dynamism; the business fabric due to its working logics; the political context due to changes in authorities that influence the development of projects; and the financial context due to the lack of resources for public

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universities. The least challenging contexts are the local context, due to its proximity to the community, and the university and inter-university context, because the working dynamics, especially those of public universities, are similar and facilitate interaction.

To address the diverse contexts, universities focus on these contexts to identify opportunities, needs, and collaboration networks. For them, the strategic plan is essential because it contains the objectives and policies for networking. Partnerships with other universities and public and private companies are also meaningful, as is participating in community forums such as working groups. They deem it essential to have funding strategies that include partnerships, internationalisation, and the development of courses tailored to the context's needs, collaborating with academic units as well, since academics frequently establish connections between stakeholders and the surrounding environment.

3.1.2 Ecosystem strategy

The universities state that it is crucial to maintain a balance between actors and stakeholders in activities for creating value, in a bidirectional relationship, contributing to co-construction and responding to the environment's needs. In the ecosystem strategy, it is also important to assess the university's capacities to determine whether it can respond to the opportunities identified in the environment.

3.2 Relationship with the external ecosystem and stakeholders

3.3 Relationship Priorities

The universities' liaison policies prioritise establishing relationships at the local and regional levels, then at national and international levels. As part of these policies, units are created to manage relationships and help build trust. The surrounding environment and its contexts are prioritised in the institutional strategic plan, considering the university's development in terms of training, the economy and regional development. The prioritisation of stakeholders, as also outlined in the strategic plan, aligns with the interests of the academic units, with academics serving as the primary articulating actors in the relationship.

Informants point out that stakeholders are important in recognising the environment's needs. The universities' main stakeholders include public and private organisations, government bodies, social organisations, universities, future students, young people and adults, *alumni*, communities and, internally, academics, staff and students.

3.3.1 Relationship characteristics

The informants recognise some barriers, facilitators, and internal and external factors involved in the relationship with stakeholders in the ecosystem. Barriers include the economy, bureaucracy, time and the systematisation of information. Facilitators include the university's history and prestige, institutional trust, academic units, students and *alumni*, and the normative framework. The external factors involved are the accreditation of higher education institutions, funding, political factors, bureaucracy and the external community. The internal factors recognised are the university's internal actors' participation, governance, and management.

3.3.2 Relationship mechanisms

In terms of relationships, universities establish agreements to formalise relations with other actors and stakeholders. In addition, they develop activities such as fairs, congresses, seminars, community services, cultural exhibitions, students' professional practices and the creation of research centres, among others. They rely heavily on communication strategies, such as the creation of offices and dissemination through newspapers and radio programmes. The factors involved in these mechanisms include funding for activities, disciplinary areas of development, academic community, formal institutional mechanisms, mutual benefit for bi-directionality, and institutional trust and reputation.

4 CONCLUSIONS

Universities relate to the external ecosystem in both more and less challenging contexts, supported by established strategic plans and binding policies, seeking alignment and balance between actors, stakeholders and activities to create value. The context provides opportunities, networks, and the need to respond. The prioritisation of contexts aligns with the strategic plan, and the needs of the academic units also influence stakeholder prioritisation, with academics sometimes acting as liaisons. In terms of

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relationships and interactions, particularly with actors and stakeholders, there are barriers, facilitators, internal and external factors. The mechanisms to interact include agreements, social, academic, regional, technological development activities, and communication strategies, influenced by different factors. Although the evidence contributes to theory and practice, this study has limitations that could be addressed in future research.

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Sustainable Growth in the Stone Sector: Innovation, Internationalization and the “Sustainable Stone by Portugal” agenda

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Abstract

This study explores the readiness of Portuguese stone sector companies to address the challenges of internationalization, digitalization, and sustainability, within the framework of the “Sustainable Stone by Portugal” agenda, supported by the Recovery and Resilience Plan. Using a qualitative approach, interviews were conducted with key stakeholders—a leading company, an industry cluster, and a government representative. The findings highlight the crucial role of clusters in knowledge transfer, support for international expansion, and the promotion of sustainable practices. Public funding and collaboration between companies and institutions emerge as key enablers of innovation and competitive positioning in global markets. The study concludes that while progress is evident, many small and medium-sized enterprises still lack strategic planning and the capacity to fully meet the demands of international markets in a sustainable and digitally advanced manner.

Keywords: Digitalization; Internationalization; Sustainable

1 INTRODUCTION

Internationalization, digitalization, and sustainability are three key growth paths for firms. Economics underscores the relevance of digital transformation as a central driver for innovation and business renewal, especially for small and medium-sized enterprises (SMEs) [1], so the relationship between network stakeholders, namely customers, government agencies, R&D organizations, and economic performance are mediated by the internationalization performance of SMEs [2]. Typically, government intervention promotes collaboration among multiple stakeholders, knowledge, and resources to explore opportunities in international markets [3]. Motivated by the significant social and economic impacts, governments have implemented specific policies/programs to improve business innovations and internationalization processes, so the ornamental stone industry is no exception and has grown progressively worldwide, both in competitiveness, obtaining greater profits and allowing long-term survival [4], Brazil being one of the largest producers of ornamental rocks, however, ornamental rock waste, in addition to being generated on a large scale, is generally disposed of in the open air. In Egypt, there are also threats as the demand for Egyptian decorative stones in construction spaces increases, so it is essential to develop new materials that reuse accumulated waste, aiming to minimize the environmental impact. Internationalisation and technological progress are therefore often considered as potentially threatening to the environment. These growth paths can only drive progress and global prosperity if they are properly sustainable, and with increasing pressure to implement sustainability practices, sustainable growth will have to be a standard followed by SMEs [5]. Measures studied in the investigation of [6] highlighted that the global economy is experiencing the most challenging era of climate change, as well as highlighted by [7] who reinforced their empirical results, highlighting that renewable energy, technological innovations and structural transition reduce the increase in environmental pollutants, facilitating the use of sustainable transport modes, as it is widely considered as a necessity to deal with these adverse effects on the quality of life of citizens, encouraging transport companies to make their business models more environmentally and socially sustainable. Renewable energy therefore has the capacity to play a significant role in energy transition initiatives, without

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significantly increasing the consumption of renewable energy, allowing for the improvement of environmental quality, achieving sustainable development and controlling global climate problems [8]. Sustainability has therefore come to assume a central role in the development strategies of extractive industries; however, resources are fundamental, and the ornamental stone sector is no exception. This sector is historically associated with significant environmental impacts and has sought to reinvent itself through the adoption of more ecological practices and innovative production processes, in line with the research of [9] who concluded that the more sustainability is valued, the greater the likelihood of adopting technological innovations and there is a strong link between process innovation and involvement with sustainability. Innovative activities boost the growth of SMEs, enabling diversification of production and processes [10]. Technological innovations are considered tools that can stimulate economic growth and sustainable development of technology, the recent development of digital technology is a key enabler of internationalization and resource-efficient business development, an innovation that SMEs find adaptable [11]. Sustainable business environment currently plays an important role in creating favorable conditions for innovation [12], contributing to the way in which digital servitization enables the internationalization of companies, enabling networked interaction between companies' digital platforms to improve international intensity and the development of digital service offerings and partnerships with ecosystems to support the internationalization process [13]. This study aims to contribute to filling the gaps identified in the literature, focusing on internationalization, digitalization and sustainability as growth options through the recovery and resilience plan promoted by the Portuguese government. The development in this area of literature allows us to raise the following research question: How prepared is the Portuguese stone sector to face the challenges of internationalization, digitalization, and sustainability, and who can cluster helps the companies in terms of knowledge to help in this process. This is a relevant research context for management research as well as for practice that aims to provide guidance tools to promote the competitiveness of companies in a complex and evolving social, environmental and technological scenario.

2 METHODOLOGY

This study adopts the qualitative method that deepens the research question, allowing greater adaptability in data collection and a more detailed analysis of the responses and reasons [14]. The confidentiality of the names of the interviewees was preserved, so from now on, we will assume the excerpts of the interviews E1, E2, E3). An interview was conducted with (E1), *“which is a limestone extraction and processing company founded in 1969 and currently present in 70 international markets. The company works with natural raw materials and promotes their use as an environmentally friendly product. In the factory, the materials derived from the processing are sent as by-products to other industries. The company uses closed-circuit water in the processing process, which is treated in a WWTP installed on the premises and the resulting sludge is sent to the cement industry or to certified landfills.”* The (E2) is a *“strategic economic cluster in the mineral resources sector and which has received recognition from the Portuguese Government, which constitutes a milestone and an important step for its management, is also financed by the European Union, which supports entrepreneurs in achieving economies of scale and international partnerships”*. Finally, we interviewed in the government area, (E3) is a political decision-maker, who plays a relevant role in Portugal's economic growth and internationalization process. (E3) states that *“within the scope of the Recovery and Resilience Plan, they promoted the Sustainable Stone by Portugal agenda that aims to enhance the relevant mobilizing and aggregating work that has been carried out in the context of the natural stone sector, for the creation of a new generation of highly disruptive and innovative products and production processes, which strengthen the sector's capacity to grow with an international bias, thus contributing to the growth and consolidation of the sector as strategic for the sustainable development of the Portuguese economy”*. (E1) states *“our company is the leader of the consortium of the Sustainable Stone by Portugal Agenda”, while (E2) “aims to contribute to the development of its associated companies and implement a new ecosystem of specialization, with international projection, which allows the effective valorization of technological knowledge, implementing the industrial processes necessary for a digital and sustainable transition, using, in the same way, new products, technologies and techniques with a markedly sustainable nature.” (E2) states “we feel that our member companies are going through decision-making moments and key moments for their businesses. Our experience in internationalization will help companies to succeed in international markets, so their growth and development depends on this entry”. (E3) states “the incentives can accelerate market diversification, reducing dependence on traditional markets and increasing resilience to external shocks. Public funding is crucial for collaborative innovation and technological development projects as it allow for the acceleration of the development of new products and/or services, boosting the differentiation of companies in international markets and boosting growth in the value chain.” (E1) states “that the strategy of this agenda promotes international*

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collaboration, supports the development of companies' international business, and maximizes cooperation with stakeholders. also the (E2) states that "participation in international fairs is a service that the cluster provides and guarantees all the logistics involved for each company. The cluster provides a list of importers and distributors in the target markets and, at the end of the event, carries out a follow-up to foster potential business. These actions are essential for companies, as they promote networking, global visibility and direct contact with customers, partners and investors, generating business opportunities and strategic partnerships. In addition, it allows companies to update themselves with industry trends, thus acquiring valuable knowledge both in terms of differentiation and innovation in the global market". (E1) shares that "we joined this project and took advantage of the opportunity to explore global markets. This mission involves prospecting, deeper knowledge of the global market, and dynamizing partnerships, and this is our path." (E2) states "that another major investment is the project for exporting companies to train in ESG criteria, which will be required by regulations, from the European Union and the production chains of large companies, who are increasingly sensitive to these issues. This is a program with generic training initiatives and specific training for companies, in which our entity is an aggregating entity and supports companies in their transition towards greater sustainability".

3 RESULTS

The support instruments allow applications to encourage collaboration in networks, promoting the sharing of resources and knowledge, enabling responses to complex challenges and financial risks associated with the rejection of applications, related to the formal requirements and economic risks dependent on the objectives and goals that must be achieved to ensure the maintenance of support. Risk management in co-financed projects must be seen as part of the strategic management of these investments, so the approach to international markets must be carefully considered, with an effective analysis and study of the risks and advantages to making a consistent and strategic decision, especially for companies. We have companies with highly differentiated products and services based on vectors such as innovation, quality and/or service, but those that succeed in the international market are those that follow the path of internationalization in an organized and strategic manner. The quality and innovation of products and/or services are essential to attract and retain customers in a highly competitive global market. The company's reputation, which involves a well-defined marketing strategy, and its operational efficiency, particularly logistics, are other factors to take into account. Currently, compliance with ESG and sustainability criteria can provide a competitive advantage. The major failures of companies in the internationalization process are their limited experience in internationalization, the lack of planning and strategy in internationalization and many of these companies are not prepared to meet the demands of international markets. It is evident from the beginning of the international expansion of companies and the barriers that may arise from the fears and expectations of entrepreneurs to overcome this period. With the support of the government and the European community, they have been able to overcome the challenges and rise up with the aim of achieving ambitious pillars for their companies and improving the competitiveness of our economy in international markets. Complementing the contribution of our study, our results suggest several practical implications, specifically addressing the level of government interventions to support the internationalization of companies. These government supports are a fundamental lever for companies to develop networks, through which they obtain valuable resources to promote their products, combined with support for the innovation of companies' processes and products. By focusing on the role of contextual factors, our study complements research investigating the aspects related to innovation and cutting-edge technology required for internationalization. Our results indicate that the future development of firms' internationalization depends on a coordinated combination of stricter government regulation of target markets and financial support systems that encourage the purchase of cutting-edge technology to foster firms' innovation. Without such support systems, firms will not be able to survive in the long term under competitive conditions, thus compromising profit-oriented business strategies. This study contributes to our understanding of the internationalization of firms in several significant ways and how accumulated experiences shape firms' decisions throughout this process.

4 CONCLUSIONS

In conclusion, internationalization can create a high degree of uncertainty and destabilize companies' routines, requiring innovative and context-specific responses. Our study offers guidelines on the internationalization process and highlights that the geographic concentration of companies operating in the same sector is advantageous as it promotes innovation and competitiveness.

Integration into a cluster is often a means for companies to achieve economies of scale that would otherwise be unattainable, enabling the formation of partnerships between companies operating in the same sector, reducing the uncertainty inherent in business and resulting in synergies of profits. Promoting cooperation dynamics is a strategy that allows companies to achieve synergies that would be

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difficult to develop if they worked in isolation from their partner-competitors. The competitive advantages of the cluster are related to easy access to component suppliers, the development of privileged information channels, the capture of specialized labor, the development of shorter learning curves and also the development of and access to technology. Diversification into non-EU markets can play an important role in mitigating risk for many companies. Attracting new productive investment projects means attracting investment and increasing production capacity, which will contribute to new exports, in a virtuous circle that will boost economic growth. Sustainability in the natural stone extraction sector can be driven by strategies that combine innovation, circular economy, energy efficiency and responsible resource management. The RRP can play an important role in this process by providing financial and strategic support, but true transformation depends on the buy-in of companies and collaboration between all actors in the value chain. SMEs based in Western economies, such as Europe, are facing a recession in their domestic markets and are therefore encouraged to expand into international markets, as domestic demand is often weak, and the path of internationalisation is a viable alternative to seeking new customers in global markets. Promote knowledge and sustainable economic valorisation of mineral resources, boosting the sector's export capacity and added value, both through deepening knowledge of the economic potential of resources and by promoting R&D+I, improving conditions for productive investment and access to markets, and stimulating inter-company and inter-institutional cooperation. Affirm the mineral resources sector as a strategic asset for the sustainable development of the Portuguese economy, intensifying its export and internationalization vocation and its capacity to create added value. By improving resource utilization, promoting circular economy principles and developing land- use-efficient plans and policies, regions can reduce import dependency, strengthening economic resilience and stability. In addition, optimizing planning and transforming mining waste into valuable resources contributes to environmental sustainability and mitigates the negative impacts of mining. This study is, of course, not without limitations. Although we have strived to make it objective and comprehensive, further empirical research is needed to fully support our findings. The limitations of this study relate to the size of the sample, resulting in constraints in terms of the representativeness of the sample. As with all studies, this one also has limitations, which must do with the small sample, which will hardly allow it to be representative of each institutional sphere. Therefore, it is considered pertinent to expand the sample to a larger universe in order to obtain greater representativeness of the spheres.

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YOUTH ENTREPRENEURSHIP: A BIBLIOMETRIC ANALYSIS, COLLABORATION NETWORKS AND NEW TRENDS

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Abstract

This study presents a comprehensive bibliometric analysis of youth entrepreneurship, based on 364 peer-reviewed articles published between 1991 and 2023, drawn from the Web of Science and Scopus databases. Using the Biblioshiny and VOSviewer software, it maps the evolution of academic output, identifies key authors and collaboration networks, and highlights major research trends in the field. The findings reveal three main thematic clusters: psychological, educational, and social factors influencing entrepreneurial development; the individualization of entrepreneurial behaviour through quantitative methods; and entrepreneurial intentions among young people, shaped by personal attitudes and reinforced by public policy. Youth entrepreneurship emerges as a multidisciplinary field encompassing management, economics, social sciences, and education, with a marked increase in publications after 2010. The United States, the United Kingdom, and Nigeria stand out as the most prolific countries in terms of scientific output. This study contributes to the systematisation of existing knowledge and suggests future research directions, including the role of culture and policy, the effectiveness of entrepreneurship education, and the impact of support networks on the success of young entrepreneurs.

Keywords: Youth Entrepreneurship, Bibliometric Analysis, Cluster Analysis

1 INTRODUCTION

Youth entrepreneurship has emerged as a topic of growing interest in both academia and public policy, reflecting its strategic role in business creation, innovation, and economic development [1]. Young people tend to exhibit a higher propensity for entrepreneurial activity compared to other age groups, making this a multidisciplinary field that spans management, economics, social sciences, and education.

Despite a significant increase in publications after 2010, the literature remains fragmented and lacks a comprehensive systematization capable of mapping the main research lines, collaboration networks, and influential authors. Only two relevant bibliometric studies have been identified: [2], based solely on the Web of Science, and [3], focused exclusively on Scopus. Both are methodologically limited by their reliance on a single data source and by their descriptive approaches, which do not delve into co-citation analyses, author networks, or thematic evolution.

This study seeks to overcome these gaps by conducting a rigorous bibliometric analysis integrating both Scopus and Web of Science databases. Furthermore, the key constructs are clearly defined: “youth” refers to individuals aged between 15 and 29, and “youth entrepreneurship” concerns entrepreneurial engagement within this age group. The search terms — Entrepreneur AND (Youth OR Young) — were applied in the title field. Analyses were carried out using Biblioshiny and VOSviewer, enabling the identification of three main research clusters: (i) psychological, educational, and social factors in entrepreneurial development; (ii) the individualization of entrepreneurial behavior through quantitative methods; and (iii) entrepreneurial intentions influenced by attitudes and public policies.

By addressing these methodological and conceptual gaps, this study makes significant contributions to the field of youth entrepreneurship. It not only provides a robust bibliometric mapping that integrates the most widely used academic databases, but also offers a detailed analysis of collaboration networks, emerging research themes, and key intellectual structures shaping the field. These insights are particularly valuable for researchers, policymakers, and educators seeking to understand the dynamics of youth entrepreneurship and to design more effective interventions. The findings of this study can guide future research agendas, inform evidence-based public policy, and support the development of educational programs that foster entrepreneurial skills among young people. The structure of this article is organized as follows: following this introduction, the methodology is described, followed by an analysis and discussion of the bibliometric results. Finally, the article concludes with key findings of the study.

2 METHODOLOGY

The methodology adopted in this study was based on bibliometric analysis, a robust and well-established approach for assessing scientific production within specific fields of knowledge. Unlike content analysis, which qualitatively examines textual material, bibliometric analysis focuses on quantifiable aspects such as publication counts and citation frequencies, offering statistically grounded insights into the evolution and influence of academic literature [4].

To ensure both breadth and thematic precision, data were collected from Web of Science and Scopus, two widely recognized and reliable databases in scientific research [5]. The search was restricted to the title field, as recommended by [6], a criterion that enhances thematic specificity by filtering out marginally relevant records. The search terms “*Entrepreneur*” and “*Young OR Youth*” were selected based on their recurrence in prior studies on youth entrepreneurship [2].

Inclusion criteria were limited to peer-reviewed journal articles and review papers published in English up to 2023, excluding book chapters, conference proceedings, and grey literature, in order to ensure academic rigour and data comparability [7]. The selection was further narrowed to subject areas such as social sciences, business, economics, management, and finance.

The data collection process followed eight structured steps: (1) database selection, (2) Boolean query formulation, (3) subject area filtering, (4) document type restriction, (5) language filtering, (6) exclusion of publications from the incomplete year 2024, (7) deduplication of records, and (8) manual screening for thematic relevance. After excluding 259 irrelevant records, a final dataset of 364 articles was retained for analysis.

The data were analysed using Bibliometrix (an R package) and VOSviewer, which enabled the application of advanced bibliometric techniques such as co-citation analysis, thematic mapping, and visualisation of collaboration networks.

A cluster analysis based on author co-citation networks was conducted using VOSviewer. This technique identifies thematic groupings based on citation patterns, revealing research streams and intellectual structures within the field. The method enables the identification of distinct yet interconnected research areas and provides a clearer understanding of how the field of youth entrepreneurship has evolved over time.

3 RESULTS

After using the two aforementioned software tools, we proceeded to analyze and present the respective data obtained.

General Data of the Database, Leading Sources and Scientific Contributions

The dataset includes 350 documents classified as articles, 1 as an “article article,” 3 as “article; early access,” 3 as “article; proceedings paper,” and 7 as reviews, with an annual average of 6.5 publications. The global average of citations per document is 12.4, while the annual average is 1.7, indicating notable variation in impact, likely influenced by methodological quality or author reputation. A total of 1,009 authors contributed, with 63 publishing individually and 946 in co-authorship. The Collaboration Index was 3.19, revealing that each multi-authored article involved, on average, over three researchers. The first identified publication appeared in 1991 [8], marking the beginning of scholarly interest in the topic. However, the 1990s saw sporadic output, with no publications in some years, reflecting limited early academic engagement. From the 2000s onward, particularly after 2010, there was a notable increase in research, indicating the growing relevance of youth entrepreneurship in the economic and social sciences.

This section also highlights key journals, influential articles and authors, country-level output, and commonly used keywords. The data come from 364 articles extracted from the Scopus and Web of Science databases (1991–2023) and were analyzed using Biblioshiny and VOSviewer.

Among the most cited journals, three stand out: *Journal of Business Venturing* leads with 387 citations, followed by *Entrepreneurship Theory and Practice* with 341, and *Small Business Economics* with 205. All three have a five-year impact factor above 7 and rank in the first quartile (Q1) of the Scimago Journal & Country Rank, underscoring their academic quality. These journals primarily focus on management, innovation, and economics.

Regarding highly cited articles, [9] is the most influential, with 227 citations, examining youth attitudes and educational practices in entrepreneurship. Next is [10], with 179 citations, analyzing young adults’ career aspirations. [8] follow with 124 citations, exploring motivational factors in adolescents. Notably, four of the top five most cited studies employed quantitative methodologies, highlighting the dominance of this approach in high-impact research.

In terms of national scientific output, the United States ranks first with 68 articles and 472 citations, averaging 6.94 citations per article. The United Kingdom follows with 40 articles and 383 citations, averaging 9.58 per article—indicating higher impact. Nigeria ranks third with 37 articles and 184 citations (4.97 average), though its academic influence is more modest. Countries like South Africa, Colombia, and Russia have averages below two citations per article, indicating limited global impact.

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Among the most influential authors, Shirokova is the most prolific, with five publications, followed by Manolova with four. In terms of average impact, Baxter and Dejaeghere stand out, with three articles and 91 citations—an average of 30.33 citations per paper—demonstrating the significance of their contributions.

Finally, the keyword analysis reveals a strong focus on core themes. “Entrepreneurship” (17%) and “youth” (15%) are the most frequent terms, followed by “entrepreneurial intentions” (9%), indicating sustained interest in entrepreneurial attitudes, motivations, and behavior. Other recurring terms include “entrepreneurship education,” highlighting the role of formal training in promoting youth entrepreneurship.

Cluster Analysis – Co-Citations

To identify the main thematic areas in the field of youth entrepreneurship, a co-citation analysis was conducted using VOSviewer. In bibliometric terms, *clusters* are groups of authors or publications that are frequently cited together, indicating a shared thematic or conceptual focus. These clusters are generated algorithmically by the software, based on similarity measures and citation patterns, and are visualised as distinct coloured groups. Each cluster reveals a particular line of research, theory, or methodological approach that characterises a subfield within the broader academic landscape. This technique allows for the mapping of intellectual structures and facilitates the understanding of how research on youth entrepreneurship is organised and has evolved.

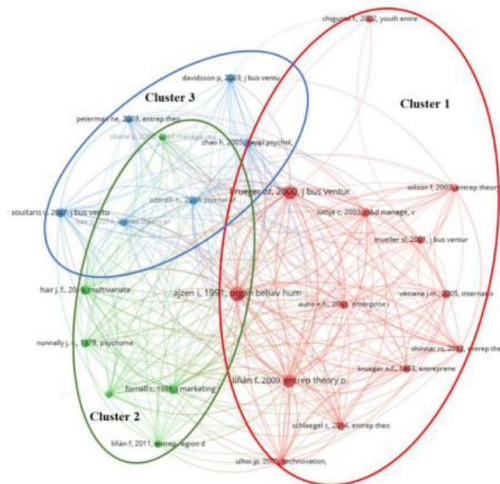


Figure 1 – Bibliometric Representation of Author Co-Citations by Cluster (VOSviewer).

- **Cluster 1 (Red) – Entrepreneurial Intentions Among Youth:** This cluster focuses on the factors that influence young people's entrepreneurial intentions [11], highlighting the Theory of Planned Behavior and the role of social support, education, and perceived feasibility [12].
- **Cluster 2 (Green) – The Individualization of Entrepreneurship Through Statistical Analysis:** This cluster emphasizes the use of quantitative methods, particularly structural equation modeling, to understand individual entrepreneurial behavior through latent variables and psychometric tools [13].
- **Cluster 3 (Blue) – Psychological, Educational, and Social Factors in Entrepreneurial Development:** This cluster analyzes how personality traits, entrepreneurial education, and social and psychological capital influence the development and success of young entrepreneurs [14].

4 CONCLUSIONS

This study contributed to a deeper and more systematic understanding of the field of youth entrepreneurship, highlighting the exponential growth of publications after 2010 and the relevance of areas such as entrepreneurial intentions, the individualization of entrepreneurial behavior, and psychological, educational, and social factors. By integrating the Scopus and Web of Science databases and using advanced bibliometric tools, it was possible to identify the most influential journals, articles, authors, and countries, while also emphasizing the importance of international scientific collaboration. The results point to the need for future research exploring the interactions between public policies, early-

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stage entrepreneurship education, and support networks as means to foster youth entrepreneurship in diverse cultural contexts and with sustainable impact.

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Improving tourism demand forecasting with online data: a literature review

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Abstract

The paper examines the current state of research on forecasting tourism demand incorporating online data by systematically reviewing quality articles in leading scientific journals. The quantitative analysis shows an increasing interest in this topic over the past decade, with studies originating from diverse countries and employing a wide range of online data sources. These involve search engine, social media, user-generated content and more. The qualitative analysis highlights the application of advanced AI-based techniques to model the relationships between internet data and tourism demand. Studies integrating multiple online data sources and advanced modelling techniques have demonstrated the ability to improve forecasting accuracy, particularly during periods of uncertainty. However, limited geographical scope, potential biases in online data, challenges in data preprocessing and issues with the interpretability of advanced forecasting models are common limitations of the studies. Hence, the authors provide suggestions for future research to achieve more accurate and reliable tourism demand forecasting, which will empower decision-making and sustainable tourism development strategies.

Keywords: Tourism Demand, Forecasting, Online Data

1 INTRODUCTION

The richness of digital content in tourism has opened new ways for analysing tourist behaviour and preferences. Lately, researchers have promoted using online data and AI-based techniques to improve the reliability of tourism demand forecasts [1]. Various online data sources have been explored, including search engine [2], posts on social media [3], online reviews [4], as well as advanced techniques such as machine learning [5] and deep learning [6] to model the complex relationships between online travel data and tourism demand. Number of tourist arrivals [7] or overnight stays [1] are the most popular measures of tourism demand. Incorporating multiple online data sources into prediction models can help improve prediction accuracy and provide valuable perspectives for travel decision-making processes. This study offers a thorough analysis of methodologies for predicting tourism demand for destinations using diverse internet data sources. This research is relevant as it provides a deeper understanding of the various data sources, methodologies, and their impacts on forecast accuracy. Moreover, given the critical role of artificial intelligence in handling complex online data, this work can shed light on the implementation of these advanced techniques in tourism demand forecasting. Finally, the findings can also identify gaps in the existing research, highlighting areas that require further exploration.

2 METHODOLOGY

A systematic literature review was applied based on two steps: a screening process to select the most relevant studies, and qualitative and quantitative analysis to extract the key trend of the topic of interest. The data was collected from the database of Scopus and Web of Science (WoS), which are well-known for their extensive coverage of tourism journals. In this study, the term “destination” refers to countries,

regions, cities, or individual attractions. Online data refers to a wide range of data types from search engines (e.g. Google, Baidu), user-generated content on social media (e.g. Facebook, Instagram) or ratings and reviews from travel platforms (e.g. TripAdvisor, Booking.com). The search was conducted on 5 May 2025, identifying important keywords relevant to the topic without the limit of publication year. The paper uses a screening process adapted from the PRISMA model. The initial search produced 511 records from Scopus and 660 records from WoS. Three hundred twenty-five articles in English in relevant research areas without duplication were selected. Next, only 283 papers published in high impact (Scimago-ranked Q1 and Q2) journals underwent a review of titles, abstracts, and full text. The final sample consists of 75 articles that are considered most appropriate and high-quality.

3 RESULTS

Qualitative and quantitative analyses were performed to understand the role online data and advanced modelling techniques in forecasting tourism demand.

3.1 Quantitative Analysis

The data shows an increasing trend in articles published from 2015 to 2025, with some fluctuations. The highest number of publications was 11 articles in 2019 and 2021, while the lowest was 1 in 2016. The distribution of articles across key journals provides insights into the multidisciplinary nature of studies on forecasting tourism demand. Tourism Management has published the most articles (9), followed by Tourism Economics with 7 articles. Other leading tourism journals, such as Annals of Tourism Research (6), Current Issues in Tourism (6), Journal of Hospitality and Tourism Research (4), and Journal of Travel Research (4) have also made significant contributions in this area.

China, including Hong Kong and Macao, has the highest number of publications (37) related to the topic of interest, while Europe ranks second (24), including the research conducted in multiple cities or countries in the region at the same time. The data also reveals that several other countries have contributed to the literature, such as the USA (3), Australia (3) and others, although to a much lesser extent compared to China. The most frequent keywords explicitly related to data sources and methodology used by the selected articles, with “big data” being the most frequently mentioned (72 papers), followed by “time series” (66), “search engine data/search queries” (58), “machine learning/deep learning/artificial neural networks” (35), “tourism demand/arrivals/flow” (72), “social media/online reviews” (23), “COVID-19/pandemic” (5). In general, the analysis of these keywords reveals condensed themes and concepts of forecasting tourism demand using online data.

3.2 Qualitative Analysis

Variables and Data Sources

Independent Variables

The most popular online data types used as independent variables to predict tourism demand are search engine, social media, and user-generated content data. Many studies used search engine data as independent variables (48 out of 75 papers). Specifically, data from key search engines like Google and Baidu have been widely utilised because Google is the most prevalent search tool globally, while Baidu's share in the Chinese market is over 80% [7]. Search engine data can capture online search behaviour of potential tourists, and the individuals' search behaviour can reveal their preferences and travel choices related to destinations. Moreover, data on travel platforms or social media such as reviews and ratings on TripAdvisor, posts, likes, comments on Facebook and geotagged photos on Instagram or WeChat have been used as inputs because those reflect the opinions and experiences of tourists, which can influence the decision-making of prospective travellers [2]. Another common approach has been using lagged or historical tourist volume data, either standalone or in combination with other online data sources [6]. A few studies also used economic factors, such as GDP, tourist income, or prices as independent variables [8]. In addition, weather information and holidays have been used as predictors because these factors can notably impact travel decisions [9]. Finally, a few research integrated high-frequency data from mobile networks in their forecast [5].

Dependent Variables

The most used dependent variables are tourist arrivals, tourist volume, and overnight stays, in which the number of tourist arrivals or tourist volume has been used in most of the samples. In addition, a few studies proposed other measures of tourism demand, such as the number of residents and visitors [5]

or daily tickets sold at a tourist destination [10]. While most studies used monthly data as the primary frequency of tourism demand, a few studies have focused on forecasting a daily or weekly number of tourists [2,3,9,10], particularly for specific attractions or destinations. This high-frequency data is valuable for operational decision-making and resource management at tourist sites, as it captures the granular fluctuations in visitor numbers [5].

3.2.2 Modelling Techniques and Model Performance Metrics

Modelling Techniques

The study shows various methodologies and modelling techniques to forecast tourism demand utilising digital data, including three key groups: time series models, econometrics and artificial intelligence/machine learning. Several studies have used traditional time series models, such as Autoregressive Integrated Moving Average (ARIMA) or seasonal ARIMA. The models recognise the inherent patterns and autocorrelations in historical time series data to generate forecasts. On the other hand, econometric models still play an essential role in identifying the relationship between tourism demand and various explanatory variables because they allow the incorporation of additional factors such as economic trends and even external shocks to capture the impacts of these aspects on travel demand. Machine learning techniques have been increasingly applied in predicting tourism demand thanks to their ability to handle complex structures and nonlinear patterns in tourism data, in which many studies adopting models, such as Artificial Neural Networks, Random Forest or Support Vector Regression [3]. Some studies have employed deep learning techniques, such as LSTM, Convolutional Neural Networks, and hybrid models combining deep learning with other techniques [6] as the models could effectively incorporate online data from search engines and social media as predictors.

Model Performance Metrics

Many studies have reported multiple accuracy metrics to assess model performance and to help compare with benchmark models. The most popular metrics are Mean Absolute Percentage Error (MAPE), Mean Absolute Error (MAE) and Root Mean Squared Error (RMSE). In addition, researchers used other accuracy measures, such as Mean Squared Error [11], root mean square percentage error [4], or Coefficient of Determination [6] to provide additional perspectives on model accuracy. Furthermore, some researchers performed statistical tests, such as the Diebold-Mariano [9] or model confidence [5] to assess the statistical significance regarding the differences in forecasting accuracy observed between the models.

3.2.3 Key Findings and Limitations

Online data is recognised as a valuable input for tourism demand forecasting as it shows the high frequency, real-time availability, and sensitivity regarding tourist sentiment and behaviour. Various studies confirmed that models using multiple internet data types could outperform single-source digital or traditional inputs. Machine learning models supported by online data have outperformed conventional models as the models can capture unexpected events or shocks. For example, internet data exhibited higher predictive power for crises like COVID-19, while traditional models struggle with volatile trends. An important finding is that the effectiveness of using search engine data heavily depends on the process of selecting and processing data. Given the complexity of unstructured data, proper methods for data treatment and normalisation are crucial in preparing data for modelling.

The selected articles identified several limitations and potential areas for improvement in using online data for tourism demand forecasting. First, many studies acknowledge the focus on specific destinations or regions as a limitation. Second, some studies highlighted the challenges of fake or biased data, such as fake reviews or misleading search queries [7], which could adversely impact the forecasting accuracy. These studies emphasise the need for robust data cleaning and validation techniques to mitigate the effects of such biases. Other studies highlight the issues related to data availability, data quality, data normalisation, variability, and sampling errors [11].

4 CONCLUSIONS

This study presents an extensive assessment of research on forecasting tourism demand using digital content. Integration of these online data with advanced techniques has enhanced forecasting accuracy compared to traditional models. Besides, combining multiple online data sources and additional relevant factors, such as economic statistics, weather information, and unexpected events, could produce promising results in capturing the complex travel patterns. To address challenges in the field, future

research should develop appropriate data cleaning and validation techniques to mitigate the effects of fake or biased reviews. Integrating diverse data sources and traditional datasets with advanced techniques such as machine learning and hybrid frameworks could help improve forecasting accuracy. Moreover, combining volume and sentiment data may enhance the predictive capacity of these models. Researchers should also investigate the potential of unstructured data, such as images and videos, as this data may help accurately predict travel trends. Given the complexity of tourism demand forecasting, incorporating interdisciplinary perspectives from different fields can help identify the factors influencing travel demand and the influence of online data in capturing these dynamics.

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THE LINKAGE OF GREEN ENTREPRENEURIAL INTENTIONS ON SOCIAL CHANGE IN UNIVERSITY STUDENTS

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Abstract

The concept of going green has become increasingly important in modern societies. Researchers have pointed out that the business community plays a significant role in activities that harm the environment, emphasising the need for environmental sustainability and green entrepreneurship in addressing social issues, climate change, and ecological sustainability. Therefore, it is essential to promote 'going green' in business and entrepreneurship and within higher education institutions (HEIs). HEIs must engage in this process, involving both teachers and students. Although interest in green entrepreneurial intentions (GEI) is growing, it is crucial to understand the factors influencing these intentions to advance research in this area. This study examines GEI and their social changes among university students, focusing on the impact of contextual factors such as entrepreneurial education, university support, and entrepreneurial incentives. Data will be collected from students at the University of Trás-os-Montes and Alto Douro, from the Agronomy, Forest Sciences, Landscape Architecture, Veterinary Sciences, and Zootechnics departments. The responses from students at the Agrarian Veterinary Sciences School will be analysed using a quantitative methodology. The study aims to offer valuable insights for various stakeholders, including teachers, students, university decision-makers, and entrepreneurs, to align entrepreneurship initiatives in higher education with the Sustainable Development Goals.

Keywords: green entrepreneurial intention, sustainable entrepreneurship, entrepreneurial education

1 INTRODUCTION

The concept of 'going green' has been emphasised in recent years, particularly in contemporary societies. Various researchers consider the business community primarily responsible for activities that negatively affect the environment and explain the growing importance of environmental sustainability and the role of green entrepreneurship (GE) in response to social problems, climate change and ecological sustainability. To [1] their approach is similar to that of other entrepreneurs, as it involves recognising opportunities, drawing up business models and mobilising human, financial and material resources to implement them. It is therefore necessary to emphasise 'going green' both in the business and entrepreneurial fields and higher education institutions.

The intention to carry out a behaviour is the first step towards the behaviour itself. According to [2], GE involves implementing sustainable innovations to promote the green economy among customers and entrepreneurs are faced with the dilemma of whether their project is really 'green'. For [2] GE means making a positive impact through ecological activities such as reuse, recycling, clean processes and waste management and contributes to developing green firms that engage entrepreneurs and businesses committed to promoting social change [3]. These businesses are more likely to last longer and have more sales than those adhering to non-green entrepreneurship concepts [3].

Although intentions are present, they do not consistently translate into actual behaviours, resulting in the phenomenon known as the "intention-action" gap in entrepreneurship [4]. Consequently, it is

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imperative to further examine individual and contextual factors to explore the strong relationship between Green Entrepreneurial Intentions (GEI) and behaviours.

Thus, understanding the factors that influence GEI is the crucial purpose of this work to advance research. This study examines GEI and their social changes among university students, focusing on the impact of contextual factors such as entrepreneurial education, university support, and entrepreneurial incentives. Data will be collected from students from the Agrarian Veterinary Sciences School (AVSS) at the University of Trás-os-Montes and Alto Douro (UTAD).

2 METHODOLOGY

The study, therefore, investigates GEI and the resulting social change among university students. As a basic framework, the influences of contextual factors such as entrepreneurial education, university support and incentives for change are examined, resulting in the conceptual model proposed in Figure 1.

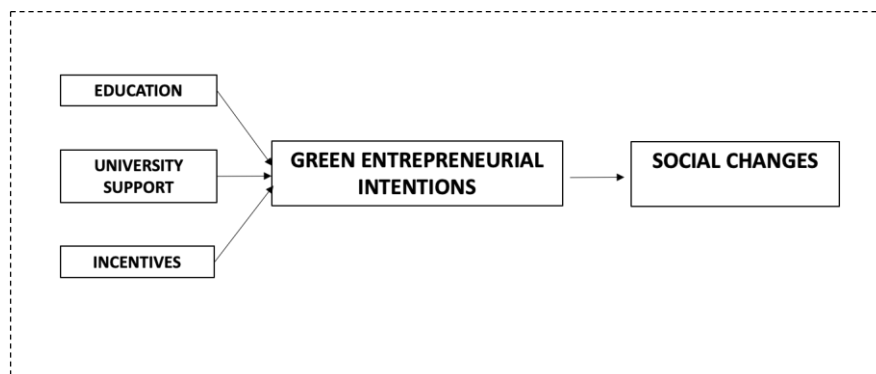


Figure 1. Conceptual Model

2.1 Population

To collect data, the researchers employed university mailing list to reach Agrarian Veterinary Sciences School (AVSS) at the University of Trás-os-Montes and Alto Douro (UTAD). Data collection was facilitated through an online questionnaire, from April to May 2025, ensuring that participants authorised the research through informed consent and agreed with the research objectives. The study aimed to accomplish its objectives by collecting information from students.

The research study used a quantitative approach. The data was collected through online questionnaires, which utilised a five-point Likert scale ranging from disagree to agree for each variable. Participants were provided with information regarding the study’s aim and the expected completion time prior to presenting the main questions of the questionnaire.

The questionnaire was structured into two sections, with the first section focusing on the respondents' characterisation. The second section comprises measures from variables – Green Entrepreneurial Education, Green Entrepreneurial Support, Incentives, Green Entrepreneurial Intentions and Promoting Social Changes. The different constructs were elaborated according to the theoretical models, with the variables selected based on the university context and literature review (Table 1). In total, the questionnaire consists of 26 items.

Table 1. Summary of constructs used in the questionnaire

Constructs		Source of scale validation
Student’s identification	Gender, age, graduation, year of attendance,...	
Green entrepreneurial education	5 items	[5]
University support	6 items	[6] , [4]
	1 item	[2]
Incentives	4 items	[5]

Regional Helix'25 – Transforming regions through innovation, sustainability and collaboration

Green entrepreneurial intention	5 items	[7] [4] , [8]
Social Changes	5 items	[5]

3 RESULTS

A total of 124 complete and valid questionnaires were obtained, and it used LimeSurvey software for the collection of data. They were analysed using IBM SPSS version 29 for descriptive statistics. The AVSS includes scientific areas such as Agronomy, Forest Sciences and Landscape Architecture, Veterinary Sciences and Zootechnics. Table 2 presents details of the participating students at the AVSS School.

Table 2. Characterisation of the participating students

<i>n = 124</i>		
	<i>Frequency</i>	<i>%</i>
Higher Education Institution (HEI)		
University of Trás-os-Montes and Alto Douro - Agrarian Veterinary Sciences School	124	
Sex		
Male	27	21,8%
Female	97	78,2%
Other	0	-
Age		
Average ages: 23 (minimum 18; maximum 49)		
(18-21)	92	74,2%
(22-25)	12	9,7%
(26-29)	7	5,6%
>29	13	10,5%
Nationality		
Portuguese	114	91,9%
Other	10	8,1%
Cycle of Studies		
CTEsP	0	-
Bachelor	74	59,7%
Master	6	4,8%
Integrated Master	44	35,5%
Phd	0	0%
Course		
Agricultural Engineering	21	16,9%
Forestry Engineering	1	0,8%
Zootechnical Engineering	12	9,7%
Winemaking	24	19,4%
Winemaking and Viticulture	218	4%
Veterinary Medicine	19	49,2%
year of study		
1º	20	16,1%
2º	32	25,8%
3º	61	49,2%
4º	0	-
5º	11	8,9%
Student Profile		
Regular	100	80,6%
Student-worker	24	19,4%
Other	0	-
Work Experience		
Yes	58	46,8%
No	66	53,2%
Family entrepreneurship - own/family business		
Yes	16	12,9%
No	108	87,1%

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<i>Entrepreneurship training</i>		
Yes	39	31,5%
No	85	68,5%

In terms of gender composition, there is a predominance of females (78,2%) over males (21,8%), with an average age of 23, with a minimum age of 18 and a maximum of 49. Most of the students surveyed don't have professional experience (53,2%), and when asked if they (or their family members) own businesses, 87,1% answered negatively.

Regarding their nationality, 91.9 per cent of the students are Portuguese and 8.1 per cent are foreigners. Of the 10 students of other nationalities, 95% come from Portuguese-speaking countries (Angola, Guiné and São Tomé).

The majority of respondents are in their 2nd and 3rd year (25.8% and 49.2% respectively). Concerning entrepreneurship training, most students (68,5%) have never attended an entrepreneurship course, and 4% have attended at least 1 mandatory course. The relevant fact is that 32 students (25,8%) decided to study at UTAD because of its strong reputation in entrepreneurship.

4 CONCLUSIONS

This study addresses a significant gap by investigating the factors that influence GEI within this demographic, providing valuable insights into how these intentions may convert into actual behaviour. This research explores the determinants of GEI and Social Changes, concepts crucial for understanding sustainable entrepreneurship.

Although interest in the topic of this research is growing, there is still a lack of literature supporting GEI. An understanding of the factors, education, support and incentives is essential to understanding GE and Social Changes. According to [9], young people today (known as generation Z or millennials), especially recent graduates, have strong entrepreneurial intentions and a social conscience, and they prioritise preserving a sustainable future over business earnings.

Therefore, identifying the most critical factors that determine the transformation of GEI into actual social changes remains an intriguing area of study that we intend to explore further in the future.

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Management



IX Regional

HELIX  25

Institutional work to legitimize digital banks: documentary research of XP Investimentos in Curitiba, Paraná, Brazil

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Abstract

This research explores the institutional work of legitimation carried out by XP Investimentos in the Brazilian financial market between 2019 and 2024. Based on the New Institutional Theory, the study analyzes how XP, as a digital bank, challenged the organizational field dominated by traditional banks amid technological advances and disruptions caused by the Covid-19 pandemic. For this purpose, qualitative documentary research was carried out through thematic content analysis of the secondary data that were collected to date. Preliminary results indicate that XP uses innovation, stakeholder engagement, and regulatory alignment to establish legitimacy, promote a reciprocal relationship between institutional change, and the construction of a new organizational identity in the financial sector. Thus, the research is contributing to the theoretical understanding of how digital banking legitimization processes can generate instability in mature organizational fields and aims to offer empirical data for similar financial institutions seeking to enter regional financial markets.

Keywords: Institutional Work, Legitimacy, Organizational Field.

1 INTRODUCTION

The financial sector has undergone a profound transformation with the emergence of digital banks, which have emerged as disruptive forces challenging the dominance of traditional banking institutions. This shift is particularly evident in Brazil, where digital banks have taken advantage of technological advances and changing consumer preferences to impose new practices in the national financial scenario characterized as a previously stable organizational field. Among these new players, XP Investimentos stands out as a key player, evolving from an investment education company, founded in 2001, to a fully licensed digital bank in 2019, located in a major financial economic hub in Southern Brazil [1].

The emergence of digital banks coincides with significant global and local events, including the 2008 financial crisis and the Covid-19 pandemic, which have accelerated the adoption of digital financial services [2]. These facts have exposed weaknesses in traditional banking models, such as high fees and limited accessibility, creating opportunities for digital banks to gain ground [3]. XP Investimentos, with its extensive network of over 600 representative offices throughout Brazil, has positioned itself as a leader in this transformation process, especially in Curitiba, where it seeks to establish legitimacy in a competitive financial market [4].

In this scenario, the following research question was formulated: what institutional work has XP Investimentos, as a new player, carried out to achieve legitimacy in the organizational field of the Curitiba financial market, between 2019 and 2024? Thus, the general objective of the investigation is, therefore, to identify XP's institutional work actions aimed at achieving legitimacy in an organizational field in crisis. To this end, based on the New Institutional Theory, the specific objectives include tracing its historical trajectory, identifying the institutions established in the traditional financial institutional context [5], identifying the institutional work carried out [6] and assessing the perceptions of the stakeholders involved in terms of XP's legitimacy [7] in the changing organizational field [8], in order to contribute both to confirming the theoretical assumptions of the theory and to presenting a practical case on the dynamics of transformation that a stable organizational field can undergo.

2 METHODOLOGY

This research adopts a qualitative documentary research design with a cross-sectional perspective and longitudinal assessment, focusing on XP Investimentos' operations in Curitiba between 2019 and 2024. The choice of a documentary research is aligned with Stake's approach [9], allowing for starting an in-depth exploration of a complex phenomenon in its real context. The organizational level of analysis targets XP's representative offices, with managers serving as primary units of analysis due to their central role in implementing institutional work actions.

The literature review selected seminal articles in institutional theory that present the foundations of the analytical categories involved. In addition, recent works were consulted that provided historical and social insights into the institutional context of the financial sector and digital transformation, to capture diverse perspectives on XP's institutional work and legitimacy efforts.

The documentary data already collected were subjected to thematic content analysis [10], with categories derived from the theoretical framework, including types of institutional work, dimensions of legitimacy of the institutional context and responses from stakeholders. The main company documents analyzed were: institutional presentation document, annual audit report, financial statements, official report from the Central Bank of Brazil [11] from <https://www.bcb.gov.br/publicacoes/estudos especiais>, and, official data obtained from websites: <https://investors.xpinc.com/>, and <https://www.xpi.com.br/>.

3 RESULTS

The theoretical foundation forms the basis for analyzing how XP Investimentos has been carrying out institutional work actions in the organizational field of the financial market in Curitiba, offering a comprehensive opportunity to understand the legitimization processes in a context that is undergoing institutional change.

3.1 Historical institutional context and rise of digital banks

The evolution of the banking sector in Brazil reflects a trajectory that goes from manual operations in the early 20th century to digital platforms in the late 20th and early 21st centuries [12]. Early innovations, such as gelatin copiers in the 1930s and calculators in the 1940s, marked the beginning of technological modernization. The arrival of the internet and smartphones in the 1990s and 2000s catalyzed a shift towards the emergence of digital banks, with the 2008 financial crisis exposing vulnerabilities in traditional models and paving the way for new entrants [2].

In this context, in 2001, XP Investimentos emerged as an investment education company. In 2007, it expanded into brokerage services and, in 2019, it obtained a banking license to offer a full range of digital financial services. In Curitiba, XP's presence has grown through its network of representative offices, capitalizing on the region's economic relevance and openness to digital innovation.

Data from the Central Bank of Brazil [10] highlights the rapid growth of digital banks, with a 380% increase in active individual customer relationships with digital entities between 2019 and 2022, compared to a modest 15% growth for traditional banks. This disparity underscores the shift in preferences towards digital platforms, especially after the Covid-19 pandemic, when restrictions on physical service increased the demand for online services.

3.2 Institutional work of XP Investimentos

XP Investimentos employs a multifaceted approach to institutional work, as evidenced by documentary data. Table 1 presents the main institutional work actions identified in the documents.

The results are aligned with the core tenets of New Institutional Theory, illustrating how XP Investimentos is doing institutional work to reshape the financial organizational field in Curitiba. Its innovative practices reflect concept of "creating" new institutions [6], challenging traditional banking norms by introducing a digital logic. This aligns with argument that strategic actors exploit crises [13] — here, the pandemic — to reconfigure power dynamics, as XP capitalized on the shift as a remote bank to gain market share. The company's managers identified the Covid-19 pandemic as a turning point, accelerating its growth by proposing digital solutions during lockdowns.

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Table 1. Main institutional work actions.

<i>Institutional Work</i>	<i>Contextualization</i>
Use of innovation	XP challenges traditional banks by offering fee-free accounts, integrated investment platforms and advanced security features such as biometric authentication
Disruptive measures	Unlike traditional banks, which rely on fee-based models and physical branches, XP's digital strategy reduces costs and increases accessibility, resonating with Curitiba's tech-savvy clientele
Focus on customer needs	Managers noted that this approach has attracted younger customers dissatisfied with traditional banks' high fees and limited digital offerings
Stakeholder engagement	XP builds legitimacy through local partnerships and participation in innovation events, such as participation in financial technology forums in order to increase its visibility and articulation
Personalization measures	Increasing trust among customers, investors and regulators. The documents emphasize XP's reach into small and medium-sized enterprises (SMEs), offering personalized services that traditional banks often overlook, integrating itself into the local business ecosystem
Regulatory alignment	Compliance with Central Bank regulations is a strategic cornerstone for XP, ensuring credibility in the financial sector. Managers note that XP's adherence to regulatory standards, combined with transparent communication, mitigates skepticism about the reliability of digital banks, a concern rooted in the newness of the sector
Aggressive marketing	Highly resourced managers emphasize aggressive marketing strategies for customer acquisition, such as promotional campaigns emphasizing low costs and high returns
Community engagement	Low-resource managers, despite facing limitations, focus on grassroots efforts such as community engagement and trust-building

XP's engagement actions with stakeholders embody "pragmatic legitimacy" [7] where acceptance is earned through tangible benefits such as cost savings and convenience. Its regulatory alignment addresses Scott's regulatory pillar, ensuring compliance with formal rules while building normative legitimacy through trust and reliability [5]. The reciprocal relationship between XP's actions and institutional change support [14] view that new entrants reshape market logics by infusing corporate values — efficiency, transparency, and accessibility — into the financial sector.

Compared to this, XP's approach contrasts with the slower adaptation of traditional banks to digitalization, highlighting a tension between stability and innovation in the organizational field [15]. However, challenges persist, including competition from other fintechs and the trust rooted in the physical presence of traditional banks. XP's success depends on sustaining its adaptive actions amid these dynamics.

Thus, this empirical study corroborates the institutional work by detailing how digital banks navigate legitimacy in a regional context, developing innovative actions that challenge a stable organizational field. Consequently, it suggests that financial institutions entering new markets should prioritize innovation, local engagement, and regulatory compliance to overcome legitimacy barriers.

4 CONCLUSIONS

The documents analyzed in the first phase of this research show that XP Investimentos has been seeking to effectively legitimize its presence in the Curitiba financial market during the period

considered, through a combination of innovation, stakeholder engagement and regulatory alignment. By challenging traditional banking norms, XP has been fostering a new organizational identity centered on digital efficiency and customer focus, contributing to a broader institutional change in the sector.

The documentary research carried out to date corroborates the foundations of institutional theory with regarding the capacity of the institutional work carried out by XP Investimentos as an insurgent actor in the transformation of the organizational field of the regional financial market, provoking the creation of new institutions in the broader institutional context.

This evidence needs to be refined based on interviews to be conducted with two different groups within the company to identify other types of institutional work to legitimize XP as a digital bank, in order to provide a replicable model for new entrants in similar organizational fields.

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Turnover: a survey with professionals from software companies of a technology-based incubator

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Abstract

Turnover is one of the major challenges faced by many software development companies. This work presents a survey aimed at investigating the causes of turnover and management strategies to minimize its impact according to the perspectives of professionals who work in software companies within a technology-based incubator. Data from 12 participants across three software companies were analyzed using descriptive statistics. The results indicate that dissatisfaction stemming from unmet expectations and work overload influences professionals' decisions to leave their companies. Therefore, software companies should adopt strategies that encourage employee retention, such as competitive salary policies, well-defined career plans, benefits policies and performance-based promotions.

Keywords: Turnover, Software company, Technology-based incubator

1 INTRODUCTION

The complexity and uncertainty of the contemporary world pose challenges for modern organizations seeking to recruit and retain qualified professionals. In the software industry, intense competition for professionals causes a phenomenon known as turnover. The term turnover refers to the movement of professionals between companies [1]. This movement can be voluntary when the professional himself leaves the company, or involuntary, when the company decides not to keep the professional.

Turnover problems are constant in software development companies [2] and can consume a significant part of the expected profit of a project [3]. In this context, research seeks to identify factors related to turnover to avoid or minimize its impact [4, 5]. Counterproductivity, higher error/loss rate, low customer satisfaction, lower product/service quality, lower profit margins and lower sales efficiency are the main consequences of turnover cited in the literature [6]. The impact of turnover for software development companies is high, as they have a strong dependence on the professionals involved in their projects, mainly because their high specialization and their replacement are not immediate. Therefore, for software companies it is important to know the causes and possible management strategies (actions or practices) that can be implemented so that turnover does not become a problem.

In technology-based incubators [7], nascent software companies participate in environments with conditions and support to leverage entrepreneurial talent, accelerate their development and, as a result, commercialize their innovative products or processes. Although these incubators have the proposition of training the managers of technological enterprises to face the barriers to innovation, the participating software companies are also subject to turnover problems. In this context, the objective of this work is to investigate the causes of turnover and management strategies to minimize its impact according to the perspectives of professionals who work in software companies within a technology-based incubator maintained by Universidade Tecnológica Federal do Paraná (UTFPR), Campus Cornélio Procópio, Paraná, Brazil. From the results obtained, it is expected to be possible to justify the need to make efforts to carry out training, consulting, advisory, among other forms of support, to meet the needs of the managers of these companies in relation to turnover problems.

2 METHODOLOGY

The method used was the survey, which has the main purpose of identifying the factors that characterize or can justify a certain event in a population or sample. A survey is conducted using instruments that allow measuring or describing the problem investigated [8]. The questionnaire technique was used for data collection.

The survey was designed to answer the following research questions (RQ) related to the turnover phenomenon:

- RQ1: What are the causes of turnover according to the perspectives of professionals from software companies within a technology-based incubator?
- RQ2: What are the main management strategies to minimize the impact of turnover according to the perspectives of professionals from software companies within a technology-based incubator?

The questionnaire, in addition to a section for the characterization of the participant and his current company, also contains a section with 14 questions about the influence of a certain cause of turnover on the professional's decision to leave the company and a section with 8 questions about the management strategies that can be employed. These questions were elaborated on a five-point Likert scale (1: strongly disagree; 2: disagree; 3: neutral; 4: agree; 5: strongly agree). When answering questions on a Likert scale, participants express their level of agreement or disagreement according to the statements presented [9]. The causes and management strategies considered in the questions were obtained from a literature review [10].

The questionnaire was sent to 16 professionals from three software companies within a technology-based incubator maintained by UTFPR, Campus Cornélio Procópio, Paraná, Brazil. The sample was determined using the criterion of non-probability sampling for convenience, also known as unintentional sampling [11]. Although this criterion increases the number of responses, it does not ensure representativeness of the entire population. The message to participants included the address to the online questionnaire page that was available for 15 days and received 12 responses. Data analysis was performed using descriptive statistics, basically an analysis of the frequency of incidences.

3 RESULTS

In this section, the results of the analysis of the data obtained from the questionnaire are presented and discussed. Initially, the characterization of the respondents and the respondents' companies is presented. Next, the results related to the causes of turnover and those related to management strategies are presented.

All participants are professionals working on software development projects and a significant amount (58%) have already had experience of leaving a company voluntarily. With respect to company aspects, 66% of participants are system analysts or developers, 25% are directors, managers, supervisors or consultants, and 8,3% other positions. 75% of participants have assumed more than one role within the company and 42% worked in the company from 1 to 3 years. The companies of the participants have 4 to 7 employees.

The participants expressed their level of agreement about the causes through questions on a five-point Likert scale. Table 1 shows the frequency of responses in relation to the statements regarding the causes of turnover, as well as the median (Med) and mode (Mode). The causes considered to have the highest level of agreement appear at the beginning of the table.

The results highlight that turnover is mainly caused by "Dissatisfaction due to unfulfilled expectations" and "Work overload". The issue of dissatisfaction due to unfulfilled expectations is cited in the literature as a cause of turnover [12, 13]. As in [14], work overload was also highlighted. In software companies, work overload is also a consequence of turnover because someone must take on the workload of those who left the company. In addition, the reduction in productivity until the hiring of a new professional and the delay in the project schedule are also part of the consequences in this context.

Participants also expressed their level of agreement regarding management strategies. Like the previous table, Table 2 presents the frequency of responses in relation to statements about management strategies to minimize the impact of turnover. The strategies of "Adoption of salary policy and career plan" and "Adoption of benefits policy and promotions for performance" appear with the highest level of agreement. In the literature, [15, 16] presents the adoption of salary policy and career

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plan as a strategy to minimize turnover. When analyzing the impact of human resources strategies on the turnover, [17] considers the strategy of adopting a policy of benefits and promotions for performance. However, for incubated software companies, the implementation of these strategies may not be a real possibility depending on their stage of development.

Table 1. Frequency of responses regarding causes of turnover.

Causes of turnover		1	2	3	4	5	Med	Moda
1	Dissatisfaction due to unfulfilled expectations	-	-	2	3	7	5	5
2	Work overload	-	3	1	3	5	4	5
3	Lack of salary policy	-	1	2	5	4	4	4
4	Conflict between work and family	2	1	4	5	-	3	4
5	Negative relationships with co-workers	-	5	2	5	-	3	2
6	Lack of periodic training	-	5	6	1	-	3	3
7	Inadequate work environment	4	3	3	1	1	2	1
8	Inappropriate managerial style	-	7	2	3	-	2	2
9	Job search by co-workers	-	7	3	2	-	2	2
10	Lack of professional recognition	2	7	1	2	-	2	2
11	Repetitive work	-	7	5	-	-	2	2
12	Lack of commitment from the organization	5	6	1	-	-	2	2
13	Environmental and cultural factors	7	4	1	-	-	1	1
14	Lack of communication in the company	9	3	0	-	-	1	1

Table 2. Frequency of responses regarding management strategies.

Management strategies		1	2	3	4	5	Med	Moda
1	Adoption of salary policy and career plan	-	-	-	1	11	5	5
2	Adoption of benefits policy and promotions for performance	-	-	1	1	10	5	5
3	Conducting periodic training	-	-	-	4	8	5	5
4	Conducting training at the beginning of the contract	-	-	2	5	5	4	4
5	Alternation of roles for the employee to perform more than one function	-	1	4	2	5	4	5
6	Documentation of project activities to assist newcomers	1	2	4	5	-	3	4
7	Use of interviews to assess risk before hiring	2	3	4	3	-	3	3
8	Carrying out activities in pairs to minimize employee departure	-	5	6	1	-	3	3

4 CONCLUSIONS

In this work, a survey was presented with the objective of investigating the causes of turnover and management strategies to minimize its impact according to the perspectives of professionals who work in software companies within a technology-based incubator. Data from 12 participants across three software companies was analyzed using descriptive statistics.

The results indicate that dissatisfaction due to unfulfilled expectations and work overload are among the main causes according to the participants. These results are related to the first research question (RQ1) defined in Section 2. Knowledge about the turnover phenomenon and its causes is strategic for executives, managers, project leaders, among other professionals from software companies. Regarding management strategies, the second research question (RQ2), the results indicated the adoption of a salary policy, career plan, policy of benefits and promotions for performance.

Although initial and exploratory, the research presented in this work provides support to the development of new investigations. A natural progression of this work is to interview the professionals to investigate turnover intentions in depth. Another possible area of future research would be to investigate the strategies applied to minimize turnover through a case study. Further experimental investigations are needed to estimate the real impact of employee turnover on software development projects. It would be

interesting to assess the effects of new strategies to minimize turnover in the face of historical data from turnover rates of software development projects.

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The interrelation between environmental, social, and governance (ESG) and transparency: a bibliometric analysis

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Abstract

Sustainability has been a central issue in recent decades, leading to the formal integration of the environmental, social and governance (ESG) dimensions by the United Nations in 2004. Although 'CSR', 'sustainability' and 'ESG' are often used interchangeably, ESG provides criteria for assessing sustainability progress. Transparent disclosure of ESG information is crucial to attracting investment and building trust, despite challenges such as gaming and greenwashing. In this context, this paper aims to analyse the evolution of research on ESG and transparency and identify trends. The study reveals an exponential publication growth using a bibliometric analysis of 497 articles from the SCOPUS database between 2011 and 2025. Europe and China lead the way in publications, influenced by EU regulations and international pressures/domestic standards. There is strong collaboration between the US, Europe, and China about academic production.

Keywords: ESG, Transparency, Global trends.

1 INTRODUCTION

Sustainability has emerged as an integral discussion about the future, especially considering that development has been promoting socio-political articulations in pursuit of sustainable growth. Current discussions on sustainability reflect the thinking behind the work of the Club of Rome in 1972, which recognised the reality of the limited availability of natural resources [1].

As the 'environmental crisis' emerged, a contemporary line of thought was taking hold in politics, promoting joint socio-economic development in favour of sustainable development [1]. Since the 1990s, this issue has been a topic of ongoing discussion. In this context, Sachs [2] supported a holistic approach to sustainability that encompasses social, economic, environmental, spatial, and cultural dimensions. This perspective remains relevant today, especially given the increased concerns surrounding climate change and resource consumption.

In this sense, the United Nations Global Compact formally integrated the environmental, social and governance dimensions and introduced the concept of ESG in 2004 [3]. The growing attention paid to 'sustainability' issues has led to a boom in companies' disclosure of information on environmental, social and governance (ESG) practices [4]. In some contexts, such as China, reports previously called Corporate Social Responsibility (CSR) Reports were renamed ESG reports in 2018 [3].

It is important to emphasise that the concepts 'CSR', 'sustainability' and 'ESG' are often used interchangeably [5]. Sustainability can be seen as the long-term goal or the broader vision. At the same time, ESG usually provides the specific criteria and metrics used to assess and report on companies progress towards sustainability [5]. ESG reporting underlines the importance of environmental, social, and governance information transparency. This transparency is argued to be a crucial factor in attracting investment, as noted by Wang [6]. Companies that excel in ESG performance tend to build stronger trust with suppliers and customers, enhancing information transparency, optimising risk management, and strengthening social responsibility [7].

However, challenges remain, as formalising rules to enhance disclosure and transparency can, paradoxically, lead to behavioural issues such as 'gaming' or preferential disclosure, ultimately undermining trust. Transparency based on limited knowledge can create a false sense of being well-informed [8].

Furthermore, a lack of transparency can make it unclear whether genuine ESG (Environmental, Social, and Governance) and CSR (Corporate Social Responsibility) actions are being taken, leading to what is commonly called greenwashing. In such cases, companies may selectively promote their positive initiatives without the real intention of changing their underlying practices. This approach seeks to legitimise corporate actions by masking negative behaviours with positive yet largely symbolic activities and reports, failing to provide clear or substantive evidence. As a result, this diversion can create a misleading impression of a company's true ESG/CSR performance, overshadowing any shortcomings [5].

In this context, this paper aims to analyse the evolution of research on ESG and transparency and identify trends over the years. So, the paper is divided into four sections: after this introduction, the methodology used to characterise the research is presented, followed by the main results and the conclusion.

2 METHODOLOGY

This research employs a bibliometric analysis to explore the relationship between ESG (Environmental, Social, and Governance) factors and transparency. Data was sourced from the SCOPUS database, widely recognised as one of the most comprehensive resources in the scientific community, allowing for a global perspective on the topic under investigation [9]. The initial search utilised the equation 'ESG AND transparency,' with no time limit. This initial search yielded 744 results, considering the article titles, abstracts, and keywords.

The search was subsequently refined to include only articles published in scientific journals, written in English, and categorised within the following subject areas: business, management, and accounting; economics, econometrics, and finance; social sciences; environmental science; decision sciences; and multidisciplinary studies. The final count resulted in 526 articles exported in BibTeX format for further analysis using the bibliometrix software. It is worth noting that during the export process, nine duplicate articles were removed from the dataset, bringing the final total to 497 articles.

3 RESULTS

The data consists of 497 documents published in 249 scientific journals between 2011 and 2025, involving the contribution of 1369 authors, including 57 papers with individual authorship and a percentage of 28.57% international authorship. The average number of citations per document is 27.84. The sample represents 15 years of publications related to ESG and transparency, with an exponential growth in 2024, which, together with the year 2025, represent 60.4 per cent of total publications. Publications from European countries (29.00%) represent a higher percentage than publications from China (21.50%), the country with the most publications.

In the case of China, the high number of publications may be associated with international pressure and global image since, as the world's second largest economy, it is under constant global pressure regarding environmental impact, human rights and corporate transparency. Internal adoption of ESG standards, such as the 'Carbon Neutral by 2060' plan, can stimulate academic production, allowing access to international investors increasingly concerned about the weight of ESG metrics.

At the European level, the increase in publications on ESG and transparency may be linked to the recent EU regulations on mandatory sustainability reporting by companies and corporate due diligence requirements on sustainability.

The relationship between the keywords of the analysed papers is also worth noting. The emphasis is obviously on sustainability, but the authors have also worked on topics such as corporate social responsibility, the governance approach and transparency (Figure 1), highlighting the importance of these topics in the studies.

Regional Helix '25 – Transforming regions through innovation, sustainability and collaboration

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How may crowdstrike it outage affect tourism firms and destinations?

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Abstract

This study explains the short-term market effect of CrowdStrike's IT outage in the tourism industry. This paper presents how hotel and airline companies are penalised by the market due to the biggest IT disruption in history. The stock market reaction in companies from both industries is negative. First, this response is explained by the adverse impact caused by IT failures in the hotel's business operations (reservation, payment, technical systems) and supply chain processes, which result in financial losses. Also, secondly, IT disruptions, by creating friction in daily operations, such as broken schedules, delayed or cancelled flights, negative externalities, and customer dissatisfaction, lead to loss of value for airlines.

Keywords: CrowdStrike; Hotels; Airline.

1 INTRODUCTION

The cybersecurity firm CrowdStrike reported on July 19, 2024, a flaw in its Falcon Sensor security software that caused widespread problems for Microsoft Windows computers using this software. Thus, around 8.5 million systems experienced crashes and were unable to restart, marking the major outage in information technology history. The estimated financial damage worldwide is \$10 billion.

In recent years, investments in technology triggered by digital transformation mean that one of the threats to which the hotel industry is exposed is technological outages [1, 2, 3]. According to the authors, the collapse of technological systems (outage or cyberattack) can instantly stop businesses' production and service delivery capacity, leading to significant financial losses. Unlike natural disasters that primarily affect the places where they occur, IT outages negatively affect the global scale.

Also, the airline industry was particularly hard hit, leading to widespread delays and cancellations and operational challenges worldwide, affecting airline operations, especially in non-Asian countries. As a result, 3,000 flights had been cancelled and more than 11,400 others were overdue in the US. Worldwide, more than 42,000 flights experienced delays on the first day. Globally, the aviation industry has seen an increase in passenger traffic, where the advancement of information technology (IT) has been a fundamental lever to sustain this acceleration. However, the high investments in IT in the airline industry mean that one of the threats the airline industry is exposed to is technological disruptions [4]. According to the financial literature, business interruptions due to technology failure or cyber-incidents can lead to severe financial consequences, including loss of revenue, reputational damage, reduced productivity, and high recovery costs [5, 6, 7, 8].

In this study, we explain the short-term effects caused by CrowdStrike IT outage on hotel and airline companies. Two recent studies analysed the effects caused by the CrowdStrike IT outage on the tourism industry. Demir and Demir [3] analysed tourism-related news on websites and conducted interviews with tourism professionals to analyse the effect of the CrowdStrike IT outage on the tourism industry. [9] utilized the event study methodology in the aviation industry to evidence that the unexpected CrowdStrike IT outage resulted in short-term negative abnormal returns. Therefore, our research fills a

critical gap in the understanding of the short-term market impact of CrowdStrike IT outage on hotel companies and on airline companies.

2 THE EFFECT OF IT OUTAGES ON HOTEL COMPANIES

In the hospitality industry, there has been an increase in investment in technology, with a clear focus on digital transformation and automation, which are referred to as valuable resources that strengthen competitive advantage by improving customer relationship management, integrating supply chains, integrating business processes [10], and thus improving operational efficiency [5, 3].

A recent systematic review of the economic impacts of information and communication technologies (ICTs) in the tourism and hospitality industry [11], reveals the existence of economic positive impacts of ICTs in terms of performance (financial and operational), operational efficiency (e.g., cost reduction and operation time saving), and market (e.g., popularity and reputation). ICTs contribute to financial performance with contributions to financial metrics, such as sales volume, revenue, and gross operating income. ICT can also contribute to increasing the operational efficiency of hotels, through the facilitation of internal processes [12] and back-of-house operational efficiency by reducing the time spent on repetitive tasks [13] and allowing employees to focus more on important tasks, as ICTs can automate routine tasks [14]. Finally, there may be market-related benefits, with ICTs enhancing the firms' market share [15], as well as the aspects of customer behaviour influenced by these technologies [16].

However, when technologies fail, there are significant disruptions in the hotel's business operations. The recent outage of CrowdStrike demonstrated this, with hotel managers mentioning that "*hotels are unable to do everything from taking payments to making room keys*". The literature focuses on the existence of significant losses resulting from the direct costs involved in repairing the crashed system, along with losses resulting from lower sales revenues and lower productivity [1, 3, 5, 17]. IT failures also cause important indirect costs for hotels, such as loss of stakeholder trust and confidence, worsened reputation, and brand damage [1, 5, 8].

However, there are few empirical studies that address the impact of IT outages on the stock market. [17] examine how stock prices react to announcements of website outages and find a significant negative impact of website outages on a firm's stock prices, whose negative impact is greater for firms with high earnings through internet business. [5] investigate the effects of unexpected operating or implementation-related IT failures on firms' market value. Their findings evidence that IT failures lead to a decline of 2% in average cumulative abnormal returns around a 2-day event window. [6] study the short-term market effects of IT operational risks. As explained by the authors, "*IT operational risk is any threat to the integrity, confidentiality, or availability of data of IT assets*" (p. 360). Based on event study methodology, they show that firms encountering availability IT operational risk events tend to experience notably greater negative abnormal returns than those dealing with integrity or confidentiality events.

They conclude that investors perceive availability events as indicating the presence of more severe IT control weaknesses compared to those highlighted by confidentiality and integrity events. They conclude that investors recognize availability events as signalling the presence of more severe IT control weaknesses compared to those signalled by confidentiality and integrity events. [18] employ event study methodology to study how online exposure to service failures impacts hotel revenue. The authors find that online exposure has a significant negative impact on hotel stock prices, which take mainly nine months to fully recover. Finally, [9] analyse the short-term market effects of the unexpected CrowdStrike IT outage in the aviation industry. They find abnormal negative returns around the event date, and a quick recovery within a week.

3 THE EFFECT OF TECHNOLOGY FAILURES ON AIRLINE COMPANIES

Technology is crucial for the operations of airlines. Airlines have used IT systems for several purposes, including computerized airline reservation systems, flight operations, telecommunications, websites, and maintenance systems such as servers and check-in kiosks [4]. The technology disruptions can lead to widespread problems in airlines [7, 19]. According to the authors, these disruptions can introduce challenges in daily operations, potentially leading to several problems such as schedule interruptions, flight delays or cancellations, and customer dissatisfaction. These disruptions typically lead to two main categories of costs for airlines [7, 19]: (i) direct out-of-pocket costs - according to the news, the massive CrowdStrike IT outage will cost airlines \$500 million, which reflects not only the loss of revenue but also the expenses associated with compensation and hotel accommodations each day over five days and

(ii) indirect costs associated with reputation damage and loss of revenue resulted from customers' lower willingness to pay and lower desire to fly with an airline after facing the CrowdStrike IT outage.

An expected decline in future cash flows caused by direct costs, reputational damage, and poor service quality will lead to a decrease in the airline's market value. This negative effect will intensify if the drop in future cash flows caused by current poor service becomes persistent over time [7]. Additionally, [20] argue that flight overdue caused by airlines lead to greater dissatisfaction than those resulting from factors outside the airlines' control.

Finally, the stock market penalizes airlines more severely for unexpected delays or cancellations, especially those that operate a larger proportion of short-haul flights, where alternative modes of transportation are more accessible. Additionally, airlines that have a higher frequency of connecting passengers tend to experience greater financial impacts from missed connections, as these can lead to increased direct costs and higher levels of customer dissatisfaction. This, in turn, can negatively affect the airlines' future revenues [7].

[6] examine the short-term market effects of IT operational risks and conclude that investors view availability events as signalling of more severe IT control weaknesses compared to those signalled by confidentiality and integrity events. Finally, [9] investigate the short-term market effect of the unexpected CrowdStrike IT outage in the IT, airports and aviation industries, and find abnormal negative returns around the event date, and a quick recovery within a week.

Note also that there is a particular interest in the location of airlines' main markets, the airline's cyber risk rating, and business model. According to [21], the airlines most penalized by CrowdStrike IT outage were those located in North America and Europe. It is important to bear in mind that the top two geographies of CrowdStrike for endpoint-protection are the US with 1819 (71.14%) and the UK with 197 (7.70%) customers, respectively. Asian nations, like China, were less affected, given that they have developed their own operating systems to reduce reliance on Windows and associated products. Regarding airline's cyber risk rating, [21] argue that higher investments in IT lead to lower future costs from cyber incidents. Additionally, airlines with a good cyber risk rating tend to have robust contingency plans and cybersecurity measures to enhance resilience and reduce vulnerability to future disruptions [22]. Lastly, regarding the impact of business model (low-cost vs full carriers) on the market value of airlines, full-service carriers have a greater capacity and access to additional resources through their networks/alliances compared to low-cost carriers [23]. As a result, they are expected to manage disruptions' effect on operational activities more effectively than low-cost airlines. The literature also shows that an unplanned event disrupting a network airline would have a significant impact on full-service carriers due to the presence of more densely populated nodes within the network airline [24, 25].

4 CONCLUSIONS

This study explains the short-term market effect of CrowdStrike's IT outage in hotel companies and in the airline industry. The hotel companies experienced, in general, negative abnormal returns around the event. While IT technologies enhance a hotel company's operational efficiency, their failures tend to have an adverse impact on the hotel company's business operations, supply chain processes, and stakeholders' confidence, which results in financial losses. This study explains the existence of a negative stock market reaction for hotel companies placed in Western countries and for hotel companies with a low cyber risk rating. Hotel companies with larger capitalization, higher profitability, and lower leverage are more resilient to adverse effects caused by IT outages. Regarding the airline companies, the most affected are expected to be those from the main CrowdStrike customers' countries and the irrelevance of the business model. The study consider that Western airlines with larger size, profitability, and cyber risk rating and lower leverage are more resilient to adverse effects caused by IT outages.

These points about cyberattacks or IT failures must only be applied to tourism companies. As highlighted by [3], the unique characteristics of the tourism and hospitality industry, such as its high reliance on technology for booking, customer service, and operational management, may not fully represent other sectors with different technological dependencies and resilience capabilities.

This research highlights that tourism-linked businesses must balance their investments in IT and digital transformation with the need for robust contingency planning and cybersecurity investments to increase resilience and reduce vulnerabilities to future IT outages, because they create friction in daily operations, like broken schedules, delayed or cancelled flights, negative externalities, and customer dissatisfaction.

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From students to entrepreneurs: the forces that shaped entrepreneurial intentions in higher education institutions

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Abstract

Higher education institutions (HEI) and their surroundings play a fundamental role for contemporary societies in the field of education and knowledge generation. During the last decade, the university and its surroundings have become a special ecosystem. Specifically, favourable conditions are created for cooperation between various entities, namely, HEI, business incubators, technology transfer centers and funding institutions, which contribute to developing the academic entrepreneurship ecosystem. The ecosystem conception represents a new competitive force that includes universities that reveal their influence over entrepreneurial ecosystems. This study investigates the impact of entrepreneurial attitudes, subjective norms, and perceived behavioural controls on entrepreneurial intention using the theory of planned behaviour (TPB) as the theoretical framework. The consideration of more factors in the TPB were explored with the main aim of building a more comprehensive and complete explanation of EIs. This involvement builds a more comprehensive explanation of entrepreneurial intentions (EI). The research analyses data from 545 students through statistics and Structural Equation Modeling. This outcome was facilitated through entrepreneurial education and support from higher education institutions (HEIs), which, notably, did not significantly influence students' entrepreneurial intentions (EI). It has been observed that personality traits exert a positive influence on EI. This finding highlights the potential for creating or enhancing a structured academic ecosystem that more effectively promotes entrepreneurship.

Keywords: entrepreneurial intention, Theory of planned behaviour, higher education

1 INTRODUCTION

Understanding why entrepreneurs are born, what they do, and how their actions are successful is a central research topic in entrepreneurship [1].

Higher education institutions (HEI) and their surroundings play a "fundamental role for contemporary societies in the field of education and knowledge generation" [2]. For the authors, the university and its surroundings have become a special ecosystem during the last decade. Specifically, favourable conditions are created for cooperation between various entities, namely, HEI, business incubators, technology transfer centres and funding institutions, which contribute to developing the academic entrepreneurship ecosystem ([2], [3]). For [4], the ecosystem conception represents a new competitive force that includes universities that reveal their influence over entrepreneurial ecosystems. For [4] and [5], there exists a notable gap in the understanding of how entrepreneurial education, support systems, and personality traits can be effectively integrated to cultivate entrepreneurial intentions (EI) among students. Thus, this study seeks to answer the following research question:

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How can entrepreneurial education, HEI support and personality traits influence students' EI in higher education institutions?

To this end, we employ the consideration and involvement of more factors in the TPB, which was explored using the theory of planned behaviour (TPB) as the theoretical framework with attitudes, subjective norms and perceived behavioural control [6]. This model is particularly appropriate for analysing the complex interaction between educational and personality factors in forming entrepreneurial intentions. In this context, this research examines the predictive factors influencing students' EIs at a polytechnic HEI in Portugal.

2 METHODOLOGY

The study, therefore, investigates EI and the resulting change among university students. As a basic framework, the influences of contextual factors such as entrepreneurial education, university support and personality factors are examined, resulting in the conceptual model proposed in Figure 1.

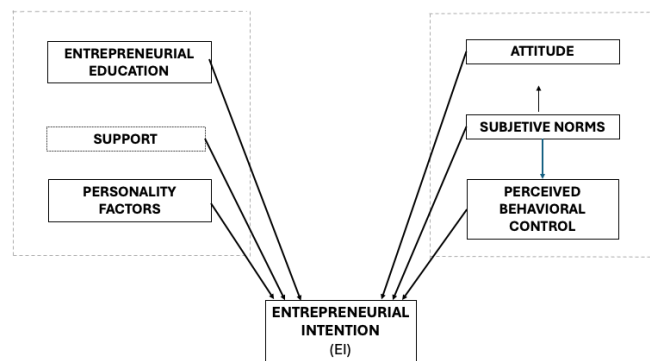


Figure 1. Conceptual Model

[6] argues that behavioral intention is fundamental to the Theory of Planned Behavior (TPB), as it reflects the motivations behind a given behavior. The theory suggests that stronger intentions increase the likelihood of actually carrying out the behavior. While TPB asserts that individuals have complete control over their decisions, it also acknowledges that behavioral intention is influenced by capabilities, opportunities, and resources. In the context of entrepreneurship, TPB emphasizes the importance of entrepreneurial intention in understanding the motivations that drive entrepreneurial behavior, confirming that a stronger entrepreneurial intention enhances the chances of becoming an entrepreneur. The questionnaire was structured into three sections, with the first section focusing on the respondents' characterisation. The second and third sections comprises measures from TPB and three constructs were elaborated and measured according to the theoretical models. The groups of items are measured in 7-point Likert scales adapted from previous research (Table 1).

This multifaceted conceptual model provided a comprehensive framework for understanding the skillsets crucial to EIs.

Table 1. Summary of sections and constructs used in the questionnaire

Sections	Constructs		Source
I	Respondents' characterisation: Age, gender, cycle and areas of studies, year attended, work experience, student profile and residence region		-
II	Attitude	4 items	[7]
	Subjective Norms	3 items	[7]
	Perceived Behavioural Control	6 items	[7]
III	Entrepreneurial education	Entrepreneurial consciousness 5 items for example: 'Teachers have a creative approach to the process of developing entrepreneurial learning.'	[8], [9]
		Perceived entrepreneurial education 6 items for example: 'My HEI offers elective courses on entrepreneurship.'	[8], [9]
	University support	Concept development 4 items for example: 'My HEI provides students with the knowledge they need to start a business.'	[8], [9]
		Business development 3 items	[8], [9]

Regional Helix '25 – Transforming regions through innovation, sustainability and collaboration

			for example: 'My HEI provides students with the financial means to start a new business.'	
Personality traits	Recognising opportunities and creativity	3 items	for example: 'It is easy for me recognize opportunities'	[10], [11]
	Leadership, communication and problem-solving	2 items	for example: 'I have leadership skills'	[10], [12]
	Networking	1 item	'I have capacity for professional contacts and networking'	[10], [13]

The Bragança Polytechnic Institute (IPB) was selected due to its accessibility and convenience for data collection purposes. The data was gathered through an online questionnaire distributed between June and July 2024, targeting students from all six schools affiliated with the IPB. This diversity was crucial to ensure the data captured a broad spectrum of perspectives and educational contexts.

Prior to presenting the main questions of the questionnaire, participants were informed about the study's objectives, the estimated time required for completion, and the voluntary nature of their participation. Informed consent was obtained from all participants. It was used LimeSurvey software for the collection of data and the sample includes 545 responses validated for data analysis.

To process and validate the data for the conceptual and proposed model, we utilized SMARTPLS 4.0 software. This software is well-suited for our exploratory study, which aims to adopt a causal-predictive approach to understanding EI. We followed the systematic two-stage approach for implementing PLS-SEM as proposed by [14] enhancing it with recent best practices discussed by [15].

3 RESULTS

SPSS statistics provides a detailed characterization of the student sample examined in this study. This study aged 18-61 years ($M_{age} = 22$ years, $SD_{age} = 5.8$) with a minimum age of 18 years and maximum age of 61 years. The majority of respondents aged between 18 and 21 years, which corresponds with the first two degrees. Corroborating age, most of the students were enrolled in a Bachelor's degree (89%). Furthermore, there were 174 men (31.9%) and 371 women (68.1%) among the participants in this study.

The Cronbach's alpha based on standardised items is equal to 0.965 for the complete model with 45 variables. This value indicates an excellent internal consistency. This suggests that the items in the scale are highly correlated and reliably measure the same underlying construct. However, Cronbach's alpha only measures internal consistency and not construct validity, i.e. whether the scale actually measures the intended construct.

As a consequence, we also presents internal consistency, and convergent validity results. All item loadings exceed the 0.70 threshold, confirming indicator reliability, except Perceived entrepreneurial education – EDU9 (0.672). Cronbach's alpha and composite reliability values are above 0.70, indicating strong internal consistency. All AVEs are above 0.50, confirming convergent validity.

To examine discriminant validity, we analyse the HTMT ratio between the constructs. All values are below 0.85, demonstrating discriminant validity ([16]). It confirms that the constructs are conceptually different from each other.

4 HYPOTHESIS DEVELOPMENT

With Figure 1 we presented the conceptual model. Extending TPB to include entrepreneurial education, HEI support and personality traits is essential for understanding their effects on EI. Entrepreneurship scholars have validated this assertion by showing that these constructs affects entrepreneurial intention positively (Table 1). Thus, we hypothesize.

4.1 Behavioral intention determinants and TPB

Hypothesis H1: the more favorable the attitude towards entrepreneurship, the stronger a student's entrepreneurial intention

Hypothesis H2: The more favorable the subjective norms towards entrepreneurship, the stronger a student's entrepreneurial intention.

Hypothesis H3: The greater the perceived behavioral control, the stronger a student's entrepreneurial intention.

4.2 Entrepreneurial education and HEI support

Hypothesis H4: entrepreneurial education significantly affect student's entrepreneurial intention.

4.3 Behavioral intention determinants and HEI support

Hypothesis H5: the more favorable the HEI support towards entrepreneurship, the stronger a student's entrepreneurial intention.

4.4 Behavioral intention determinants and personality traits

Hypothesis H6a: Recognising opportunities and creativity towards entrepreneurship, the stronger a student's entrepreneurial intention.

Hypothesis H6b: Leadership, communication and problem-solving towards entrepreneurship, the stronger a student's entrepreneurial intention.

Hypothesis H6c: networking skills solving towards entrepreneurship, the stronger a student's entrepreneurial intention.

5 CONCLUSIONS

This study reveal the importance of a holistic approach to developing entrepreneurial intentions. The conceptual model established could show the factors that need to be maximised to increase EI and specifically, have implications for EI among higher education students at IPB, in the north of Portugal.

The research analyses data from 545 students through statistics and the model presents internal consistency, and convergent validity results which means that these factors collectively contribute to the development and reinforcement of student's EI

The model has a limitation when it comes to analyses and hypothesis testing that should be considered when interpreting the findings in designing future research. Furthermore, deepening this study through PLS-SEM reveal the positive effect of these factors, such as education, university support, and personality traits. Its strength will be stablished with multivariate analyses that will facilitate the evaluation of the measurement model and hypothesis testing.

The collection instrument could also be used effectively in future research to refine and improve the survey items for future studies. Also, this future finding highlights the potential for creating or enhancing a structured academic ecosystem that more effectively promotes entrepreneurship.

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Innovation



IX Regional
HELIX  **25**

Smart specialisation strategy and its effects on regional innovation: insights from northern Portugal

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Abstract

The purpose of this article is to analyse the RIS3 of the Northern region of Portugal in the 2014-2020 programming period and to analyse the contribution of non-business entities in the Research and Innovation (R&I) system to innovation in the Northern region's Regional Innovation System (RIS) during the implementation of the Northern region's RIS3 in the same programming period.

This article adopts a deductive approach, based on a mixed methodological choice (qualitative and quantitative), using documentary analysis, database research and a questionnaire survey as data collection.

The governance model of the RIS3 in the Northern region in the 2014-2020 programming period was a typical multi-level governance model, following many European experiences. The Northern region's RIS is made up of agents from different areas and competences, in a triple helix perspective, with a greater concentration of non-business entities in the R&I system in the municipalities with the largest business fabric, thus showing that the R&I system is more present in the most dynamic economies.

Through the statistical modelling carried out, it was found that the non-business entities of the R&I system influenced the business fabric in organisational innovation, product innovation and its competitive orientation and internationalisation, in the 2014-2020 programming period, and also that the governance of RIS3 influenced the organisational innovation of the business fabric of the North, in the same programming period.

Keywords: Research and Innovation Strategies for Smart Specialisation (RIS3); Regional Innovation System (RIS); Non-business entities in the R&I system; Regional Innovation; North.

1 INTRODUCTION

The implementation of the Europe 2020 Agenda has led to the adoption of the concept of Smart Specialisation by the regions of the European Union (EU), with a view to smart, inclusive and sustainable growth, advocating the development of an economy based on knowledge and innovation, more efficient in terms of resource use, more ecological and competitive, and with high levels of employment in order to ensure social and territorial cohesion ([1]).

At the root of the conceptualisation of smart specialisation is the work carried out by a group of European economists known as 'Knowledge for Growth' ([2]). According to this group, the concept of smart specialisation is based on discovering the areas of greatest potential, considering the main resources and capabilities of each region, making it possible to build or strengthen the competitive position of that regional economy in the global market. This concept implies, in addition to reinforcing existing capacities and strengths in each region, identifying new possibilities for developing them ([2]).

This concept arose because Europe was not attracting international research and development (R&D) and two explanations were put forward for this phenomenon: the existence of highly fragmented national

Regional Helix 25 – Smart Specialisation Strategy and Its Effects on Regional Innovation: Insights from Northern Portugal

innovation systems and the high level of competition between successful strategies within the regions and countries of the EU. It was then concluded that it was necessary to identify different areas of specialisation to avoid wasting resources and move towards a more specialised Europe, based on a coordinated R&D system ([3]).

Smart Specialisation is an academic concept that has evolved into a practical application and its implementation in the regional context in the EU has taken place through the 'Research and Innovation Smart Specialisation Strategies' (RIS3) ([4], [5], [6]). The development of RIS3 was an ex-ante conditionality established by Community regulations for the 2014-2020 programming period ([7], [8], [9]) and an enabling condition in the current 2021-2027 period ([10]). RIS3 differs from previous strategic initiatives in that it encompasses a participatory and multi-level innovation process, with the deeper involvement of various players in the innovation system ([11]).

The development of the RIS3 has put pressure on EU regions and member states to reflect on their governance of innovation policy. On the one hand, with the incorporation of participatory processes into the political process, on the other, with coordination between government departments and political actors that were previously peripheral to innovation policy. ([12]). Regional governance respects the quadruple helix model, constituting a process of entrepreneurial discovery involving companies, educational, research and development institutions, public planning and management bodies for R&I policies, and innovation users ([12]).

Given this framework, it is important to study the implementation of RIS3 in the various regions, allowing for adjustments in future practices in subsequent programming periods. In addition, there is a gap in the literature in terms of up-to-date studies on the influence of RIS3 on innovation in Regional Innovation Systems (RIS) in the various EU regions, and there is also a gap in the impact of non-business entities in the Research and Innovation (R&I) system on RIS.

In this sense, the research objectives of this article are as follows: to analyse the RIS3 of the Northern region of Portugal in the 2014-2020 programming period, and to analyse the contribution of non-business entities in the R&I system to innovation in the RIS of the Northern region during the implementation of RIS3 Norte, in the 2014-2020 programming period.

2 METHODOLOGY

This article adopts a deductive approach, based on a mixed methodological choice (qualitative and quantitative), using documentary analysis, database research and questionnaire surveys as data collection tools and techniques. We began by identifying, for each priority area, the absolute and relative distribution of the number of approved projects and their eligible investment by NUTS III sub-region. We then carried out a qualitative analysis of the integrated territorial development strategies of the NUTS III sub-regions and an analysis of the relative specialisation of the same NUTS III sub-regions in each priority area, using the relative specialisation indicator, using the Locational Quotient methodology. Subsequently, we mapped the NIS of the Northern NUTS II region, of business and non-business entities and carried out a questionnaire survey of all the non-business entities in the R&I system that make up the Northern NIS. With regard to the statistical analysis of the questionnaire data, Partial Least Squares Structural Equation Modelling (PLS-SEM) was used, using version 4.0.1.6 of the SmartPLS software.

3 CONCLUSIONS

The objectives set for this article were to analyse the RIS3 of the Northern region of Portugal in the 2014-2020 programming period and to analyse the contribution of non-business entities in the R&I system to innovation in the RIS of the Northern region during the implementation of the RIS3 of the Northern region in the 2014-2020 programming period.

This article adopts a deductive approach, based on a mixed methodological choice (qualitative and quantitative), using documentary analysis, database research and a questionnaire survey as data collection tools and techniques.

The RIS3 governance model for the Northern region in the 2014-2020 programming period was a typical multi-level governance model, following many European experiences. However, the incorporation of these practices into the strategic territorial intervention documents in each NUTS III sub-region was different. It revealed that in coastal territories (which are not entirely low-density), governance practices and the mobilisation of stakeholders and communities to participate in political decision-making

Regional Helix 25 – Smart Specialisation Strategy and Its Effects on Regional Innovation: Insights from Northern Portugal

processes are more consolidated. Low-density territories, on the other hand, claim to make a greater effort to mobilise communities in decision-making processes, showing that their mobilisation is weak, which may be related to low levels of satisfaction with the constraints arising from the low density of their territory.

With regard to the Northern region's NIS, it is made up of a series of agents from different areas and competences, in a triple helix perspective, with business entities, public administration and non-business entities in the R&I system, which were the subject of this study (Higher Education Institutions, R&D Institutions and Infrastructures, Technological Institutions and Infrastructures, Innovation Hubs, Infrastructures for Hosting and Valorising S&T Activities). There was a greater concentration of non-business entities in the R&I system in the municipalities with the largest business fabric, showing that the R&I system is more present in the most dynamic economies.

With regard to the degree of specialisation of the NUTS III sub-regions in each priority area of RIS3 Norte for the 2014-2020 programming period, it can be seen that AM do Porto has specialisation in 6 areas (Advanced Production Systems; Agri-environmental Systems and Food; Life and Health Sciences; Sea Resources and Economy; Mobility and Environmental Industries; Human Capital and Specialised Services), Terras de Trás-os-Montes specialises in 4 areas (Agri-environmental and Food Systems; Symbolic Capital; Tourism Technologies and Services; Life and Health Sciences; Mobility Industries and Environment), Alto Minho specialising in the Sea Resources and Economy and Mobility Industries and Environment domains, Alto Tâmega specialising in the Symbolic Capital Tourism Technologies and Services and Agri-Environmental Systems and Food domains, Cávado specialising in the Culture, Creation and Fashion and Advanced Production Systems domains, Douro specialising in the Symbolic Capital Tourism Technologies and Services and Agri-Environmental Systems and Food domains, Ave in the Culture, Creation and Fashion domain and Tâmega e Sousa in the Culture, Creation and Fashion domain.

The statistical modelling carried out showed that the non-business entities of the R&I system influenced the business fabric in terms of organisational innovation, product innovation and competitive orientation and internationalisation in the 2014-2020 programming period, and also that the governance of RIS3 influenced the organisational innovation of the business fabric in the North in the same programming period. In addition, the exclusion of some variables from the structural model suggests that the initial collaborative dynamic for the choices of RIS3 priority areas was reduced, the bottom-up approach may not have been that important in defining the priority areas or perhaps it didn't work, the combination of the bottom-up and top-down approaches may not have brought competitive advantages to the sub-regions, regional actors may not have a clear understanding of the vision and objectives of RIS3 Norte, smart specialisation does not harm low population density territories, the processes may not be the most appropriate to achieve the objectives of RIS3 Norte and that in the 2014-2020 programming period the non-business entities of the R&I system did not encourage the business fabric to use academic and technological networks as a knowledge resource.

This study has several limitations due to the complexity of the topics covered. One limitation of this study, and perhaps the main one, is the limited number of responses to the questionnaire from non-business organisations in the R&I system, in relation to the total population under study. Another limitation is the fact that the period

That said, for future research it would be relevant to analyse the next programming period (2021-2027) or even the two programming periods in order to have a more robust impact assessment. Furthermore, given the lack of studies at this level, it is important and crucial to consider the sub-regional and local level in order to see if the objectives of RIS3 are being achieved in these contexts.

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**Regional Helix 25 – Smart Specialisation Strategy and Its Effects on Regional Innovation:
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New residents and emerging dynamics: social innovation processes in rural territories

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Abstract

In recent years, rural areas have attracted growing interest from new residents seeking a more balanced and sustainable lifestyle. This revaluation of the rural world, combined with the expansion of remote working, has driven new socio-professional dynamics. Coworking spaces stand out, combining work support with a community dimension, promoting encounters, synergies and social ties. In low-density regions, such as north-western Portugal and Galicia, these rural hubs play a strategic role in promoting innovative ways of living and cooperating. At the same time, communities of new residents are emerging who share values and lifestyles, contributing to local dynamism. These territories, marked by a history of demographic decline, offer environmental and social attributes that are valued by those who choose to live and work there. The emerging dynamics can be reinforced by innovative public policies based on participatory governance models.

This article presents a reflection based on the analysis of communities and initiatives in rural areas of north-western Portugal and Galicia.

Originality/Value: It compares two cross-border contexts, revealing similarities and differences.

Theoretical contribution: It broadens the debate on social innovation in low-density areas, based on networks and citizen participation.

Keywords: Collaborative networks, Communities, Rural coworking

1 INTRODUCTION

In recent years, there has been growing interest in rural areas among new residents seeking lifestyles more aligned with values of sustainability, well-being, and work-life balance. This reconfiguration of rural areas — not as places of fragility, but as territories of opportunity — stems from socio-economic and cultural transformations, as well as advances in digital technologies, which enable new forms of remote working ([1], [2]). Newcomers see these territories as a relational and meaningful space where they can build life projects rooted in community, ecological and creative values [3]. This attractiveness of rural areas is associated not only with environmental and landscape aspects, but also with the possibility of regenerating social ties and actively participating in local revitalization, often through collaborative networks, community-based initiatives and social innovation practices [4]. The existence of a sense of community and the possibility of actively participating in the collective life of a local community are considered factors of permanence, but also of attraction to rural areas, including return [5]. Rural areas are no longer seen as marginal, but are now recognized as living laboratories for new ways of living, producing and cooperating.

In this context, social innovation has emerged as a promising field, proposing collaborative solutions that actively involve civil society, promoting collective well-being and combating forms of exclusion [6]. Although rural areas have historically been marked by depopulation, in recent years there has been a revaluation of these spaces, driven by changes in lifestyles and the growing attractiveness of contexts that offer a higher environmental quality, closer social relations and a less fast-paced daily life [7]. In this movement, new residents — often attracted by ideals of more sustainable living — have been settling in peripheral areas, such as the mountainous regions of north-western Portugal and Galicia. Their arrival

often occurs through informal reception and integration centers, where small groups of families share values, practices and cooperation strategies, creating support networks and solutions adapted to local needs.

At the same time, rural coworking spaces are emerging as strategic infrastructures that not only provide physical support for new forms of remote and autonomous work, but also function as spaces for meeting, sharing knowledge and community development [8]. These hubs contribute to the strengthening of local networks, the emergence of collaborative initiatives and the consolidation of new ways of living and producing in the territory — central dimensions of social innovation ([9], [10]).

Stronger governance, with greater involvement of local communities, is considered fundamental to the construction of these innovative solutions [11]. In addition, collaboration between different actors can increase the resilience of rural areas by promoting new forms of social and economic organization [12].

In this article, we start from an analysis of several communities and initiatives in cross-border rural areas to reflect on the role of new residents and social innovation infrastructures in the revitalization of rural areas. Our approach compares realities in north-western Portugal and Galicia, allowing us to identify common dynamics and contextual specificities, with a view to broadening the debate on participatory governance and collaborative networks in low-density territories.

2 METHODOLOGY

This study follows a qualitative exploratory approach, focusing on the analysis of social dynamics and innovation practices in low-density rural areas, with a particular focus on the integration and participation of new residents and the role of rural coworking spaces as infrastructure supporting professional activity and catalysts for community building.

Various qualitative techniques were used to collect data, including direct and participant observation in rural coworking hubs and community initiatives of new resident communities, surveys of digital nomads, semi-structured interviews with those responsible for the spaces and other local actors, exploratory field visits with recording of interactions and territorial practices, and documentary analysis of institutional and communication materials. The data collected were analysed using inductive thematic analysis, an approach that allows for the identification, organisation and interpretation of significant patterns emerging from the data, without relying on pre-established categories [13]. This process involved the systematic coding of empirical material, the grouping of codes into themes, and their subsequent review and definition.

3 RESULTS

The data collected reveals a trend of migration to rural areas, driven by the search for more balanced, sustainable and community-based lifestyles. Many of those interviewed saw rural areas as a space where personal, professional and civic life can be harmoniously integrated. As one new resident put it, "(...) I simply fell in love with Campo [do Gerês]. I liked it: the people, the landscape, the nature."

There are associative movements and coworking spaces in these areas that play important roles in revitalizing the area. These are emerging as multifunctional infrastructures, going beyond mere support for professional activity. They function as meeting points, fostering sociability and the building of networks, not only for digital nomads, but also for other workers seeking to establish ties with the area and the community, many of whom end up settling in nearby rural areas. More than just workplaces, they are spaces for socializing, exchanging knowledge and building bonds, facilitating the sharing of ideas, the creation of collaborative projects and the integration of new residents into local dynamics.

3.1 Motivations and paths of new residents

The motivations that lead to moving to rural areas are varied, with emphasis on the search for a better quality of life, greater proximity to nature and a more satisfactory balance between personal and professional life. In the case of young couples with children, there is also a concern to provide children with more direct contact with the natural environment and with a more cohesive and meaningful community experience, as one of the interviewees stated: "(...) we looked for a calm life and a space of environmental and social quality for our children." Also in the survey carried out with digital nomads, "peace and tranquility" and proximity to Nature" were the options indicated as most important when choosing a place to work and, sometimes, to live.

3.2 Cooperation Networks and Community-Based Initiatives

At the same time, we have observed the emergence of other forms of community organization, such as informal groups and local mutual aid networks. Shared initiatives, such as local markets, artistic residencies and cultural events, strengthen social ties between new and old residents. There are associative movements that promote various initiatives and bring communities together, bringing residents closer to the territories.

Such is the case of a Galician Association linked to a coworking company, whose manifesto includes the following sentence: “Our vision is to create an open movement to promote and contribute to the development of rural areas through technology, arts and creativity.”

In another Portuguese village, an association founded by young locals and new residents and supported by public investment, promotes activities in the agricultural, ecological, educational, artistic and cultural areas, promoting various initiatives linked to the arts and education, bringing together new residents and the local community. In the words of its leaders: “We are bringing artists here, bringing creative solutions to liven up the community. Creating events and social situations here”. “(...) we realise that the interesting thing is for people to participate (...). We don't find it so interesting to have artists come here to do their work and then leave. What is interesting is when people can co-create, can participate and the artist benefits from this community and the community benefits from the artist (...)”. However, the broad participation of residents is not guaranteed and has been decreasing.

Despite the promising nature of these dynamics, there are significant challenges to be overcome. Infrastructure limitations, such as the lack of affordable housing and educational solutions for children, are significant obstacles, as is the difficulty in renewing their social bodies. The lack of structuring public policies also poses a risk to the sustainability of these initiatives, which are based on motivated leadership and a high degree of volunteerism from a small number of people. Nevertheless, the results point to the emergence of social innovation processes, where the mobilization of local networks, cooperation between different profiles of residents and the collective appropriation of the territory actively contribute to the social and economic revitalization of rural areas.

4 CONCLUSIONS

This study concludes that a deeper understanding of the emerging processes of rural attraction is essential for designing more effective public policies and governance models. Identifying the critical factors that drive the transformation of peripheral rural territories can help to consolidate them as spaces that are not only attractive to new residents, but also as territories with renewed capacities for creation, innovation and sustainable development.

In recent years, associative movements have been helping to revive some of the bonds that sustain the sense of community. The activities they promote represent important opportunities for conviviality and community animation, and keep alive traditions that are the foundations for fostering a sense of belonging.

The results obtained show that coworking spaces, in addition to their function as infrastructures to support remote work and entrepreneurship, play an important role in the social and economic dynamism of rural areas. These structures have the potential to act as catalysts for collaborative networks, fostering close relationships, resource sharing and community integration. In this sense, rural coworking hubs not only meet the professional needs of new residents, but also contribute to strengthening the attractiveness of the area, acting as anchor points for those seeking to settle in rural areas with life projects aligned with values of sustainability, quality of life and connection to the community. Their presence can therefore play a strategic role in the processes of repopulation and revitalization of rural areas, particularly when articulated with public policies to support settlement and social innovation.

These themes show that the new socio-territorial dynamics, although marked by the diversity of paths and forms of organization, contribute to the revitalization of rural areas, configuring emerging forms of social innovation with transformative potential.

The results show that rural areas that adapt to the new dynamics associated with the arrival of new residents are able to benefit from their capacity for innovation, experience and knowledge. The analysis of the cases studied shows that the creation of support networks and the implementation of appropriate public policies are key elements in strengthening the attractiveness and sustainability of these areas.

Regional Helix '25 – Transforming regions through innovation, sustainability and collaboration

Social innovation, promoted by collaboration between local stakeholders and new residents, is essential to counteract depopulation and boost economic dynamism.

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Study of the Determinants of Innovation in Portuguese Companies: Application to the Engineering & Tooling Cluster

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Abstract

Business innovation plays a central role in the competitiveness of companies and in the economic growth of countries. This study examines the key factors influencing innovation in Portuguese companies, with a specific focus on the Engineering & Tooling Cluster, a sector of strategic relevance to national industry. Based on recent literature, the analysis explores the influence of five critical factors: Investment in R&D, External Collaboration, Government Policies, Workforce Qualification, and Internationalization. Using a quantitative methodology, the study applies logistic regression analysis to data from the Community Innovation Survey (CIS 2022), since the dependent variable – business innovation – is binary (innovative/non-innovative). The findings confirm that Investment in R&D is the most significant determinant, reinforcing the importance of sustained research activities. External Collaboration also shows a strong effect, indicating that partnerships with universities, firms, and R&D centers boost innovation. Government incentives and regulatory support have a meaningful impact, as do Internationalization, which contribute to knowledge absorption and new market access. The results contribute to the literature on innovation determinants and provide practical insights for policymakers and managers aiming to foster innovation ecosystems. The study highlights the relevance of collaborative networks, strategic investment, and institutional support for industrial innovation in Portugal.

Keywords: Innovation, R&D Investment, Collaboration.

1 INTRODUCTION

Business innovation is essential for corporate competitiveness and economic development. This study analyses the determinants of innovation in Portuguese companies, with a particular focus on the Engineering & Tooling Cluster, a strategic sector for the national industry. The study investigates the influence of factors such as R&D Investment, External Collaboration, Government Policies, Workforce Qualification, and Internationalization & Foreign Trade.

Using a quantitative approach based on data from the Community Innovation Survey (CIS 2022) and applying logistic regression analysis, the impact of these variables on business innovation was assessed.

The results show that R&D Investment is the main driver of innovation, highlighting the importance of continuous efforts in research and development. External Collaboration also stands out as a crucial factor, demonstrating that strategic partnerships enhance innovative capacity. Government Policies are shown to have a significant impact, reflecting the need for solid institutional support. Human Resource Qualification is not confirmed as a key determinant in the development of innovative solutions. Finally, Internationalization & Foreign Trade reveal a positive relationship with innovation, supporting the absorption of new knowledge.

It is concluded that innovation in the cluster results from the interaction between investment, knowledge, and collaboration, reinforcing the importance of effective public policies and an environment conducive to technological development.

The structure of this work is as follows: Section 2 details the methodology and model; Section 3 presents the empirical results and analysis; and Section 4 concludes with implications and suggestions for future research.

2 METHODOLOGY

This research adopts a quantitative and deductive approach to evaluate the determinants of business innovation in Portugal's Engineering & Tooling Cluster. A conceptual model was developed based on a review of literature, relating five independent variables—R&D Investment, External Collaboration, Government Policies, Workforce Qualification, and Internationalization—to a binary dependent variable: business innovation (1 = innovative firm, 0 = non-innovative firm). The data for quantitative analysis used were obtained from the Community Innovation Survey (CIS 2022), conducted by DGEEC and INE, covering innovation activities from 2020 to 2022. The sample includes 623 companies from CAE codes 22, 25, and 29, directly related to plastics manufacturing, metal products, and automotive components. Data were collected via the WebInq electronic platform. Large firms were surveyed via census, while small and medium-sized enterprises (SMEs) were selected using stratified sampling to ensure representativeness. Variable definitions:

- Business Innovation: Binary (1 = innovative firm, 0 = non-innovative), based on whether the firm introduced new products or processes during the reference period.
- R&D Investment: Internal and contracted expenditures in research activities.
- External Collaboration: Existence of partnerships with firms, universities, or research centers.
- Government Policies: Access to financial incentives, tax credits, or regulatory support.
- Workforce Qualification: Percentage of employees with higher education.
- Internationalization: Firms with export activity during the period.

Given the binary nature of the dependent variable, logistic regression analysis was employed to ensure unbiased and consistent estimates. The general model is:

$$\text{logit}(P(\text{Innovation})) = \beta_0 + \beta_1(\text{R\&D}) + \beta_2(\text{Collaboration}) + \beta_3(\text{Policy}) + \beta_4(\text{Qualification}) + \beta_5(\text{Internationalization}) + \varepsilon$$

Hypotheses:

H1: R&D investment has a positive impact on business innovation.

H2: External collaboration positively influences innovation.

H3: Government support increases innovation capacity.

H4: Workforce qualification is positively associated with innovation.

H5: Internationalization promotes business innovation.

3 RESULTS

The analysis was carried out using logistic regression analysis model in SPSS software, with the aim of testing the relationship between business innovation and five key determinants: R&D Investment, External Collaboration, Government Policies, Workforce Qualification, and Internationalization & Foreign Trade. The logistic regression model demonstrated good overall performance, with the Omnibus Test confirming its statistical significance ($\chi^2 = 265.023$, $p < 0.001$), and goodness-of-fit indicators showing that it explains between 34.6% and 46.6% of the variance in innovation outcomes. The classification table reveals a high overall accuracy of 77.4%, with stronger predictive power for non-innovative firms (84.5%) but still substantial accuracy for identifying innovative ones (72.1%).

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Table 1. Omnibus Test of Model Coefficients

Test	Chi-Square (χ^2)	df	Sig. (p-value)
Omnibus Test	265.023	4	< 0.001

Table 2. Model Fit and Explained Variance

Statistic	Value
-2 Log Likelihood	584.096
Cox & Snell R ²	0.346
Nagelkerke R ²	0.466

Table 3. Classification Accuracy of the Logistic Regression Model

Classification	Accuracy (%)
Overall Accuracy	77.4%
Accuracy (Non-Innovators)	84.5%
Accuracy (Innovators)	72.1%

The logistic regression analysis indicates that four independent variables — Investment in R&D (Inv_ID), External Collaboration (Col_Ext), Government Policies (Pol_Gov), and Internationalization and External Trade (Int_C) — have a statistically significant impact ($p < 0.001$) on the likelihood of a firm being innovative. The variable Human Resources Qualification (Qual_RH) was initially included in the model but was ultimately excluded due to its lack of statistical significance, suggesting it does not meaningfully contribute to explaining innovation within the sample analyzed. The table below summarizes the estimated coefficients and their interpretation:

Table 4. Logistic Regression Coefficients, Significance Levels, and Odds Ratios for Innovation Predictors

Variable	B	S.E.	Wald	Sig.	Exp(B)	Interpretation
Investment in R&D (Inv_ID)	2.596	0.372	48.760	<0.001	13.411	Firms that invest in R&D are 13.4 times more likely to innovate.
External Collaboration (Col_Ext)	1.655	0.340	23.687	<0.001	5.231	Firms with external collaborations are 5.2 times more likely to innovate.
Government Policies (Pol_Gov)	0.846	0.234	13.047	<0.001	2.331	Government support more than doubles the probability of innovation.
Internationalization (Int_C)	0.784	0.229	11.749	<0.001	2.189	Internationalized firms are 2.2 times more likely to innovate.
Constant	-1.332	0.204	42.447	<0.001	0.264	Baseline probability of innovation is low when all predictors are absent.

The Human Resources Qualification (Qual_RH) variable was dropped from the model due to a lack of statistical significance ($p > 0.05$). The most influential predictor is clearly Investment in R&D, followed by External Collaboration, Government Policies, and Internationalization. The relatively low standard errors (ranging from 0.204 to 0.372) indicate precise coefficient estimates, and the high Wald statistics (ranging from 11.749 to 48.760) confirm that all variables—R&D Investment, External Collaboration, Government Policies, and Internationalization—are highly significant predictors of innovation. The results highlight that innovation is strongly influenced by a combination of internal capabilities and external engagement. The results support the findings from the literature review. R&D investment is reaffirmed as the main driver of innovation [1]. The relevance of external collaboration reinforces the theory of open innovation and collaborative ecosystems [2–6]. Government policies validate the importance of public support for competitiveness [7–9]. Finally, internationalization emerges as a strategic factor for the absorption of knowledge and innovative practices [10–12]. The study confirms that business innovation in the Engineering & Tooling cluster results from the interaction among R&D investment, external collaboration, government policies and internationalization.

4 CONCLUSIONS

The present study confirmed the positive influence of four key factors on business innovation within the Engineering & Tooling Cluster in Portugal: R&D Investment, External Collaboration, Government Policies and Internationalization. R&D Investment emerged as the most significant determinant, highlighting the critical role of research in developing new products and processes. External Collaboration proved essential for fostering innovation through strategic partnerships. Government Policies and Tax Incentives were validated as important forms of institutional support. Internationalization demonstrated a direct impact on innovation capacity which facilitates access to new markets and knowledge exchange. This study contributes to advancing the understanding of innovation determinants and offers practical recommendations: sustained investment in R&D, strengthening of external partnerships, effective utilization of public incentives and strategic international expansion. It is further recommended that public policies reinforce an institutional environment conducive to innovation and encourage cooperation between firms and research centers. Differentiating itself from previous research, this study focuses specifically on the Engineering & Tooling cluster within the Portuguese context and integrates multiple innovation drivers into a comprehensive empirical analysis. Secondary data provides access to a broad, reliable dataset that enhances the robustness and generalizability of the findings. Thus, the use of secondary data represents a methodological trade-off rather than a drawback, enabling a more extensive investigation. Future research is encouraged to adopt mixed methods approaches, investigate emerging factors such as digital transformation, sustainability, and artificial intelligence, and conduct comparative studies across different industrial clusters to deepen the understanding of innovation drivers amid rapid technological and global changes.

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Changing the mindset for circular economy, through its benefits

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Abstract

The transition from a linear economy to a circular economy represents not only a structural change in production and consumption, but also a complete transformation in the values, behaviors and mentalities of society. Despite the increasing awareness of the community, the acceptance of circular principles remains hampered by entrenched linear habits and also by resistance to change. This paper argues that one of the most effective positive ways to promote a circular mindset is by highlighting the possible benefits and all the strategies that can be implemented for economic development, which affects individuals, businesses and policymakers.

Keywords: Circular economy, Structural changes, Mindset

1 INTRODUCTION

The study explores how the demonstration of the benefits of circular economy (CE), such as cost reductions, innovation, supply chain creation and positive environmental impacts - can act as key pillars in changing values and attitudes. The main goal is to reformulate the idea of CE to characterize it not as a sacrifice but as an opportunity for profitability and creation of future values. This is precisely what the paper seeks to present, i.e. an attempt to change the attitude towards CE and its acceptance. Through a review of the multidisciplinary literature [1] and the analysis of case studies, this paper will present successful interventions in sectors where exactly the benefits are those that have motivated behavioral changes in relation to CE [2]. Furthermore, the role of communication strategies, educational programs and policy incentives that make a convincing orientation towards the recognition of the benefits is presented [3].

2 METHODOLOGY

In the methodology, we will be able to collect statistical data through a questionnaire, created among individuals starting at the age of 15, businesses which can implement circular economy into their activities [4] and some employees of Albanian government, on how much information they have about CE and how they envision their future with it. The questionnaire includes questions on how much information the population has about the circular economy and its status of operation. There are also questions regarding the trust of beneficiaries in the circular economy and what is important is that 70% of those interviewed accept that the future is the circular economy.

The initiative for such a questionnaire has come from examining the implementation of the circular economy in different businesses on a case-by-case basis [5, 6]. Often, decisions are made on the basis of R strategies of recycling, remanufacturing, reuse, etc. Here it remains important that it is not enough for just a small sector to develop the circular economy, but the circular economy must be enough to develop the entire market.

3 RESULTS

What is valuable about this article is exactly the presentation of how we can act to change the opinions of the community to support circular economy initiatives. Also, so that opinions do not remain simply

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opinions, the next element is implementation, and for this to happen, positive results from the use of the circular economy and the change in the opinion of the community to expand it are the first positive signal for businesses to activate the circular theory by reducing costs and increasing benefits.

This can be divided into 3 points:

Point one: The positive impact of the circular economy on an economy, by conducting a cost-benefit analysis [7].

Point two: Disseminating this information to the community in order to convince them of its benefits [8].

Point three: Connecting theory and community opinion to apply to government and business policies [9].

Regardless of the theoretical results that we present when it comes to commenting on the results through the questionnaire, we come to the conclusion that a better way to encourage a circular economy is the interaction of three actors, government, business, and families together.

Here we can also create a data table for the share of individuals who have changed their minds and support the circular economy and businesses that are moving away from the linear scheme and are using the circular economy, and also the identification of those entities that use the circular economy.

4 CONCLUSIONS

As a result of all this study, we come to understand that in fact, using a circular economy has more benefits than costs. The cost that weighs most heavily on the implementation of the circular economy is the initial fixed cost of implementing the new technology and this is accompanied by the social cost of individual support. However, if an entrepreneur or a simple individual sees the benefits that accompany the circular economy, they will not support it. Support is also the biggest challenge.

The circular economy is not just an economic development strategy. It offers economic advantages through savings, job creation in the repair and reproduction sectors and of course it brings social benefits by reducing dependence on limited resources.

Its development process is continuous and adaptive. Success lies in how the elements of the circular economy will be connected according to processes with the aim of sustainable collaborations towards development and a regenerative future.

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Mapping user needs in the competitive trading card game community

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Abstract

Trading card games (TCGs) have evolved from locally rooted communities to globally connected networks of players who rely on online platforms for strategy discussion. Despite the increasing availability of digital tools, most do not adequately address the specific and complex needs of competitive players. This paper explores how lightweight, qualitative methods can help uncover user expectations within this globally dispersed and specialized community. A survey was distributed across various online TCG communities, to collect information about their practices and feelings about existing tools. The data was analyzed using empathy mapping to highlight user perspectives, and affinity diagramming to group recurring needs, behaviors, and frustrations. These methods helped uncover gaps between what current tools offer and what players require. The findings are used for the development of a new platform that assesses the specific needs of competitive TCG players. Future work will include continuous user feedback monitoring and localization efforts to serve international audiences more effectively. This study provides a replicable approach for researchers and designers working with specialized global userbases where standard UX methods may fall short.

Keywords: User experience, Market research, Online communities

1 INTRODUCTION

Trading card games are competitive games where players build customized decks from a pool of collectible cards and compete using complex, evolving strategies. The process of choosing which of these cards should be part of your strategy is called *deckbuilding*. Since their appearance in the early 1990s, most notably with the release of *Magic: The Gathering* [1], TCGs have spawned passionate communities centered around local game stores, tournaments, and in-person discussions. For many years, strategic knowledge and deck ideas were shared informally within these physical spaces, leading to local and isolated communities.

In recent years, those communities have significantly changed. Online platforms such as forums, Reddit *subreddits*, and Discord servers have become the center for competitive discussion, metagame analysis, and deckbuilding. For example, some popular community forums for trading card discussion on the Reddit social media platform include: *r/MagicTCG*, *r/Yugioh* and *r/PokemonTCG*. Alongside these communities, a growing number of digital tools have been developed to support players in constructing and optimizing decks. However, many of these tools fall short of meeting the real needs of competitive players, who often prefer using their intuition instead.

Identifying the needs of this userbase presents a challenge, as the community is dispersed globally among many regions, each having their own preferences for different games and ways of engaging with specific games. This study explores how lightweight, qualitative methods, specifically semi-structured

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surveys, empathy mapping, and affinity diagramming, can help researchers and developers understand and categorize user needs in such contexts.

By sharing this approach and its application, we hope to offer a practical model for others who aim to design for specialized, globally dispersed communities.

2 METHODOLOGY

Based on extensive personal experience within parts of the competitive TCG community, along with ongoing discussions with players and observations of online discourse, it appeared that existing digital tools for deckbuilding and probability calculation do not fully meet the needs of competitive players, particularly in preparation for tournaments. To explore this further, a qualitative survey was created using Google Forms and shared across several online platforms, including Reddit *subreddits*, Discord servers, and Facebook groups dedicated to TCGs.

The survey included approximately 20 questions, with around half being open-ended. These questions were designed to gather insights into participants' demographics, past experiences with deckbuilding, their opinions of current tools, and their emotional responses to the process of tournament preparation. In total, 30 responses were collected.

To analyze the data, responses were first organized using empathy mapping, a method used in design thinking to capture what users say, think, do, and feel in relation to a product or process [2]. This helped surface both explicit statements and implicit concerns. Next, affinity diagramming was used to cluster similar player needs, behaviors, and frustrations into meaningful groups. Affinity diagramming is a technique that involves organizing qualitative data into categories based on natural relationships or themes that emerge from the content [3].

Empathy mapping and affinity diagramming were chosen due to their grounding in design thinking, which prioritizes user-centered analysis in product development and problem solving. Affinity diagramming is effective for clustering qualitative data to identify user types and needs, as shown by [4] in their user model development regarding a popular music software. [5] used affinity diagramming along with the System Usability Scale (SUS) to analyze users' open-ended comments on the interface of online roadshow websites. These methods are effective for interpreting qualitative and unorganized input, especially when user needs are poorly documented or highly contextual. Empathy maps help with the understanding of users' needs, even if they aren't expressed directly, while affinity diagrams organize unstructured data into coherent categories.

3 RESULTS

The primary outcome of the initial research phase is the affinity diagram (Fig. 1), which clusters different user types and their experiences with the current TCG strategy tools, as well as their expressed needs when it comes to a newly proposed platform.

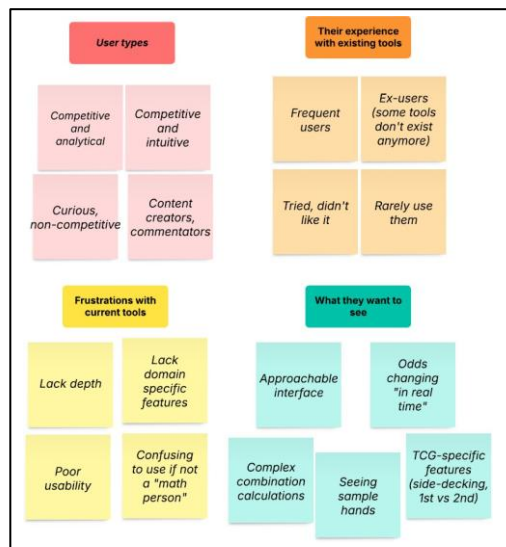


Figure 1. Affinity diagram

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The diagram was made by filtering through, analyzing and clustering different responses to the form distributed among trading card game players. Although the resulting diagram is relatively simple, its purpose is to summarize the most valuable insights gathered from the survey.

These insights, now structured and visualized in the affinity diagram, point toward an unmet demand in the community, one that could be addressed through the development of a new online platform.

4 FUTURE WORK

The basis of current work is the answers to the survey of circa 30 players primarily focused on only one of the popular trading card games. To make sure that the needs of the players of other TCGs are considered, a similar approach will be used after surveying other TCG communities. Other than addressing the needs of a more diverse userbase, this will also address the possibility of the sample size not being adequate for proper clustering of datapoints.

If a new online platform for competitive trading card game players is to be developed, it will be important to maintain ongoing engagement with the target audience to ensure the final product remains aligned with their evolving needs. Gathering user feedback on early prototypes and monitoring how the tool is used after launch will help identify areas for improvement and guide future updates.

Given the international nature of the competitive trading card game community, future work must also consider localization and cultural adaptation. This includes translating the tool into other languages and accounting for regional differences in gameplay habits and platform preferences.

5 CONCLUSIONS

Understanding the needs of competitive trading card game players requires methods that account for both the community's global distribution and its specialized nature. This study showed how a combination of semi-structured surveys, empathy maps, and affinity diagrams can help make sense of diverse user input and highlight common goals, frustrations, and feature requests. Importantly, the study is exploratory and primarily focused on laying the groundwork for future development efforts.

These lightweight tools proved effective in organizing user feedback and identifying critical gaps in existing platforms. The insights gathered through this process will directly inform the development of a new tool designed to better align with what users want, addressing the disconnect between current tools and player needs. Hopefully, this experience can serve as a useful reference for others working with similar niche communities, where traditional UX research methods may be difficult to apply.

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Sustainability



IX Regional
HELIX  **25**

ENHANCING RENEWABLE ENERGY UTILIZATION THROUGH RESIDENTIAL PEER-TO-PEER TRADING

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Abstract

This study investigates decentralized peer-to-peer (P2P) energy trading strategies within a residential community context. It focused on the design and modeling of trading mechanisms that enable households to exchange surplus renewable energy. A real-world dataset on renewable generation and household consumption was used to synthesize energy profiles for a ten-household community. Two trading strategies are considered: a supply–demand matching approach that pairs surplus and deficit participants, and a distance-based strategy aimed at reducing distribution losses. The simulation assesses key performance indicators such as reduced dependency on the main grid, volume of energy traded locally, and consumer cost savings. The study emphasizes the potential of localized energy trading to enhance renewable energy utilization and deliver economic benefits at the community level.

Keywords: Peer-to-peer energy trading, Local energy markets, Decentralized systems

1 INTRODUCTION

The rapid evolution of energy systems has underscored the need for local energy markets (LEMs) that can more effectively balance supply and demand, integrate renewable energy, and mitigate grid congestion. Traditional, centrally managed energy markets often lack the agility and adaptability needed to accommodate the increasing decentralization of energy generation. In contrast, LEMs provide a decentralized framework that enables small-scale energy trading, allowing households and other prosumers to directly exchange surplus electricity. This approach not only enhances self-consumption and optimizes the use of locally generated renewable energy but also improves overall energy efficiency and empowers communities to reduce their dependence on the centralized grid [1],[3].

However, designing LEMs capable of accommodating high penetrations of variable renewable energy sources (RES) requires rethinking market structure and temporal resolution. Bichler *et al.* (2022) argue that future electricity systems will consist of thousands of active participants, generators, consumers, and prosumers, who must offer flexibility to balance variable supply with high spatial and temporal granularity [4]. Specifically, the authors identified three key market-design imperatives: moving from large zonal to nodal pricing to reflect local scarcity (spatial granularity), shortening gate-closure times and introducing sub-hourly products to capture real-time imbalances (temporal granularity), and fostering an active demand side through advanced bid languages and demand-response programs [4].

Beyond technical design, the success of LEMs hinges on viable business models and supportive regulatory frameworks. Iazzolino *et al.* (2022) review how energy communities, formal aggregations of small-scale renewable producers and consumers, have emerged across Europe under directives such as RED II, enabling collective self-consumption, shared asset ownership, and community governance [3]. They highlight key features of sustainable community models, including transparent energy accounting, equitable cost-sharing mechanisms, and value propositions that align environmental goals with economic incentives. Such community-centric designs help lower barriers to entry for underserved households, fostering energy equity and social acceptance [3].

Taken together, these strands of research suggest the emergence of a comprehensive LEM paradigm, one that combines market-design innovations, hierarchical peer-to peer (P2P) and flexibility coordination, and community-oriented business models to foster more resilient, equitable, and sustainable local energy ecosystems. This study builds on these foundations by simulating decentralized P2P trading strategies within a residential community, optimizing both economic and technical performance, and examining implications for energy equity and grid integration [5], [6].

2 METHODOLOGY

The simulation framework is developed using a high-resolution dataset, which was recorded at 15-minute intervals over 2020 from a single residential household without storage [1], [2]. This dataset captures detailed profiles of electricity consumption and renewable generation, serving as a solid foundation for modeling dynamic energy behaviors, focusing on three primary variables:

- Electricity load, i.e., the total electricity consumption of the household;
- Residential wind generation, considering the energy produced by a wind turbine.
- Residential solar generation, the energy produced by solar photovoltaic (PV) panels.

To simulate a community of ten households as proposed in Fig. 1, synthetic datasets are generated for the remaining nine households by applying carefully calibrated, predefined multiplicative scaling factors to the original measurements. This process ensures that the temporal dynamics and inherent variability of the original data are preserved, while realistically representing heterogeneity in consumption and renewable generation patterns across different households for a comprehensive community-wide analysis.

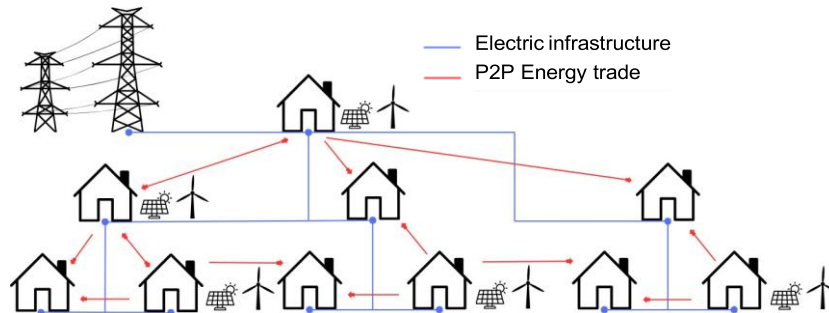


Figure 1. Households Community

Building on this robust community-level dataset, the next phase involves evaluating potential energy trading mechanisms aiming at optimizing local energy exchanges and improving both technical efficiency and economic outcomes [7]. To this end, two distinct peer-to-peer trading strategies, previously proposed in the literature, are implemented to facilitate efficient and equitable energy transactions among households [2]:

Supply–Demand Matching Strategy (ST1): This strategy dynamically assigns trading coefficients based on each household’s net energy balance, i.e., the difference between local renewable generation and consumption. By normalizing these values, households with significant surpluses are incentivized to trade with those experiencing substantial deficits. This dynamic pairing ensures that energy exchanges occur in a manner that maximizes economic efficiency and enhances local self-consumption.

Distance-Based Matching Strategy (ST2): In this approach, static trading coefficients are determined solely by the physical or network proximity between households. The strategy assigns lower coefficients to pairs of closely located households, thereby promoting energy exchanges that minimize transmission losses and improve technical efficiency. By encouraging local transactions, ST2 aims to reduce grid congestion and foster greater economic benefits through lower internal trading prices.

The modelling and simulation evaluate the effectiveness of these trading strategies through key performance indicators such as local energy consumption rates, the total volume of energy exchanged among households, and the resultant economic benefits, including cost savings achieved by reducing dependency on the centralized grid.

3 RESULTS

The Supply–Demand Matching Strategy (ST1) demonstrates a high potential for maximizing local renewable energy use and reducing consumer costs. By dynamically pairing households with surplus and deficit energy in real-time, the strategy encourages energy self-consumption within the community, which contributes positively to environmental sustainability. Its flexibility is a notable advantage, as it can quickly adapt to variations in energy production, such as solar and wind intermittency, and sudden consumption peaks.

However, this strategy has some drawbacks. It requires continuous calculations to maintain real-time responsiveness, which imposes a high computational demand and may require robust hardware and software systems. Furthermore, the operational complexity of setting up and maintaining such a dynamic system can be resource-intensive. The system's responsiveness to rapidly changing conditions can also result in unpredictable trading patterns, leading to potential instability. Despite these challenges, this first strategy remains an attractive approach due to its adaptability and efficiency, particularly in communities with diverse and fluctuating energy profiles.

In contrast, the Distance-Based Matching Strategy (ST2) offers a more static and straightforward model. By prioritizing trades between geographically close households, it effectively reduces distribution losses and minimizes pressure on the electrical grid, especially during periods of high demand. Its fixed nature simplifies implementation and yields consistent, predictable outcomes, making it appealing for communities seeking a reliable framework without extensive computational requirements. Additionally, the reduction in energy losses often translates into lower transaction costs for participants. However, this strategy's simplicity comes at the cost of adaptability. It does not dynamically respond to changes in generation or consumption, which means it may overlook more economically favorable trades with more distant households. Furthermore, its rigid configuration limits its ability to evolve with the market, such as when new participants are added.

Taken together, both approaches offer distinct pathways for implementing peer-to-peer energy trading. ST1 excels in adaptability and real-time optimization, although with higher complexity, while ST2 provides a stable and low-overhead alternative that may be more appropriate in static or less dynamic environments.

The simulation results demonstrate the potential of these two P2P trading strategies in enhancing local renewable energy utilization and lowering energy procurement costs. Key findings include:

- Both trading strategies substantially reduce grid dependency when compared to a baseline scenario with only centralized grid interaction.
- The Supply–Demand Matching Strategy (ST1) effectively aligns households with energy surpluses to those with deficits during peak production and consumption hours.
- The Distance-Based Strategy (ST2) encourages a higher volume of energy exchanges by assigning lower trading coefficients to closer households. Consequently, this strategy has the potential to increase the overall volume of P2P traded energy, which may, in turn, lead to lower average trading prices.

4 CONCLUSIONS

The simulation results demonstrate that decentralized P2P energy trading can substantially enhance local energy utilization and generate significant economic benefits in a residential community. Both trading strategies lead to a marked reduction in grid dependency and lower energy procurement costs compared to scenarios with purely centralized grid interactions. The Supply–Demand Matching Strategy (ST1) effectively pairs households with surplus energy with those with deficits, fostering economically optimal exchanges. In contrast, the Distance-Based Matching Strategy (ST2) may enhance trading volumes and lower internal trading prices by prioritizing energy exchanges among nearby households, minimizing also distribution losses.

Overall, these findings confirm that decentralized trading mechanisms can play a pivotal role in improving the efficiency and resilience of local energy systems. The successful application of these strategies in a simulated residential community highlights their potential scalability and robustness in real-world settings. Future research should focus on extending these models to larger and more heterogeneous communities and integrating real-time market adjustments to further optimize energy usage and economic performance.

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Digital Transformation



IX Regional

HELIX  25

Adoption of wearables: a UTAUT2 perspective

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Abstract

This research sought to understand the adoption of Wearable devices, analyzing aspects such as demographic profiles, experiences with technology and personal perceptions. An adaptation of the UTAUT2 model was made, obtaining responses from university students and frequent internet users through a survey using the Likert scale questions was administered to 96 participants. Based on the analysis, there was a tendency for higher acceptance among younger people, those with higher levels of education and greater technological proficiency among men and more qualified individuals. The Smartwatch stood out among the devices, followed by the Fitness Bracelet and the Smart Ring. A variation in social influence was observed according to the type of apparatus. Unexpectedly, social influence has not proven to be as crucial in the acceptance of wearable devices as initially thought. The results show a trend towards the adoption of these devices, while also warning of challenges linked to the perceived value and price of products.

Keywords: Adoption of Wearable Devices, Wearable, Wearable Technologies

1 INTRODUCTION

The accelerated dissemination of wearable technologies in the last decade requires a thorough analysis of the impacts they cause on society and the individual [1]. This technological advance was not limited to modifying aspects of everyday life but also found its place in business processes and routines. Therefore, considering their trajectory of expansion and social importance, it is crucial to analyse both the positive points and the possible challenges associated with these devices [2] [3].

Wearable devices are emerging as catalysts for a new era of health monitoring and information, enabling not only the tracking of health indicators, but also instant interaction through messages and precise location via GPS.

However, before the popularization of wearable devices, many of the features currently offered by these devices were already available, albeit in a more restricted way and dependent on less portable and practical equipment. Wearables transform this scenario by enabling a fluid connection with other smart devices, ensuring consolidation and simplified access to information, whether for immediate consultation or future analysis.

Wearables stand out for their versatility and integration of advanced technologies into compact and comfortable devices. In addition to health monitoring, they are already used in areas such as sports, security and education. Their ability to collect and analyse data in real time makes them increasingly relevant, which reinforces the importance of understanding the factors that influence their adoption.

The adoption of wearables is influenced by a multitude of factors, including technological, social and cultural, economic, and health and wellness factors. These factors play a crucial role in shaping

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consumers' intentions to adopt wearable devices and understanding them is essential for the successful development and promotion of wearable products (see Table 1).

Table 1. Adoption of Wearables.

Category	Factors
Demographic	Income, Age, Gender
Device-Specific	Performance, Brand, Convenience, Credibility, Irreplaceability
Psychological	Perceived Enjoyment, Usefulness, Personal Innovativeness
Social	Peer Influence, Health Interests
Cultural	Uncertainty Avoidance, Future Orientation, Humane Orientation
Other	Style, Fashion, Privacy Concerns, Advertising and Promotions

The table presents a comprehensive categorization of the factors that influence the use of wearable devices, grouping them into demographic, device-specific, psychological, social, cultural, and other dimensions. Each category brings together elements that, together, shape the perception and adoption of these devices by users. This organization facilitates the analysis of consumer behaviour, allowing for a more structured and guided understanding. This makes it possible to develop more effective strategies to promote the acceptance and continued use of these technologies.

2 METHODOLOGY

o evaluates the acceptance of wearable devices, an adaptation of the UTAUT2 model by Venkatesh [4] was performed. The UTAUT (Unified Theory of Acceptance and Use of Technology) methodology was initially proposed by Venkatesh [5] as a comprehensive theoretical framework for studying technology adoption and use. It integrates elements of eight previous models that explain technology acceptance. The four main constructs of UTAUT are:

1. Performance Expectancy: The degree to which an individual believes that using technology will help him or her achieve gains in job performance.
2. Effort Expectancy: The degree of ease associated with using technology.
3. Social Influence: The degree to which an individual perceives that important people believe he or she should use the new technology.
4. Enabling Conditions: The degree to which an individual believes that an organizational and technical infrastructure exists to support the use of technology.

It was on these constructs that this research study was based.

3 RESULTS

The results of this study on the acceptance of wearable devices reveal significant insights, using the UTAUT methodology as a basis for understanding the factors that influence this acceptance. Statistical

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analysis was performed with a sample of individuals, focusing on their demographic characteristics, experiences with technology and personal impressions regarding the devices. The application of the UTAUT model allowed us to identify how variables such as performance expectation, effort expectation, social influence and perceived value impact the intention to use and the adoption of these devices.

One of the main findings was the predominance of younger users with high educational qualifications. Performance expectation proved to be a crucial factor, as participants who believed that wearables could improve their performance in daily activities demonstrated greater willingness to adopt them. This positive perception was more pronounced in individuals with greater technological knowledge, who see devices as tools that offer efficiency and advantages in everyday life.

Effort expectancy also played a significant role in the acceptance of wearables. Participants reported that the ease of use of the devices was a determining factor in their decision to adopt them. Those who considered wearables to be intuitive and easy to use showed a greater propensity for acceptance. In contrast, those who perceived a greater effort required to use these technologies revealed resistance to adopting them.

Social influence, although recognized as a relevant factor, did not prove to be as decisive as expected in the acceptance of wearables. The results suggest that although support from friends, family and influencers has some impact on the purchase decision, other factors, such as the perception of usefulness and the overall value attributed to the devices, are more influential on the intention to use. This indicates that, for many, the decision to adopt technology is more personal and based on individual experiences than social pressure.

The analysis of perceived value highlighted that cost-benefit is a critical aspect for the acceptance of wearable devices. Those who considered the price of the devices to be excessive in relation to the perceived benefits showed hesitation in adopting them. Therefore, consumer perception of the cost and benefits that wearables can offer is critical for manufacturers to attract a broader customer base.

In terms of device preferences, the results pointed to a clear preference for the Smartwatch, which was considered the most appealing in terms of functionality and excitement. Fitness Bracelets and Smart Rings showed more moderate, but positive, acceptance. Participants were more likely to see the Smartwatch as a device that could integrate multiple functions and improve quality of life, reinforcing the need for marketing strategies that highlight the features that make these devices unique.

Finally, despite the overall positive uptake, the study identified significant challenges associated with the adoption of wearable devices. The analyses highlighted the need for a user-focused approach that prioritizes understanding individual perceptions and performance expectations. Manufacturers can benefit from investing in educational marketing and pricing strategies that highlight the benefits and usefulness of wearables, thereby seeking to drive broader and more integrated adoption of these technologies in everyday life.

4 CONCLUSIONS

The present research on the acceptance of wearable devices, as outlined in the results, offered a comprehensive understanding of the dynamics that influence the adoption of these technologies. The data collected highlights a predominant profile of young users, with an important level of education, suggesting a correlation between youth, education, and the acceptance of wearables. This trend reinforces the idea that familiarity and comfort with technology, often associated with younger age groups and well-educated individuals, plays a crucial role in the willingness to adopt new devices.

The general acceptance of wearables among participants suggests a positive trend towards the adoption of these technologies. However, the results also highlight significant challenges, particularly regarding the perceived value and price of devices. This is a crucial aspect, as value for money plays a key role in consumers' purchasing decisions. The prominent preference for Smartwatches, followed by Fitness Bracelets and Smart Rings, points to a hierarchy in user preferences, which appears to be influenced by the perception of usefulness and functionality of the devices.

Contrary to initial expectations, social influence proved to be less decisive in the decision to adopt wearables. This finding suggests that although peers and society may play some role, other factors such as expected performance and perceived value are more crucial in users' final decision. This finding reiterates the need for a more user-centric approach, focusing on individual perceptions and performance expectations to drive adoption.

ACKNOWLEDGEMENTS

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Does virtual reality tourism have a future? An application of the PPM framework

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Abstract

The rapid advancement of Virtual Reality (VR) has significantly transformed tourists' experiences, even making them not moving to physical destinations and travel from home or visiting virtual travel agencies. This study bases on the PPM (Push, Pull, Mooring) framework with the aim of examining the factors affecting the decision of tourists migrating from traditional traveling to physical destinations to VR tourism. A thorough research review and qualitative study have been done to adapt PPM factors to the context of VR tourism. Proposed push factors are perceived inefficiency, inconvenience, dissatisfaction with previous experiences and mobility problems. Pull factors are sustainability, interactivity, personalization and enjoyment. Mooring factors are switching costs, habit, social influence and the dependent variable is switching intention to visit a destination using VR. This paper contributes to literature as it is the first of its kind to explore the switching intention from offline to VR tourism using the PPM framework. The results can provide valuable insights to help tourism managers to know VR as an innovative and sustainable traveling possibility making a destination a smart and innovative one and to identify the key VR attractions for tourists.

Keywords: Tourism, PPM framework, Virtual Reality.

1 INTRODUCTION

Tourism is experiencing a digital information revolution. As [1] state, interaction among elements of virtual tourism like smartphones, augmented reality, virtual reality, big data, and artificial intelligence are recasting the virtual tourism experience. In this study, the focus is on Virtual Reality (VR) as it plays a pivotal role across various sectors, including tourism. VR can help consumers to know rural destinations or distant destinations, especially when consumer have movement problems due to environment circumstances (i.e. COVID pandemic), personal characteristics (i.e. disability, mental illness, innovativeness), past unsatisfactory traveling experiences or the need or desire to save costs and be sustainable. In these contexts, an interesting kind of virtual tourism is VR tourism, which can offer an attractive, cheap, immersive, entertaining and sustainable alternative that can make the tourist migrate from physically moving to destinations to VR tourism. Besides, Technologies have made a great contribution to enrich and personalize tourism, as it happens in the concept of smart tourism [2].

In this context, it is interesting to analyse if VR tourism could substitute traditional tourism, at least under certain conditions and for certain targets. The PPM framework can be helpful to understand migration (see Figure 1). The PPM framework is a popular paradigm in human migration literature and has mainly been used to explain geographical movement. This concept was used in the marketing domain by [3], who demonstrated the correlation between migration and the switching behaviour of customers. Push, pull, and mooring effects are the three categories of factors that explain switching behaviour. *Push factors* are elements that cause consumers to turn away from a channel or technology and switch from the original provider (i.e. mobility problems to travel due to being old, ill or disabled in the case of physically moving to a destination). *Pull factors* represent advantages of an alternative channel or technology that draws customers to the new provider (i.e. virtually knowing places that are expensive to visit physically, unknown or that are far away from home and at the same time making tourism immersive and funny). *Mooring factors* are those that facilitate or impede decisions to switch depending on social or personal characteristics (i.e. costs of VR technology or habit of moving personally to a destination).

Therefore, push, pull and mooring factors have an influence on switching intentions and thus on switching behaviour.

Recent studies have adopted the PPM framework to explore the switching intention toward new channels such as metaverse [4] and in tourism contexts, such as sharing accommodation platforms [5], peer-to-peer accommodation [6] (see [7] for a meta-analytical review). However, PPM literature have not yet addressed VR as a new technology that facilitates digital tourism and most papers use different PPM factors and scales that make comparison between studies more difficult.

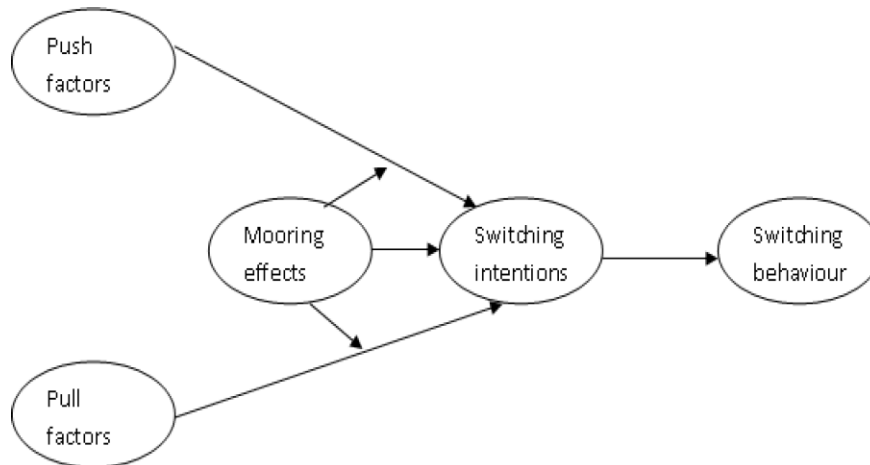


Figure 1. Push-Pull-Mooring (PPM) Migration Model of Service Switching. Source: [3]

Given VR integration into daily life and the importance for tourism professionals to know consumer preferences and behavioural changes, VR opportunities and obstacles must be addressed. To the extent of my knowledge, this is the first paper that apply the PPM framework to VR tourism and that, after a deep paper revision, propose specific factors that can play the role of push, pull, mooring and moderating factors in the case of VR tourism.

This study, which is still under development, aims to examine the factors affecting the decision of tourists not traveling to physical destinations and opting for VR tourism through the PPM (Push, Pull, Mooring) framework. Specific objectives include adapting PPM factors to the VR tourism context and developing specific scales for those factors in VR tourism. Two proposed questions in this research are as follows. In this study in progress, RQ1 is addressed.

RQ1: What are the PPM factors adapted to VR tourism?

RQ2: Does the PPM framework work well in the case of VR tourism?

2 METHODOLOGY

The methodology comprises 3 stages. First, a thorough revision of PPM framework and virtual tourism literature. 25 relevant papers from indexed journals have been reviewed until now. Second, a qualitative study to reflect on PPM factors and develop specific scales for VR tourism. More specifically, a pilot study based on semi-structured interviews with 3 experts and 5 tourists have already been done. 2 experts were selected according to their research experience in tourism and immersive marketing and 1 expert was a professional in digital marketing. The selection of 5 tourists was convenience-based and they were of different age, gender and technological knowledge.

Third, a quantitative study will be based on 300 surveys with a complete original questionnaire including valid and refined measurement scales. A Google Forms questionnaire will be prepared and Prolific worldwide consumer database will be used to select individuals with the filter conditions of having already certain degree of familiarity with VR and having travelled at least once last year. A compensation of 2 pounds will be given to each participant in the database for collaboration. These individuals are going to be from two different cultural countries, one of them is Germany, which is more advanced in

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innovation adoption and VR knowledge and use [8]. The other one is Spain, where consumers' VR use is increasing and which is the second leading tourism brand in the world. Finally, this information will be analysed with SPSS software to get descriptive statistics and scales validation and hypotheses testing will be made in the future using structural equation modelling with PLS software, following recommendations by [9] and [7].

3 RESULTS

In order to address RQ1, a review of relevant papers and a pilot study were done to know the possible factors that can play the role of push, pull, mooring and moderating factors in the case of VR tourism. Besides, with the help of experts, scales have been developed for the subsequent quantitative study. In this sense, *push factors* can be perceived inefficiency, inconvenience, dissatisfaction with previous experiences and mobility problems, *pull factors* can be sustainability, interactivity, personalization, immersion and enjoyment, *mooring factors* can be switching costs, habit, social influence and the *dependent variable* can be switching intention to visit a destination using VR. Finally, interesting *moderating variables* can be innovativeness, family income and age. See table 1 for a summary.

In this moment, the development of a quantitative questionnaire is under progress to address RQ2 in the future.

Table 1. Proposed PPM factors for VR tourism after the piloting study

Push factors	Pull factors	Mooring factors	Dependent variables
Perceived inefficiency. Inconvenience. Dissatisfaction with previous experiences. Mobility problems.	Sustainability. Interactivity. Personalization. Enjoyment. Immersion.	Switching costs. Habit. Social influence.	Switching intention to visit a destination using VR (VR tourism).

4 EXPECTED CONTRIBUTIONS

The rapid advancement of VR has significantly transformed the customer and tourism experiences. This work will contribute both the academic literature with providing 'food for thought' regarding original and specific PPM factors and valid scales for VR tourism. Besides, it contributes to the professional world as it can help practitioners to design marketing strategies to attract potential tourists to certain areas that are less known or far away from the target market, such as rural areas. In fact, VR strategies are low cost, innovative, inclusive and sustainable ones to promote destinations and make them attractive for smart tourism. Besides, VR tourism can help specific individuals with mobility problems to know destinations that otherwise they would never visit.

ACKNOWLEDGEMENTS

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QualyTools: an online collection of tools for quality management and control

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Abstract

Quality practitioners use a varied set of tools to diagnose, stabilize, improve and control business processes and aid in decision making. Most of the tools are well known and several implementations exist across statistical software packages or other software, and online resources. While some tools are generic (e.g. a histogram) other tools are more specific to quality (e.g. a control chart), but they are often integrated into expensive software bundles that are of little use for quality practitioners.

We developed an application (*QualyTools*) that integrates a set of essential tools for quality management and control. These tools cover common needs and include distribution analysis (histogram and scatter plots), Pareto charts, control charts, and capability analysis. The tools were implemented in an application developed using the R *shiny* package and framework. The collection was published online and can be freely used. We also kept the application code open to collaboration, by means of a GitHub repository.

The primary objective of the application is to provide an integrated, efficient and accessible solution for statistical and visual analyses, allowing users to transform data into relevant information to support decision making. The tools can be a resource for practitioners and quality management students.

Keywords: Quality Tools, Statistical Process Control, R shiny, Open Source

1 INTRODUCTION

In ISO 9004, the quality of an organization is defined by how its characteristics meet the expectations of stakeholders, aiming to achieve sustained success [1]. To accomplish this, an organization must apply the quality management principles: customer focus, leadership, people engagement, process approach, improvement, evidence-based decision making, and relationship management [2].

Some quality tools are widely used, and Kaoru Ishikawa is often credited for stating that “95% of process problems can be rectified using the 7 Basic tools of Quality” [3]. The same study found that the main advantage of Ishikawa’s tools was to provide a structured approach to problem solving and help to solve the problems by clear definition, measurement and analysis phases. The study also found that, although the Ishikawa tools were mainly used in manufacturing, they were also applied to other sectors, such as IT and finance.

A literature search reveals that the tools are still widely applied, mainly in manufacturing, but also in other areas, such as healthcare [4], education [5] or finance [6], among many other examples.

One of the main drives for the implementation of this project was the lack of freely available similar tools. To our best knowledge, there is no other collection of tools like the one that was developed. For a long time, the American Society for Quality (ASQ) offers a collection of quality tools templates, implemented as computer worksheets for each individual tool [7].

2 METHODOLOGY

For implementing the tools we used the **shiny** framework [8] that itself is implemented as a package for the R language [9]. The R language is a general language for statistical computing and the **shiny** package provides an easy way to develop web user interfaces and dashboards.

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Additionally, some additional R packages were used, with the most relevant being **qcc** [10], for creating control charts and conducting process capability analysis. This package facilitates the calculation of basic statistics for each sample group, as well as generating control charts that highlight the Western Electric rules violations [11], assisting in the visual interpretation of alerts or nonconformities.

The implementation phase focused on integrating analytical tools while prioritizing usability and accessibility. Finally, the application was tested using simulated datasets to evaluate performance, accuracy, and user experience, leading to iterative improvements.

The open-source model promotes flexibility, technological innovation, and collaboration, allowing for continuous improvement of the application through community contributions. In addition to its relevance in education and research, the growing adoption of open-source technologies, such as Artificial Intelligence and Blockchain, reinforces its importance in developing inclusive and accessible technological solutions [12]. This work presents the development, functionalities, and potential impact of *QualityTools* in the context of quality management. The application is available online [13] and the source code can be accessed on a GitHub repository [14].

3 RESULTS

The application integrates a set of important quality management tools, offering specific functionalities for various areas in quality and statistical process control: data distribution analysis (histogram and normality), correlation analysis, Pareto analysis, control charts and capability analysis.

The tool allows the user to input their data by means of a comma separated values (CSV) file, allowing different file formats.

The distribution analysis tool allows for the assessment of data distribution in two ways: visually, through the histogram and the quantile-quantile plot, and numerically, through statistical tests for normality (Kolmogorov-Smirnov (Lilliefors corrected) and Shapiro-Wilk). These methods help ensure that the distributions meet the expected requirements, providing a robust analysis of how well the data fits a normal distribution.

In the correlation analysis tool, we again use visual and numerical items. We use the scatter plot and the Spearman correlation test to characterize the relationships between variables. This allows the user to identify significant associations, making it easier to understand how different factors combine and relate.

For the Pareto analysis, the tool builds the standard Pareto chart for the user to identify the critical factors contributing to process issues, following the Pareto principle to highlight the most impactful areas, where improvements would result in the greatest benefits to overall process performance.

For process monitoring the application provides control charts. The charts provided are the $\bar{X}R$ (average and range) chart and the $\bar{X}S$ (average and standard deviation) chart. With the help of these charts, the user can monitor the behavior of processes, identifying variations that may indicate quality issues and the need for interventions.

In the process capability analysis tool, the user can input specification limits and access different capability indexes like C_p or C_{pk} , providing a way to measure the process performance and its ability to stay within the established parameters. The capability calculations and the control charts rely on the **qcc** package.

For illustration purposes, **Erro! A origem da referência não foi encontrada.** provides a glance at the user interface of the application.

4 CONCLUSIONS

This tool was developed as part of an academic graduation project and implemented a set of tools for quality management and control that we deem relevant and useful. As part of future work, we identified some areas that could be improved or expanded.

For data input, other formats can be added and an option for manually inputting small sets of data, either by typing or by pasting. In the distribution analysis, we only consider the Normal distribution, but other distributions could be added. The same applies to the correlation analysis, where we only considered the linear trend, but other types of relationships could be analyzed. For control charts, many types of control charts are missing, notably, control charts for attributes, as only two control charts were

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implemented. The Pareto diagram could be enhanced by automatically identifying less relevant items and grouping them into an “others” or similar category, to avoid a cluttered visualization.

At the level of the user interface, a relevant feature would be the possibility to generate print quality plots in some convenient format, such as Adobe PDF or images, that could be downloaded. Another area of improvement would be the formatting of the numeric outputs because they are displayed in R raw text format.

Because we made the tool open source, further development will be carried out via the GitHub repository, encouraging community contributions to steer the evolution of the project.

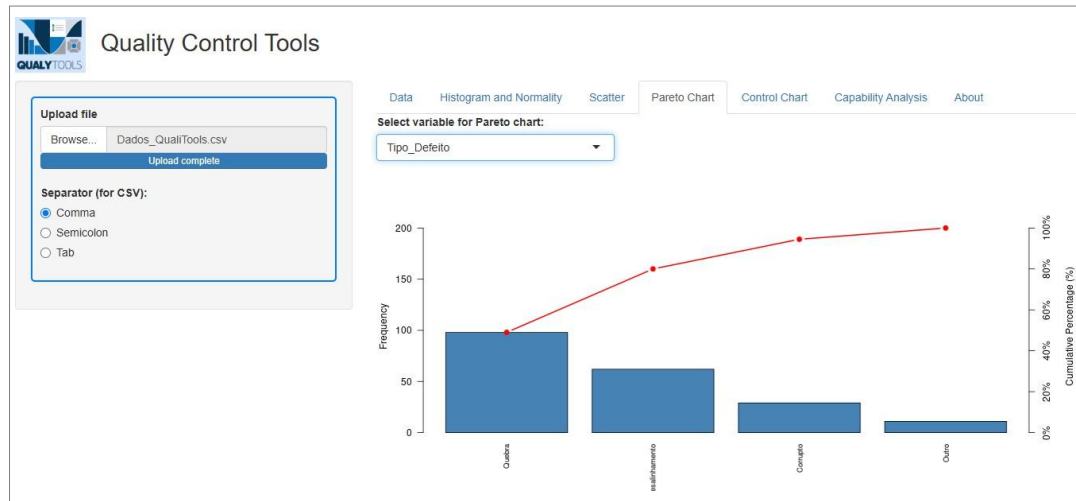


Figure 1. A glance at the QualyTools user interface.

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Collaboration and Networks

IX Regional

HELIX 25

Open innovation and co-creation in home care services. A case study for regional inclusive innovation.

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Abstract

This paper focus on the case of a regional public/private/third sector actors' conjoint development, an open innovation project led by the University of Málaga in Andalucía (Spain), called Living at Home. Its purpose is to show how different actors were involved in new knowledge co-creation for a common objective, facilitating home care service innovation, in the case of elderly and people with disability. A qualitative methodology, based on a particular action research methodology (academic-practitioners-users interaction) and individual case studies, was applied. In order to understand the complexity of the service ecosystem and redesign the future home care service model, including techno-actors and looking for increasing the emotional and physical well-being of the users a variety of data was obtained. Several focus groups with key informants (sixty stakeholders, including users, family members, care workers, managers, suppliers, and policymakers), workshops, and direct observation and semi-structured interviews to fifteen participants, for two years, was conducted. The new orchestration of services and the new role of some providers in the proposed model have arisen. Relevant implications for service managers and policymakers were revealed in order to reach the real inclusive innovation.

Keywords: home care services, co-creation, open innovation.

1 INTRODUCTION

Population ageing is one of the most important demographic trends worldwide. In European countries, one in four inhabitants will be aged 65 or over in 2050 and the share of people over 80 years old will reach 13 percent of the whole population by that year [1]. This joints the fact that people are living longer, thus family structures are experiencing significant transformations and the needs of the elderly and the young people have to be combined. In this way, senior citizens can become physically or psychologically unwell, so they will need specific support from care services, also in the case of people with disability living at home. Accordingly, it is necessary the provision of high-quality care services to these citizens. Likewise, lower socio-economic status citizens experience difficulties accessing care services, so the public sector must protect them, avoiding "social division" [2]. In this sense, public and private organisations have to pay attention to the needs and the well-being of the vulnerable users and considering not just the economic outcomes of the innovation process, but also to the individual, collective and social ones. In this vein, the inclusive innovation framework establishes a roadmap about how to face these challenges.

2 THEORETICAL FRAMEWORK

Care services include telecare, professional home-care, nursing home care, or care in day/night centres, among others [3]. Innovation in care services consist of the provision of new services or develop new processes by service providers, attending to psycho-physical health and well-being, improving the quality of life, of elderly and people with disability, through social and household-oriented services, with environmental support, and nowadays considering the introduction of high-tech products [4]. However, in innovation processes, the organisations involved have to take into account the complexity of the service ecosystem, in the specific case of home care services (see Figure 1).

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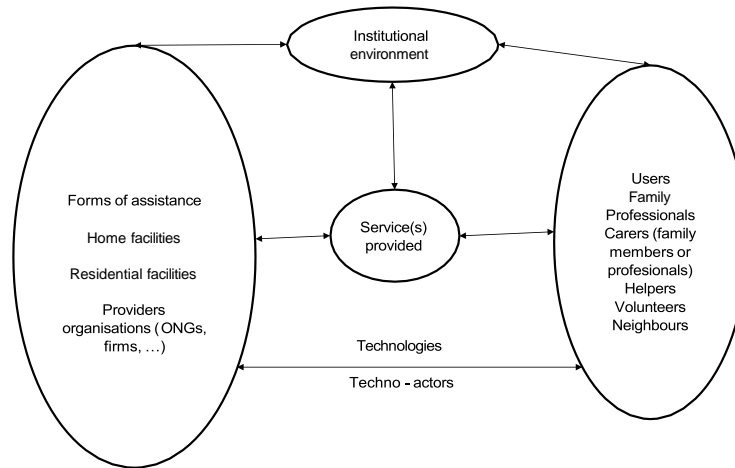


Figure 1. Home care service ecosystem - elderly and people with disability home care service

In the provision and consumption of these services interact the institutional environment (legal rules and norms), the human and the tangible and intangible environment, and the techno actors (robots and smart home devices, among other technologies) [5]. In addition, it is needed to consider that in this specific service sphere there is an active role of the users in the value co-creation process, so in the innovation processes a co-destruction unexpected effect could be obtained without their input [6]. In this sense, it is needed a user-centred redesign service process, in the case of elderly and people with disability [7]. From the supplier's perspective, open innovation (OI) perspective, ecosystems rely on collaboration, knowledge exchange, and unrestricted idea flow among businesses, academic institutions, government agencies, practitioners, researchers, and other entities, all of these factors being interconnected [8], and allow smaller stakeholders to joint innovation projects. In the case of care services, and in home care services in particular, public, private, and third sector actors, as members of this service ecosystem, are needed to work together in order to innovate.

3 METHODOLOGY

To get insight into the redesign of the future home care model, in the case of elderly and people with disability, including techno actors in the service ecosystem, different methods were used to have data about this collaborative social value co-creation. An analysis of secondary data, focus groups with key informants (more than 60 stakeholders, including users, family members, care workers, managers, and policymakers), and direct observation and interviews to fifteen participants, during a period of two years, has been conducted to get insight about this. A qualitative methodology was conducted, based on action research (academic-practitioners-users interaction) and individual case studies [9].

4 THE CASE OF THE LIVING AT HOME PROJECT

With the purpose of redesign the delivery and consumption of home care services (elderly and people with disability) in the Andalusia region, for elderly and people with disabilities. Through the Ministry of Social Rights (Spanish government), the Andalusian regional government attracted in 2022 EU Next-Generation funding to develop this research, led by the University of Malaga. In Spain, there is an specific Act on the Promotion of Personal Autonomy and Attention to People in Situations of Dependence, "Dependency Act", recognising the right of all dependents to receive support from the State (provision of economic subsidies to relatives for the care and the direct provision of care services). Other implied agents included the Agency of Dependence and Social Services from the Regional Autonomy of Andalusia, private/public organisations, and non-profit and for-profit social organisations (senior residences; day-care centres, caregiving services firms) [3].

The project objective was to propose an innovative model of home care, incorporating the technological dimension at home, and the complementarity with a personalised catalogue of services to promote the permanence in their own home of people in a situation of dependency. The project had a double dimension. Firstly, rethinking the current model of home care, with a people (user)-centred orientation, with their specificity and changing needs. Secondly, incorporating the technological dimension at home, as a new component that complements the traditional orchestration of services in care models.

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The role of the University was to integrate public, private, third sector actors, users, researchers and practitioners, in order to create new knowledge through a co-creation process for a common objective, transforming the home care service model using technology and the redefinition of the service catalogue, including new actors (such as case managers), processes and elements, in the case of elderly and people with disability, looking for improving their well-being. A redesign of the home care model arose from this OI project, with the university acting as a hub of the innovation ecosystem. A dual perspective was considered for the redesign of the service process, technological and social in an unexplored specific service, at home, interacting with real users, their family's and all the actors involved in the service provision.

The technologies included in the Living at Home project were smart home devices (smart door opening, flood sensors, air quality sensors, temperature sensors, emergency button), a virtual social centre, virtual reality glasses (users can see using VR glasses where they were born or to visit touristic places), in-home advanced robotic systems to manage medications and social robots. Robots help with videocalls and medication reminders, making emergency calls, among others. For example, Nuka/Paro is a baby seal robotic pet used for therapy in hospitals, nursing homes, and at homes for people who cannot interact with real pets. And Nao, another robot, can follow users with its gaze, speaks, tells stories, plays music, and performs physical actions, e.g., walking, dancing, making gestures with its arms and hands, helping for example with physical rehabilitation.

Additionally, the project proposes the introduction in the model new roles of some actors, for example nursing homes services, with outpatient services of functional rehabilitation. And the intensification of some other actual services, such as hours of home help service for daily activities, provided by caregiver companies, advanced telecare or home adaptation. A novelty of the model is also the inclusion of case managers, professionals that adapt the home service model to each users at the beginning of and follow-up the intervention and manage the orchestration of the different service providers involved. In the project, the selection of fifteen people having the common denominator of being recognised as dependent was carefully carried out in coordination with the social services' local authorities in the district. The home care model was adapted in each case based on the proximity of resources and participation in the environment (family member, cohabitants, volunteers and neighbours). The collaborative individual or organisational service entities were professionals from the municipality, different companies (nursing homes, caregiver companies), third-sector organisations, and research centres, among others.

5 RESULTS

The project was developed from an OI framework integrating the mentioned organisations. The main results are the following: technology enables continuous user monitoring, facilitates social interaction, promotes personal autonomy, and helps maintain healthy routines. In addition, in a secondary role, some technology (e.g., Nuka) provides recreational support and emotional one. It was also found the complexity of home care service ecosystem, the variability in users (physical, cognitive, behavioural changes, medical treatment, rehabilitation) and the constellation of services providers that have to be coordinated by the public social services in order to offer the better services. Furthermore, there were identified in the project possible difficulties of "connection" between the technology (e.g., robots) and users, and potential risks and ethical concerns associated with technology. The model will be enriched in the future with the inclusion on smart home devices, social robots, outpatient services, temporary accommodation and intensification of help care services. Additionally, the relational dimension arises as relevant in the provision and consumption of home care services, with the individual case manager, family members, neighbourhood environment, cohabitants, and volunteers playing a relevant role in the process.

In a relatively unexplored area, care services, specifically home care services provision and consumption for elderly and people with disabilities [5], this research identifies the complexity of the service ecosystem, and how in an innovation process have to take place the human environment (professionals, users, family members, civil servants, among others), service providers (nursing homes managers, home care company managers, employees of service providers, among others), to consider the institutional environment and the techno-actors (such as social robots or smart home devices, among others). A new orchestration of services and new roles of service providers in the proposed model have arisen, based on the positive outcomes from the users.

6 CONCLUSIONS

The analysis of the actors' boundary work allowed to describe the role of the different organisations in the process of value creation within the home care service, considering the institutional context of the region. Through the co-creation process it emerged knowledge about empowering users in home care service provision and engaging them in staying longer at home increasing their emotional and physical well-being. It was revealed the relevance of social interaction in value co-creation beyond the technology. The technology acts as a catalyst of the value co-creation but is not the main element. On the contrary, the users consider trust in the professionals, personal interactions, mediated or not by technology, and the accompaniment of the individual case managers to be the most important aspects of the new model. From the perspective of the organisations, public/private/third sector, they had the opportunity of interacting with each other and with real users, to be able to introduce the generated knowledge into their own internal innovation processes.

The provision of social services provision in complex, public, private organisations, third sector actors, together with users, families, workers at service providers and other professionals are involved. Technology is helping to innovate in social services provision and users increase security feeling and develop more personal autonomy thanks to the inclusion of techno actors in the model. However these technology-enhanced services should be personalised to the users as there are not unique solutions. As practical implications, policymakers should bear in mind how they could improve home care service model by including the user's, family views and the care services professional views. Only in this way could be possible to arise a real inclusive society. As limitations, more quantitative data would enrich the analysis.

ACKNOWLEDGEMENTS

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Defining industrial tourism in the cross-border region of Portugal and Spain

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Abstract

This paper deals with the definition and valorisation of industrial and pre-industrial tourism in the cross-border region of *Terras de Trás-os-Montes* (Portugal) and *Castilla y León* (Spain). Industrial and pre-industrial heritage is crucial to collective memory and has significant cultural, historical and tourist value. Industrial tourism is emerging as an initiative that enhances historic landscapes and contributes to urban development, the revitalisation of communities and the preservation of heritage. It is considered an innovative strategy for rehabilitating territories, transforming old facilities into attractions, exploring historic sites or operating companies. The “IN_GENIOS_DUERO_DUORO” project focused on promoting this heritage in the Douro-Douro Euroregion. The methodology included detailed mapping and characterisation, creating a database with 1,079 sites identified in 22 Portuguese and 80 Spanish municipalities. The results show that most sites are in Spain (77.1 %). The municipalities with the most identified sites are Valladolid (250) in Spain and Mirandela (32) in Portugal. The main heritage categories include transport infrastructure (335), wineries (255) and the food industry (221). Around 47.27 per cent of the sites identified are accessible to tourists. The database created is fundamental for valuing, safeguarding and designing tourist routes.

Keywords: Industrial tourism, Industrial heritage, Cross-border region.

1 INTRODUCTION

Industrial and pre-industrial heritage represents a fundamental dimension of the collective memory of territories, reflecting the past and present ways of life, production techniques and economic systems. In recent years, there has been growing recognition of this heritage's cultural, historical and tourist value, driving the development of integrated valorisation and promotion strategies, particularly in regions with a strong territorial identity and tourist potential [1, 2, 3].

Industrial tourism has emerged as an initiative that enhances historic industrial landscapes, contributing to urban development, the revitalisation of communities and the preservation of cultural and historical heritage. It involves reusing tangible elements of industrial history, such as factories, mines, and transport infrastructure, which are transformed into museums and spaces for interaction with the public and the promotion of sustainable development [1, 3].

Industrial tourism is an area with high economic, cultural, and social value, offering unique experiences by allowing visitors to explore historic sites or companies during the entire operation and demonstrating manufacturing and production processes [2].

It is also addressed as an innovative strategy in the rehabilitation of industrial territories, highlighting the potential of transforming former industrial facilities into tourist attractions, allowing visitors to learn about historical production processes to learn about the evolution of processes and the socio-economic

impacts of industries, contributes to the preservation of cultural heritage, focuses mainly on economic opportunities in degraded areas [4].

Andrade-Suárez and Caamaño-Franco [5] identify three main categories in industrial tourism: pre-industrial heritage, industrial heritage and active industries, which can be classified into industrial archaeological heritage and industries in operation, dividing industrial tourism activities between visits to active factories and inactive industrial heritage sites [6].

Pre-industrial tourism highlights structures that predate the Industrial Revolution, such as churches and cathedrals, preserved for their cultural, social and religious value. Industrial tourism, conversely, can be defined as the tourist activity centred on visiting and interpreting sites, equipment, processes and memories linked to industrial activity, whether active, decommissioned or converted for museum and cultural purposes [7].

In this context, the project 'IN_GENIOS_DUERO_DOURO: Cooperation for the valorisation of the industrial culture of the Duero-Douro through tourism' arose. Its main objective is to promote knowledge and valorisation of the industrial and pre-industrial heritage in the cross-border cooperation territory between the region of *Terras de Trás-os-Montes* (Portugal) and *Castilla y León* (Spain). The initiative aims to consolidate an integrated and sustainable tourism system in the Duero-Douro Euro-region, taking advantage of the rich history and heritage shared by both sides of the border.

The Douro/Duero River route, as the unifying and structuring element of the territory, serves as the guiding thread for identifying, analysing and promoting spaces and structures of industrial and pre-industrial significance, from mills, factories, hydraulic systems and railways. These tangible and intangible testimonies are tourist resources with great potential for attracting new audiences and fostering local and regional development dynamics.

The 'IN_GENIOS_DUERO_DOURO' project is realised through strong institutional coordination between Portuguese and Spanish entities, focusing on research, technical cooperation and creating innovative tourism products that enhance shared identity. During the implementation period, several key actions were carried out, including an in-depth literature review on industrial tourism and creating a comprehensive database with 1079 sites identified in 22 municipalities in Portugal and 80 municipalities in Spain.

This paper aims to present the mapping and characterisation of industrial attractions in the project region, organising the information into thematic sections that cover the theoretical and institutional framework of the methodology for inventorying heritage elements, the territories involved, and the tourism enhancement strategies adopted. So, the paper is divided into four sections; after this introduction, the methodology used to characterise the industrial attractions is presented, followed by the main results and the conclusion.

2 METHODOLOGY

Collecting and mapping industrial heritage in Portugal and Spain aimed to identify, catalogue and subsequently promote sites of interest in industrial tourism. Data was collected using a structured questionnaire based on the previous literature aligned with the project's objectives. The questionnaire was validated by all the partners involved and sent to local councils between October 2024 and March 2025.

The collection of this information allowed for the construction of a detailed database, essential for the valorisation and promotion of industrial tourism in the region. Identifying and mapping these elements was fundamental to encouraging the development of cultural and industrial tourism, contributing to the preservation of heritage and the economic dynamisation of the territories involved. The database made it possible to catalogue the attractions in the following respects: location (country, county, municipality and full address); name of the heritage site; GPS coordinates (latitude and longitude); category; description; availability for visits; website; classification of level of interest; level of importance for the project.

The data is available in Excel files in the project's cloud. The analysis is based on a survey of 1,079 heritage sites in Portugal and Spain. In this paper, descriptive statistics were used to characterise the attractions. In addition, the attractions have been distributed on a map to make it easier to visualise the industrial heritage in the region under analysis.

3 RESULTS

The characterisation of industrial tourism begins with its geographical distribution (Figure 1). In this case, most attractions are in Spain (77.1%). This disparity may be associated with the territorial dimension of each country, as well as the diversity and history of industrialisation in both regions.

Regarding the distribution by municipality in each country, specifically in Portugal, the municipalities with the highest number of heritage sites identified are Mirandela, with a total of 32, followed by *Bragança* and *Tabuaço*, both with 28 sites, *Peso da Régua* with 19 sites and *Torre de Moncorvo* with 17. In Spain, the most significant number of heritage sites identified is Valladolid with 250 attractions, followed by Toro with 75, *Zamora* with 53 attractions and *Peñafiel* with 38.

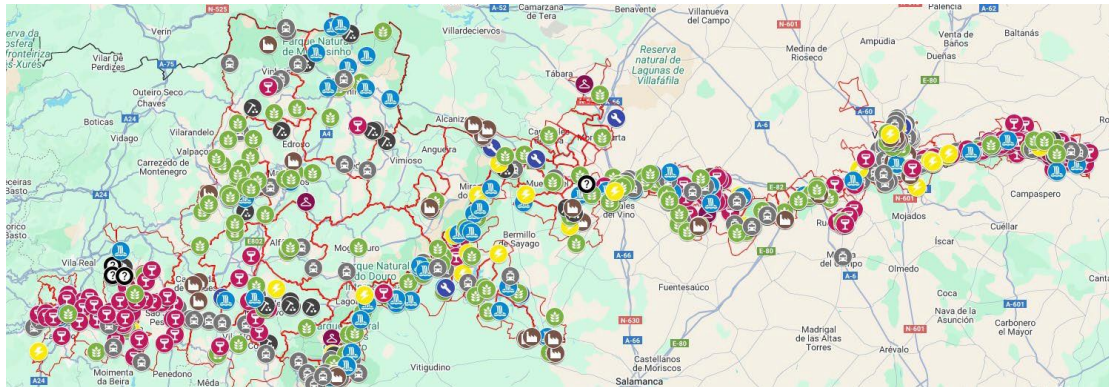


Figure 1. Geographical Distribution of Industrial Heritage

The heritage sites identified were classified into various categories, reflecting industrial activity and infrastructure diversity. The category with the most records is transport infrastructure, with 335 heritage sites, highlighting the historical importance of communication routes and logistical means. This is followed by wineries, with 255 sites, underscoring the importance of wine production and culture. The food industry also represents a significant proportion, with 221 heritage sites, demonstrating the essential role of this sector in the economy and industrial tradition. Water heritage brings together 100 heritage sites, covering infrastructure for managing and utilising water resources. Transformation and manufacturing industries account for 73 heritage sites, reflecting the diversity of production activities over time. Energy production infrastructures account for 44 assets, while extractive industries account for 25 assets, illustrating the exploitation of natural resources. The metal and steel industry sector has 12 heritage sites, and the textile heritage, associated with producing fabrics and clothing, has six heritage sites. Finally, the 'Other' category covers eight heritage sites, encompassing elements that do not fit into the previous classifications.

The division by country reveals that the most representative category in Portugal is wineries, with 62 records, followed by the food industry (62 records) and transport infrastructure (47 records). In Spain, the most representative category is transport infrastructure (288 records), followed by wineries (189 records) and hydraulic heritage (159 records).

Finally, the level of accessibility of the heritage was analysed, and the percentage of heritage sites declared as accessible to receive tourists is approximately 47.27%. This indicates that less than half of the heritage sites identified are officially ready to welcome visitors, suggesting a possible need to improve accessibility and tourist reception infrastructures.

4 CONCLUSIONS

The categorisation of the heritage identified covers various types, reflecting the richness and historical diversity of the cross-border region. The main types of heritage identified include wineries, illustrating the strong wine-growing tradition of the *Douro-Duero* region, and transport infrastructure, namely old railway stations and bridges, which witness industrialisation's impact on regional connectivity. There are also hydraulic structures, such as water mills and historic dams, which show how water resources have been used for industrial activity over the centuries.

The spatial analysis of the data also made it possible to identify areas of greater heritage density, suggesting the existence of centres of high historical and cultural value. The typological diversity and

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geographical distribution of heritage assets reinforce the region's relevance in the context of industrial and pre-industrial heritage, providing a comprehensive view of its evolution over time. In this sense, the map is a fundamental tool for valuing and safeguarding this legacy. It enables a more in-depth knowledge of its distribution and characteristics and the definition of strategies to promote its preservation and sustainable tourist use. The database preparation had some limitations, namely the difficulty in obtaining information from all the municipalities in the sample. We suggest an on-site visit to fill in all the information for future studies.

This was an essential practical study for the region under analysis, since the database will enable industrial tourism routes to be drawn up based on the specific interests of tourists and the categorisation of industrial heritage.

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The reciprocal dynamics of internationalization and quality of life: an institutional and resource-based perspective

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Abstract

The dual relationship between the degree of internationalization (DOI) of an economy and its quality of life (QOL) remains insufficiently explored. While internationalization is known to enhance economic growth and institutional development, its impact on social well-being varies across contexts. Similarly, a higher QOL – driven by strong institutions and human capital – can facilitate deeper economic integration, yet its role in shaping internationalization patterns requires further investigation. Drawing upon the institutional theory and the resource-based view (RBV), we explore the mutual relationship between DOI and QOL within the Portuguese economy. We test the causal relationships using a longitudinal dataset with three time points. Findings showed that past DOI positively contributes to later QOL as well as the reverse. The dual relationships support the need to extend institutional theory and RBV by considering DOI as an antecedent as well as an outcome of QOL.

Keywords: degree of internationalization; quality of life; cross-lagged panel models

1 INTRODUCTION

Globalization has fundamentally reshaped economic and social structures worldwide, fostering deeper economic integration and interdependence among nations [1]. This process, characterized by the removal of trade barriers, increased foreign direct investment (FDI), and the expansion of multinational enterprises, has significant implications for economic development and social well-being. One of the key aspects of globalization is internationalization, which reflects the extent to which an economy or a firm engages with international markets through trade investment, and technological exchange [2], [3].

Scholars have extensively debated the impact of globalization on quality of life (QOL), with some arguing that greater economic integration fosters economic growth, social stability, and enhanced living conditions [4], [5], [6], [7], [8], while others highlight potential adverse effects (e.g., [9], [10]) such as increased inequality, labor market disruptions, and environmental concerns. Despite the breadth of research on this topic, there remains an ongoing need to explore the nuanced and multidimensional effects of globalization on QOL [1], [11], [12], [13], [14].

Likewise, QOL plays a crucial role in shaping the extent to which an economy can successfully integrate into the international market. High-QOL environments – characterized by robust institutional frameworks, well-developed human capital, and efficient infrastructure – facilitate economic participation by attracting foreign investment and enabling firms. However, extant research offers contrasting perspectives on the impact of QOL on globalization. Some scholars (e.g., [15], [16]) contend that globalization decreases governmental effectiveness in delivering better QOL by increasing interdependence, restricting domestic policy autonomy, while others (e.g., [17], [18], [19]) identify a positive relationship between human development and globalization.

Consequently, the relationship between globalization and QOL is not unidirectional; rather, it is a dynamic and reciprocal interaction wherein improvements in QOL can drive the economy's globalization, just as globalization can contribute to enhanced living standards. However, while the literature acknowledges these interdependencies, empirical research into the dual nature of this relationship remains scarce. To address this gap, this study employs institutional theory and the resource-based view (RBV) as theoretical frameworks to explore the mutual influence between an economy's degree of

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internationalization (DOI) – considering the interdependencies between globalization and internationalization – and its QOL.

This dual-theoretical approach aligns with established research traditions in international business and allows for a more comprehensive understanding of the underlying mechanisms. Methodologically, the study adopts the firm-level metric most used to assess internationalization: the ratio of foreign sales to total sales (FSTS). To ensure cross-national comparability and reinforce the validity of the longitudinal analysis, this ratio is applied at the national level through the coverage rate, which reflects the ratio between exports and imports of goods and services.

Institutional theory emphasizes the role of formal and informal institutions in shaping economic activities, arguing that regulatory frameworks, governance structures, and social norms influence both internationalization patterns and social well-being [20], [21]. Meanwhile, the RBV highlights the relevance of unique resources – such as human capital and technological capabilities – as key drivers of international competitiveness [22], [23]. By integrating these perspectives, this study aims to provide a comprehensive understanding of the dynamic interaction between an economy's DOI and its QOL over time.

Accordingly, this research is guided by the following question: To what extent does the degree of internationalization of an economy influence subsequent quality of life, and conversely, how does quality of life impact the degree of internationalization?

Overall, a higher DOI at an early stage initiates economic, institutional, and technological transformations that continue to enhance QOL over time. Countries that integrate into the global economy earlier tend to experience sustained improvements in wealth, governance, and human development, ultimately leading to a higher QOL in the long term. Accordingly, the following hypothesis is proposed:

Hypothesis 1. *The degree of internationalization of an economy at an earlier time point is positively associated with the subsequent quality of life within the same economy.*

However, a higher QOL at an earlier stage provides the human capital, institutional stability, and infrastructure required for successful internationalization. Consequently, economies with a strong foundation in social and economic well-being are more likely to expand their foreign presence in the future. Thus, we formally propose:

Hypothesis 2. *The level of quality of life within an economy at an earlier time point is positively associated with the subsequent degree of internationalization of the same economy.*

By investigating this dual relationship, this study addresses a critical gap in the literature, contributing to ongoing discussions on globalization's broader socioeconomic effects. To the best of our knowledge, this is the first study to explore the recursive nature of the DOI-QOL relationship using one of the most recent cross-lagged panel models [24], based on data collected from the Portuguese context, a small open economy (SMOPEC).

2 METHODOLOGY

The dataset used in this study is longitudinal and national in scope, comprising 846 observations spanning the period from 2004 to 2021. The degree of internationalization of an economy and QOL were measured at three distinct time points – 2017, 2019, and 2021 – referred to as Time 1 (T1), Time 2 (T2), and Time 3 (T3), respectively. To empirically test the proposed hypotheses, data were collected from the Instituto Nacional de Estatística (INE) [25] and Pordata databases [26]. Longitudinal analysis was employed to examine the effects of internationalization on QOL over time.

The degree of internationalization of the economy was assessed by calculating the ratio of exports to imports of goods and services at T1, T2, and T3. The calculation of the coverage ratio was conducted using data sourced from Pordata, ensuring reliability and consistency in the measurement of trade dynamics. To ensure methodological alignment with established international business research, this study adopts an approach consistent with the firm-level metric most frequently used to assess internationalization – the ratio of foreign sales to total sales (FSTS) (e.g., [27], [28], [29], [30], [31]).

Using data from the INE and drawing on previous studies (e.g., [14], [32], [33]), the quality of life in the economy is measured through seven categories of practices. These categories include both objective and subjective indicators across the following domains: health; work-life balance; education, knowledge, and skills; social relationships and subjective well-being; civic participation and governance; personal

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security; and the environment. The work-life balance and social relationships and subjective well-being dimensions were excluded from the analysis, as they did not meet the threshold of 0.60, considered the less conservative cut-off for the internal consistency reliability measure, Cronbach's alpha (α). Consequently, the results presented in Section 3 reflect the QOL measurement through five dimensions: (1) health, (2) education, knowledge, and skills, (3) civic participation, (4) personal security, and (5) environment. Each specific practice within these domains was standardized by the INE, converting raw data into a normalized scale. This process facilitates comparisons across different units, time periods, and analytical dimensions.

We applied cross-lagged panel models (CLPM) using structural equation modeling (SEM) to test causal relationships. This method allows for assessing bidirectional effects while controlling for autoregressive influences. Measurement invariance tests confirmed the consistency of the QOL scale across time points. Estimation was performed using the lavaan package in R software [34].

3 RESULTS

The overall fit indices for the dual relationship model demonstrated satisfactory alignment with established thresholds ($\chi^2/df = 12.49$, $p = 0.000$; CFI = 0.90; GFI = 0.90; RMSEA = 0.056; TLI = 0.88) (Table 1). The findings provide empirical support for both hypothesized relationships. Consistent with Hypothesis 1, the estimated paths from T1 DOI to T2 QOL ($p < 0.05$) and from T2 DOI to T3 QOL ($p < 0.10$) were both positive and statistically significant. Similarly, in support of Hypothesis 2, the paths from T1 QOL to T2 DOI ($p < 0.10$) and from T2 QOL to T3 DOI ($p < 0.05$) were also positive and significant (Table 1).

Table 1. SEM regression estimates.

	$\beta\beta$	SE	p-value
<i>Auto-regressive terms:</i>			
<u>Degree of internationalization</u>			
AR $X_{T1} \rightarrow X_{T2}$	0.877***	0.008	<0.001
AR $X_{T2} \rightarrow X_{T3}$	0.886***	0.006	<0.001
<u>Quality of life</u>			
AR $Y_{T1} \rightarrow X_{T2}$	0.744***	0.016	<0.001
AR $Y_{T1} \rightarrow X_{T2}$	0.766***	0.016	<0.001
<i>Cross-lagged terms:</i>			
<u>H1: Degree of internationalization \rightarrow Quality of Life</u>			
CL $X_{T1} \rightarrow Y_{T2}$	0.032*	0.012	0.015
CL $X_{T2} \rightarrow Y_{T3}$	0.025†	0.016	0.084
<u>H2: Quality of life \rightarrow Degree of internationalization</u>			
CL $Y_{T1} \rightarrow X_{T2}$	0.041†	0.025	0.098
CL $Y_{T2} \rightarrow X_{T3}$	0.049*	0.023	0.042
<i>Fit indices:</i>			
χ^2 (p-value)	12.49 (0.000)		
CFI/GFI/TLI	0.90/0.90/0.88		
RMSEA/ SRMR	0.056/0.067		

X, degree of internationalization; Y, quality of life; *** $p < 0.001$; * $p < 0.05$; † $p < 0.10$; AR, autoregressive; CL, cross-lagged; CFI, comparative fit index; GFI, goodness-of-fit index; TLI, Tucker-Lewis's index; RMSEA, root mean square error of approximation; SRMR, standardized root mean square residual.

These findings suggest a dynamic and reciprocal relationship between economy's internationalization and quality of life over time. The broader implications of these results are explored in the next section.

4 CONCLUSIONS

The findings of this study provide empirical support for the hypothesized dual relationship between an economy's DOI and QOL. The positive and statistically significant relationship between these variables reinforces prior research highlighting the beneficial impact of internationalization on national development outcomes. Specifically, the results align with Rodrik (2000)[35], who posited that economic

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integration fosters improved governance, institutional strengthening, and long-term welfare gains. Globalization, as a multifaceted process, influences and is shaped by several socioeconomic factors. Prior studies (e.g., [4], [5], [6], [7], [8]) suggest that globalization enhances QOL and well-being by increasing trade flows, attracting FDI, and generating employment opportunities. Moreover, globalization and internationalization are closely interlinked, as firms play a central role in shaping economic integration and national welfare. The internationalization of firms facilitates cross-border knowledge transfer, enhances productivity, and promotes the adoption of best practices [36].

Conversely, the findings also indicate that higher QOL levels promote an economy's internationalization by fostering a skilled labor force, strengthening institutional infrastructure, and creating an attractive business environment. This aligns with research by Hall and Soskice (2001) [37] and Ireland et al. (2005) [38], which emphasize that well-functioning institutions, high human capital, and advanced infrastructure – key components of QOL – facilitate international business expansion and enhance competitiveness. Similarly, several studies have established a positive association between human development and globalization [17], [18], [19]). In this context, globalization facilitates firms' internationalization by lowering entry barriers and expanding cross-border market opportunities, thereby enhancing competitiveness [39], [40].

Overall, the results highlight the dynamic and reciprocal nature of the relationship between the economy's DOI and QOL over time. Unlike traditional perspectives that assume a unidirectional causality, this demonstrates a reinforcing cycle, wherein increased international engagement fosters economic and social development, while enhanced QOL further strengthens a country's international economic integration. This finding complements the institutional theory [21], [41] and the RBV [22] by illustrating how institutional and resource-related factors interact to shape economic trajectories.

This study also presents practical implications, thus underscores the critical role of internationalization for firms in small and open economies (SMOPECs) like Portugal, where structural constraints limit domestic growth potential. Early and sustained international engagement is essential for long-term competitiveness. For policymakers, the findings highlight the need to strengthen institutional quality, invest in human capital, infrastructure, and innovation, and adopt inclusive policies that enhance both international integration and quality of life.

This study has three main limitations that suggest avenues for future research. First, data at three-time intervals allows to examine the feedback loop between an economy's DOI and its QOL in a very limited way. Specifically, our reliance on data from 2017, 2019, and 2021 suggests that the findings may be influenced by context-specific social or economic events within this period. Therefore, a more extensive longitudinal analysis across multiple time periods is necessary to capture the long-term dynamics between DOI and QOL. Second, a comprehensive explanation of the DOI-QOL relationship requires that the QOL measure covers the full scope of the construct. Although the QOL measure used in this study incorporates most components included in the INE dataset, existing research has yet to reach a consensus on the precise definition of QOL and well-being [14]. Third, our findings indicate that a unidirectional interpretation of causality between DOI and QOL may be misleading, at least within the Portuguese context (a SMOPEC). Future research is needed to determine whether this dual relationship is generalizable across different cultural and economic contexts.

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Empowering entrepreneurship in Ibero-American HEIs: training needs assessment and strategic framework

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Abstract

This study presents part of the results of a survey conducted in Ibero-American Higher Education Institutions (HEIs) aimed at identifying the specific training needs of managers and teams working in entrepreneurship centers, units, and offices across the MetaRedX member countries: Argentina, Brazil, Chile, Colombia, Spain, México, Peru and Portugal. By collecting and analysing both quantitative and qualitative data, the survey offers a regional snapshot of current capacities, perceived gaps, and preferred training formats.

The findings provide a foundation for strategic actions planned by the International Working Group on Training and Capacity Building for 2025 and 2026. Common training needs were identified in areas such as innovation management, startup mentoring, and fundraising, as well as context-specific challenges related to policy, digital infrastructure, and institutional maturity. Moreover, these insights will guide the development of a comprehensive and modular training program tailored to national contexts and institutional roles. They also support the creation of competency frameworks, promote regional collaboration, and establish a baseline for measuring long-term impact.

Keywords: Entrepreneurship; Ibero-American Higher Education Institutions

1 INTRODUCTION

The "third mission" of universities—emphasizing societal engagement alongside teaching and research—is increasingly acknowledged as essential for both regional development and institutional effectiveness. As higher education institutions broaden their traditional roles, they are placing greater focus on knowledge transfer and active contributions to local and regional ecosystems [1], [2].

However, fulfilling this expanded mission poses key challenges. For example [3], highlights institutional barriers and calls for governance reforms to strengthen research, technology transfer and commercialization processes. Recent studies further emphasize the need to establish robust mechanisms that enable universities to effectively meet their evolving societal responsibilities. These

include pathways and adopting an entrepreneurial university philosophy [4], [5], [6] and [7]. Entrepreneurship centers or units within universities play a pivotal role in this context. They contribute to enhancing entrepreneurship curricula, supporting entrepreneurs, facilitating research implementation and technology transfer, and ultimately promoting the growth of the small and medium-sized enterprises (SMEs). More broadly, they foster the economic development of the region where their institutions are located [8].

This paper presents part of the results of an online survey conducted in 2024 by the International Working Group “Training and capacity building” of MetaRedX. The survey targeted member countries - Argentina, Brazil, Chile, Colombia, Spain, México, Peru and Portugal - aiming to identify the specific training needs of managers and teams working within entrepreneurship centers, units, and offices.

The findings also address several related topics: identification of common training gaps; customization of training programmes to adapt content and format to the specific needs and constraints of each country; creation of a skills matrix for entrepreneurship centre staff to map current capabilities against desired ones; identification of institutions with complementary strengths and weaknesses to foster peer learning and regional collaboration; and finally, measurement of training impact over time.

MetaRedX is a collaborative network of entrepreneurship units and offices within Ibero-American HEI, supported by Universia and Santander Universidades. Its mission is to strengthen these units, enhancing collaboration in startup creation within university communities and increasing their interaction with local, regional, national and international entrepreneurship ecosystems.

2 METHODOLOGY

Aware of the need to strengthen entrepreneurship training, MetaRedX identified as a priority the exploration and definition of key areas and topics with the greatest impact or most significant deficiencies within the Entrepreneurship Units of the HEIs in its network. Identifying these critical areas is essential to design more effective training strategies that enable entrepreneurs and their mentors to acquire relevant up-to-date skills and, thereby supporting HEIs in their knowledge transfer mission.

During 2024, with the goal of offering highly relevant training programmes, MetaRedX designed and implemented the ‘Survey to Measure Training Needs in MetaRedX Countries’. This online survey targeted professionals working within entrepreneurship offices in the member countries, including both managers and team members.

The objective of analysing the survey results was to gain a clearer understanding of existing knowledge gaps, identify areas requiring strengthened learning, and develop a collaborative action plan among the participating HEIs. This plan aims to improve training programmes and provide resources that have a tangible impact on skills development within the entrepreneurial ecosystem.

The questionnaire was developed by members of the International Training and Capacity Building Group, drawing on their experience and the specific contexts of each country. The survey was available online for responses from January to November 2024 and was disseminated through partner and non-partner institutions within the network. A total of 266 responses were received from 238 HEIs, reflecting a strong interest and commitment from universities to enhance entrepreneurship training and continuously improve their capabilities.

3 RESULTS

This article focuses on the comparative analysis of knowledge gaps within entrepreneurship units. Specifically, it examines the differences in technical knowledge between the heads of the entrepreneurship units and their respective teams, based on responses related to 21 entrepreneurship-specific topics. These topics were subsequently grouped into four key dimensions: (1) agile methodologies and customer discovery, (2) fundamentals and key skills for entrepreneurship, (3) innovation and technology for entrepreneurship, and (4) sustainability applied to entrepreneurship, each dimension includes several related subtopics.

These four dimensions represent common strategic orientations adopted by the entrepreneurship units in their efforts to training, support and develop entrepreneurial capabilities. In other words, they reflect not only technical content but also the underlying approaches that shape the functions and priorities of these units across different institutional contexts. Specifically:

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- **Agile methodologies and customer discovery**, focuses on early validation methods, iterative learning processes, and user-centered design. These are fundamental pillars supporting a dynamic venture orientation and fostering growth potential.
- **Fundamentals and Key Skills for Entrepreneurship**, encompasses essential knowledge required to formally structure a business, operate strategically, and effectively communicate value. It is especially prevalent in units focused on operational consolidation of ventures and traditional entrepreneurial environments.
- **Innovation and technology for entrepreneurship**, involves the intensive use of digital tools, technological solutions and innovative processes. It typically characterizes units that aim to generate competitive advantages through entrepreneurship and/or promote science- and technology-based ventures.
- **Sustainability applied to entrepreneurship**, integrates principles of triple impact (social, environmental, economic) and aligns with the Sustainable Development Goals (SDGs) in the design and implementation of business models. It reflects units oriented towards training socially and environmentally conscious entrepreneurs.

The scores were obtained using a five-point Likert scale, where 1 indicates low knowledge and 5 indicates high knowledge. For each country, we calculated weighted averages of knowledge levels separately for unit leaders and their teams. The knowledge gap was then estimated as the difference between these two scores. This gap serves a relative measure of alignment or misalignment in technical knowledge between leaders and teams within each national context.

The analysis of these gaps is presented in two parts: First, an overview compares differences between countries across the four dimensions, considering the strategic orientations reflected in leaders' knowledge levels. Second, a detailed examination of subtopics within each category identifies specific patterns in knowledge distribution between leaders and teams. This approach facilitates the design of targeted interventions, tailored training programs and knowledge transfer strategies among institutions and countries.

By progressing from a general overview to a detailed thematic analysis, this method links empirical evidence with actionable recommendations aimed at strengthening the institutional capacities of entrepreneurship units based on their unique needs and strengths within the collaborative network.

Observing the technical knowledge gaps across the four strategic dimensions allows identification of patterns indicating which approaches are more deeply in each country, as well as challenges in internal alignment between leaders and their teams units. Table 1 includes the average ratings of managers, teams, and gaps by country.

Table 1 summarizes the average ratings for managers, teams, and their respective gaps by country.

Country	Agile Methodologies and Customer Discovery			Core Entrepreneurial Skills and Foundations			Innovation and Technology for Entrepreneurship			Sustainability Applied to Entrepreneurship		
	Managers	Teams	Gaps	Managers	Teams	Gaps	Managers	Teams	Gaps	Managers	Teams	Gaps
Argentina	3,7	2,8	0,9	3,5	3,1	0,4	3,2	2,6	0,6	3,9	2,9	1,0
Brazil	3,8	3,6	0,2	3,9	3,8	0,1	3,6	3,6	0,0	3,5	3,5	0,0
Chile	4,3	3,7	0,6	4,0	3,5	0,5	4,0	3,6	0,4	3,8	3,6	0,2
Colombia	4,0	3,6	0,4	4,1	3,5	0,6	3,7	3,3	0,4	3,3	3,4	-0,1
Spain	3,6	3,2	0,4	3,6	3,3	0,3	3,4	3,0	0,4	3,3	3,0	0,3
Mexico	3,2	3,0	0,2	3,7	3,3	0,4	3,1	2,9	0,2	3,3	3,1	0,2
Peru	3,9	3,7	0,2	4,0	3,6	0,4	3,5	3,3	0,2	3,7	3,7	0,0
Portugal	4,0	3,3	0,7	3,8	3,2	0,6	4,0	3,4	0,6	3,7	3,3	0,4

Argentina shows the highest knowledge gaps among all countries, particularly in sustainability (+1.0) and agile methodologies (+0.9). This suggests a significant concentration of technical knowledge within the managers. Although managers demonstrate greater mastery in sustainability, the consistently high gaps across all dimensions reflect a vertical institutional structure, characterized by limited knowledge transfer to teams. This weak operational ownership constrains the teams' capacity for autonomous implementation of strategic approaches.

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Brazil, in contrast, exhibits strong internal consistency across all dimensions, with very low or near-zero gaps: agile methodologies (+0.2), entrepreneurial fundamentals (+0.1), technological innovation (0.0), and sustainability (0.0). This distribution indicates a horizontal knowledge-sharing model, where technical expertise is effectively distributed between managers and teams. The key strength of the Brazilian model lies in the operational balance of its entrepreneurial units, although its further emphasis on innovation, technology and sustainability as strategic differentiators may be beneficial.

Chile presents moderate and consistent gaps across all dimensions, ranging from +0.2 and +0.6, indicating a well-distributed strategic orientation, yet still a phase of operational maturation. The gap is found in agile methodologies (+0.6). Chilean entrepreneurship units appear to adopt a diversified approach that includes methodologies, fundamentals and innovation, alongside efforts to strengthen operational capabilities. This pattern suggests an institutional framework that has embraced key strategic approaches but requires enhanced team-level implementation. Additionally, Chile could serve as a reference point for methodological knowledge transfer to some HEIs in Portugal.

Colombia exhibits one of the highest gaps in entrepreneurial fundamentals (+0.6), followed by agile methodologies and technological innovation (+0.4). This pattern indicates that, while leaders demonstrate strategic clarity, teams struggle with implementing basic entrepreneurial tools and emerging technologies. The country reflects an institutional logic characterized by sound technical design but faces challenges in effectively disseminating knowledge to operational teams. Interestingly, in sustainability, Colombia displays atypical behaviour: teams outperform leaders by one point (-0.1), which may be explained by the fact that sustainability has not yet been deeply integrated into the core functions of entrepreneurship units.

Spain shows homogeneous gaps across all dimensions, ranging from +0.3 to +0.4. This suggests a stable institutional framework with a clear strategic design but a deficit in operational knowledge transfer. The approach is largely conceptual and driven from management levels, highlighting the need for targeted training and support to enhance technical execution within teams as well as to improve at the leadership capacities, particularly in current topics such as innovation, emerging technologies and sustainability.

Mexico presents moderate gaps in all categories, between +0.2 and +0.4. The absence of critical gaps combined with relatively low scores suggests that while strategic approaches have been generally adopted, they lack in depth. This developing institutional model would benefit from intensified training efforts aimed at both leaders and teams, especially in agile methodologies, innovation and emerging technologies, and sustainability. Investment in these areas could substantially improve the operational capacity and modernization of Mexico's entrepreneurship units.

Peru, alongside Brazil, stands out as one of the countries with the lowest gaps. It demonstrates strong alignment across almost all categories, with a zero gap in sustainability and very low gaps in agile methodologies and entrepreneurial fundamentals (+0.1). This pattern reflects a technocratic institutional logic and a high level of professionalization within technical teams. Peru's distributed management model positions it as a regional benchmark for operational sustainability and methodological knowledge transfer, particularly in agile methodologies, entrepreneurial foundations and sustainability.

Portugal exhibits wide gaps across all dimensions: agile methodologies (+0.7), entrepreneurial fundamentals (+0.6), technological innovation (+0.6) and sustainability (+0.4). These values indicate a concentration of technical knowledge within the leadership, accompanied by limited operational implementation at the team level. This structure reflects a vertical specialization model, highlighting the need for a more deliberate, cascade-style training strategy to effectively transfer knowledge throughout the organization.

4 CONCLUSIONS

This study offers a pioneering, multidimensional evaluation of entrepreneurship units within 238 Higher Education Institutions across eight Ibero-American countries. The findings illuminate systemic structural asymmetries, critical capacity gaps, and regional disparities that influence performance and evolution of the entrepreneurial ecosystem.

Three institutional archetypes emerged from the analysis —vertical concentration, horizontal alignment, and transitional models—providing a nuanced understanding of organizational dynamics that affect capacity building.

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Vertical concentration models, exemplified by Argentina and Portugal, reveal significant centralization of knowledge within unit leadership, leading to substantial gaps with operational teams. This imbalance restricts autonomous decision-making and delays strategic execution, underscoring the urgent need for cascade training protocols and greater operational decentralization.

In contrast, horizontal alignment models, observed in Brazil and Peru, demonstrate effective knowledge sharing and operational parity between leaders and teams. This distributed approach enhances organizational resilience and agile responsiveness, making it a replicable benchmark for other countries.

Transitional models, such as those in Chile, Spain, and Mexico, display moderate gaps that indicate ongoing institutional realignment. These processes can be accelerated through targeted mentoring, hands-on labs, and co-execution frameworks.

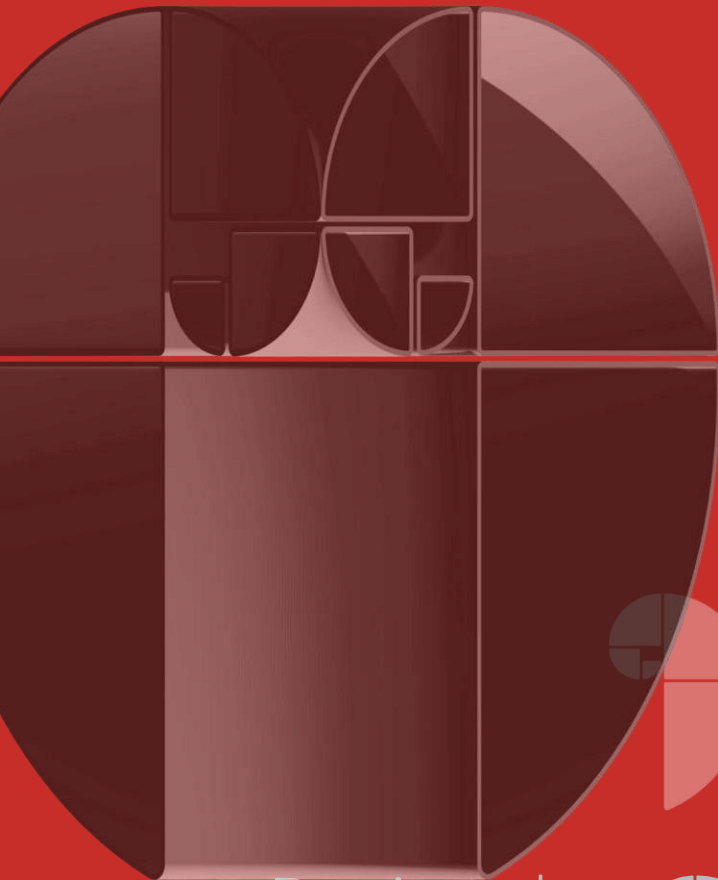
With the growing global emphasis on sustainable and impact-driven entrepreneurship, integrating sustainability frameworks and circular economy principles into entrepreneurship curricula and practice is imperative. Argentina's leadership in sustainability orientation, despite internal knowledge gaps, positions it as a potential leader in regional methodological transfer.

In conclusion, this study establishes a solid empirical foundation to strategically empower university entrepreneurship ecosystems across Ibero-America. By addressing identified gaps and leveraging institutional strengths through collaborative governance and targeted training, MetaRedX and its partners can accelerate the realization of universities' "third mission", thereby making significant — contributions to regional economic development, innovation capacity, and social impact in the digital era.

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Entrepreneurship and Regional Economy



IX Regional

HELIX  25

Transcultural and adaptive entrepreneurship: social status challenges and fear of failure among Brazilian entrepreneurs in Portugal

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Abstract

This qualitative study explores the experiences of Brazilian entrepreneurs in Portugal, focusing on the relationship between social status, fear of failure, and cultural adaptation in the context of transcultural entrepreneurship. Based on thematic analysis of seven interviews, the findings show that social status plays a vital role in shaping credibility and entrepreneurial persistence, especially in customer-oriented sectors. Participants strategically adapted their communication, image, and business environments to align with Portuguese expectations and overcome initial cultural barriers. Fear of failure was reported as both a limiting and motivating factor, encouraging some entrepreneurs to invest in professional development, planning, and resilience. Cultural identity, rather than being hidden, was used as a competitive advantage, especially in sectors such as aesthetics, food, and technology. Brazilian entrepreneurs leveraged perceived traits such as creativity and dedication to differentiate themselves. Despite the small sample size, the study includes diverse profiles and is set in a low-density region, offering original insights into immigrant entrepreneurship outside major urban centers. The study contributes to the international entrepreneurship literature by highlighting how cultural context influences intentions, strategies, and perceptions of immigrant entrepreneurs.

Keywords: Transcultural entrepreneurship, social status, fear of failure.

1 INTRODUCTION

Transcultural entrepreneurship presents distinct challenges for immigrant entrepreneurs, who must navigate cultural, economic, and social barriers when establishing businesses in unfamiliar environments ([1]). In Portugal, Brazilian entrepreneurs often face intensified pressures, including fear of failure and the pursuit of social status—two factors that significantly influence entrepreneurial intentions ([2]).

Recent data show that Brazilians represent 35.3% of all foreign residents in Portugal, highlighting the growing relevance of this group in the national economy ([3], [4]). While cultural proximity facilitates integration, challenges related to status recognition and emotional security persist.

Social status, understood as a form of capital ([5]), is crucial for building credibility, especially among immigrant entrepreneurs seeking legitimacy in new markets ([6]). Conversely, fear of failure—particularly in cultures with low tolerance for uncertainty—can act as a barrier or motivator depending on individual resilience ([7], [8]).

This study investigates how Brazilian entrepreneurs in Portugal perceive and respond to these dynamics. By analyzing their strategies for adaptation and persistence, this research contributes to a

deeper understanding of transcultural entrepreneurship and the unique challenges faced by immigrant business owners.

2 METHODOLOGY

This study adopts a qualitative approach based on semi-structured interviews with seven Brazilian entrepreneurs who have established businesses in the district of Vila Real, a low-density region in northern Portugal. The aim was to explore how these individuals perceive social status, fear of failure, and cultural adaptation within the Portuguese context.

Participants were selected through convenience and snowball sampling techniques, allowing access to a network of immigrant entrepreneurs. Interviews lasted approximately 45–60 minutes and were conducted in Portuguese. Ethical procedures were followed, including informed consent and confidentiality guarantees.

The data were analyzed using thematic analysis, supported by NVivo software. This method allowed for the identification of patterns related to emotional, cultural, and strategic dimensions in entrepreneurial behavior. The diverse profile of participants in terms of gender, age, education, and business sector adds richness to the data, providing insight into entrepreneurial dynamics in non-metropolitan areas.

Table 1. Profile of the Brazilian entrepreneurs interviewed.

<i>ID</i>	<i>Gender</i>	<i>Age</i>	<i>Education</i>	<i>Sector</i>	<i>Location</i>
E1	Female	43	Higher Education	Veterinary Medicine	Vila Real
E2	Female Male	23 26	Secondary Education	Food Business	Vila Real
E3	Female	43	Technological Course	Interior Design	Vila Real
E4	Female	32	Secondary Education	Hairdressing	Vila Real
E5	Female	30	Secondary Education	Beauty Services	Vila Real
E6	Female	31	Postgraduate	Aesthetics	Vila Real
E7	Male	47	Postgraduate	Technology & Informatics	Vila Real

Although this paper reports on findings from an initial sample of seven participants, additional interviews are currently being conducted to enhance data depth and diversity. The results presented here should therefore be considered as preliminary insights, aligned with the exploratory and iterative nature of qualitative research. The final version of the full article will reflect a more comprehensive data set.

3 RESULTS

3.1 Challenges of Social Status in a Transcultural Context

Social status plays a crucial role in the trajectories of immigrant entrepreneurs, acting both as a motivational driver and as a structural barrier ([5], [6]). In transcultural settings, the search for legitimacy and recognition becomes more complex, as individuals must reconstruct their social identity according to unfamiliar norms and expectations ([9], [10]).

The interviews revealed that Brazilian entrepreneurs in Portugal face significant challenges in achieving credibility, especially due to their age, nationality, and lack of local networks. Participants reported that appearance, communication style, and personal image became essential tools to convey professionalism and build trust. Subtle forms of prejudice were also mentioned, reinforcing stereotypes and highlighting the need for constant self-monitoring to gain acceptance in a conservative and formalistic cultural environment.

Strategic adaptation—such as adjusting behavior, curating physical space, and adopting a more mature image—was central to managing perceptions of status. As one participant noted, "I had to change how

I presented myself. I couldn't be seen as a girl—I needed to look like a mature, professional woman so people would trust me."

Ultimately, gaining social recognition depended not only on technical competence, but also on the ability to navigate cultural codes, communicate value, and establish a sense of belonging in a socially distant context.

3.2 Impact of Fear of Failure on Entrepreneurship

Fear of failure is a well-documented psychological factor that affects entrepreneurial intentions and persistence, especially in cultures where failure is socially stigmatized ([7], [8]). In Portugal, a country with a high uncertainty avoidance index (99/100), failure is often perceived as a threat to one's reputation and self-worth, increasing emotional risk for entrepreneurs ([11]).

The interviews revealed that fear of failure is a common concern among Brazilian entrepreneurs, mainly due to cultural and market differences. However, this fear did not paralyze them. On the contrary, it motivated them to invest in training, strategic planning, and cautious decision-making. Some participants reported that past failures strengthened their resilience and helped them navigate new ventures more confidently. Others remained cautious, particularly regarding financial risks.

Participants also noted cultural contrasts between Brazil and Portugal: while failure in Brazil is seen more as a learning step, in Portugal it is associated with stigma and judgment. Despite these pressures, most interviewees adopted a proactive and positive outlook—viewing failure as an opportunity to restart with more preparation and resolve.

As one entrepreneur stated, "Failure is no longer a fear for me. It's something that taught me what to do differently next time."

3.3 Adaptations and Strategies for Success in a Transcultural Context

Entrepreneurship in transcultural settings involves dynamic processes of adjustment, requiring cultural sensitivity and strategic adaptation. Literature on immigrant entrepreneurship highlights that success in culturally distinct environments depends on the ability to decode social norms, align business practices with local expectations, and build meaningful networks ([12], [13]). This adaptation is both functional and symbolic—entrepreneurs must gain legitimacy while negotiating their cultural identity ([14]).

Interview results reveal that Brazilian entrepreneurs in Portugal develop multiple adaptation strategies to respond to cultural, social, and professional challenges. Language, behavior, and presentation were adjusted to meet local expectations. Personal image and physical business space were used strategically to communicate trust and professionalism, particularly in sectors like beauty, food, and aesthetics.

Rather than hiding their Brazilian identity, many participants leveraged it as a strength—associating it with creativity, warmth, and innovation. Fear of failure, though present, was reframed as a motivator for discipline, learning, and persistence. As one entrepreneur stated, "Failure was never an option—I do it until it works."

Finally, the presence or absence of support networks deeply influenced their entrepreneurial paths. Resilience, self-determination, and cultural flexibility emerged as core traits for navigating this transcultural landscape.

4 CONCLUSIONS

This qualitative study sheds light on the complex dimensions of transcultural entrepreneurship, focusing on the experiences of Brazilian entrepreneurs in Portugal. The thematic analysis revealed that their success is strongly tied to their ability to culturally adapt, manage symbolic dimensions of social status, and reframe fear of failure. Rather than static barriers, these elements emerged as dynamic forces shaping strategies, decisions, and entrepreneurial behavior.

Social status was found to be a key factor in gaining legitimacy as economic agents in an initially skeptical environment. Personal image, professional conduct, and effective communication proved

crucial for establishing credibility. Although fear of failure was present, it did not paralyze the entrepreneurs; instead, it served as a driver for strategic planning, professional development, and resilience-building. Furthermore, the strategic use of Brazilian cultural identity as a competitive asset reflected the entrepreneurs' capacity for identity repositioning and market adaptation.

Despite the small sample size, the study's strength lies in the diversity of participant profiles—ranging from aesthetics and food services to design and technology—all operating in a low-density region (Vila Real). This context adds relevance in light of regional cohesion policies and inclusive economic development beyond metropolitan areas.

The study has limitations, primarily related to its exploratory nature and non-probabilistic sampling, which precludes generalization. Additionally, the focus on Brazilian entrepreneurs restricts comparison with other immigrant groups that may adopt different cultural and strategic approaches.

Future research should consider broader geographic scopes and comparative studies across nationalities, regions, and sectors. Longitudinal designs would also help to capture how perceptions of status, failure, and identity evolve over time. Finally, mixed methods are recommended to combine the interpretative depth of qualitative research with the generalizability of quantitative approaches, contributing to a more comprehensive understanding of immigrant entrepreneurship and its role in regional development.

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Albania's role and Western Balkans in green transition: green finance and eu partnership

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Abstract

This paper presents a literature and policy review on green finance as a catalyst for sustainable development in Albania and the Western Balkans, in alignment with EU climate objectives, particularly the European Green Deal and the Green Agenda for the Western Balkans. It examines how Environmental, Social, and Governance (ESG) principles are integrated into financial systems to promote climate resilience and facilitate low-carbon transitions. Drawing from academic literature, EU regulations, and national policy documents, the paper examines key green finance mechanisms, institutional developments, and cross-border cooperation efforts. The review highlights flagship renewable energy projects, such as the Karavasta Solar Park and the Floating Solar Plant, as well as Albania's increasing reliance on non-coal-based energy sources. It also highlights the role of international partners, such as the EBRD and IPA III, in funding green infrastructure. Despite encouraging progress, the analysis reveals ongoing challenges, including regulatory fragmentation, institutional capacity gaps, and limited financial awareness. The study emphasizes the importance of aligning innovative specialization strategies with environmental priorities and recommends enhancing legal clarity, promoting public-private partnerships, and fostering regional coordination. This review contributes to the broader discourse on sustainable finance by contextualizing Albania's experience within the evolving European green investment landscape.

Keywords: Green Investments, Sustainable Development, Green Economy

1 INTRODUCTION

In the face of global climate challenges and the need for sustainable economic transformation, green finance has emerged as a critical mechanism for guiding capital toward environmentally and socially responsible investments. According to the literature, sustainable development principles can be attained by integrating Environmental, Social, and Governance (ESG) factors into financial decision-making, thereby aligning economic growth with ecological and social goals [1]. Additionally, the Paris Agreement, adopted by 195 nations, further underscores the need for accelerated investment in green finance to limit global warming to below 2°C and strive for 1.5°C. [2]. Studies [2] and [3] provide empirical evidence supporting the notion that investments in renewable energy and green infrastructure substantially contribute to achieving the Sustainable Development Goals. Institutions and Authors such as [1], [4], and [5] emphasize that green finance not only aids in climate change mitigation but also enhances economic outcomes, including job creation, productivity, and long-term resilience and environmental sustainability [7]. Authors [4] argue that green finance is crucial for transitioning to a low-carbon economy, a perspective that positions sustainable finance as a central pillar of modern economic and financial policy. Investing in green contributes to energy efficiency, renewable energy development, and ecological improvement [8]. They are essential for transitioning from high-polluting economies to sustainable ones, with benefits including poverty reduction, enhanced food security, and ecosystem stability [9]. Financial institutions increasingly recognize green investments as a necessary shift in business practices [10]. The Green Agenda for the Western Balkans aims to achieve climate neutrality by 2050, decouple economic growth from resource use, and ensure inclusive progress. The agenda focuses on

- Transitioning to clean energy sources and climate protection.
- Shifting towards a circular economy.

- Depolluting air, water, and soil.
- Developing sustainable agriculture and food systems.
- Safeguarding biodiversity and ecosystems.

The EU supports its implementation through the Instrument for Pre-Accession (IPA III) and the Economic and Investment Plan (EIP), with €9 billion in grants and €20 billion in guarantees. The paper aims to present a review of existing policies and projects.

2 METHODOLOGY

The methodology combines a qualitative analysis with an exploratory quantitative approach to examine the role of green finance in supporting Albania's and the Western Balkans' sustainable development goals. The qualitative analysis includes a review of EU regulations, international reports, national policy, and case studies of renewable energy initiatives and green financing. The quantitative component is exploratory, focusing on the collection and interpretation of publicly available data regarding green financial flows and renewable energy investments. Due to the limited availability of official data, this part of the study aims to identify preliminary trends and some generalizable results.

3 RESULTS

Albania actively engages in regional frameworks such as the Berlin Process, promoting the integration of transport, energy, and digital infrastructure across the Western Balkans.

The region has a natural advantage in renewable energy. This is evident in Albania, which relies heavily on hydropower for electricity, and in Montenegro, where over 40 percent of electricity is generated from this source. While coal serves as the backbone of the region's energy systems, Kosovo, Serbia, and Bosnia and Herzegovina rank among the world's top ten countries regarding the share of coal in their electricity production, with 95 percent, 67 percent, and 65 percent, respectively. In contrast, North Macedonia (51 percent) and Montenegro (41 percent) maintain relatively more balanced energy mixes. At the same time, Albania generates no electricity from coal [11].

Investments in transport corridors and energy systems align with EU goals for sustainable regional connectivity. Major initiatives, such as the Karavasta Solar Park (140 MW, operational since January 2024), were implemented by the Albanian government through an international competitive tender organized in cooperation with the European Bank for Reconstruction and Development (EBRD). The EBRD supported the tender process under its Renewable Energy Auctions Program but did not directly fund the project. The project benefits from a 15-year Power Purchase Agreement (PPA) for 70 MW at a fixed tariff of €24.89/MWh, one of the lowest in Europe. Another project is Spitalla Solar Park (100 MW, under construction), which follows the same procedures. It has a 5-year PPA for 40 MW at a tariff of €29.89/MWh. Projects like the 40 MW Erseka Solar Park (operational since 2025) are fully private investments, and legislative support for agrisolar and wind projects on pastureland reflects the country's adaptation of the EU's Taxonomy Regulation, incorporating sustainability into governance. Blue 1 Solar Project (50 MW) near Topojë, Fier, Albania, is notable for being Albania's first fully privately funded renewable energy initiative. Albania has initiated public-private partnership (PPP) projects in the energy and utilities sectors, but success depends on achieving legal clarity and transparency.

The EBRD is another crucial partner, particularly in green financing, alongside the World Bank and the European Commission, for decarbonization projects. The Floating Solar Plant on Vau i Dejës Lake (12.9 MW) is a floating photovoltaic plant. The project is financed through a €7.48 million loan from the EBRD, a €1.9 million contribution from the Albanian government, and a €2.6 million grant from the Western Balkans Investment Framework.

Regarding other WB countries, Serbia has initiated significant renewable projects and adopted new legislation to reform state aid, though it faces resistance from public utilities. North Macedonia aims to generate 46% of its electricity from renewable sources by 2025, with EU-supported solar projects already underway. Although coal remains the dominant source, Kosovo plans to install 1,600 MW of renewable energy capacity by 2031.

Another European financial mechanism towards EU membership is the Instrument for Pre-Accession Assistance (IPA), where Serbia, Albania, and Kosovo are leading in terms of the share of their IPA III funding allocated to green initiatives. Serbia allocates the highest share, at 61%, followed by Kosovo at 52% and Albania at 48%[12].

Fig.1 indicates that Serbia holds the largest share of green investments, both in total approved allocations and in the EU contribution (approved IPA allocations), at approximately 61% and 56%, respectively [11]. The lowest share is in Montenegro and Bosnia and Herzegovina [11].

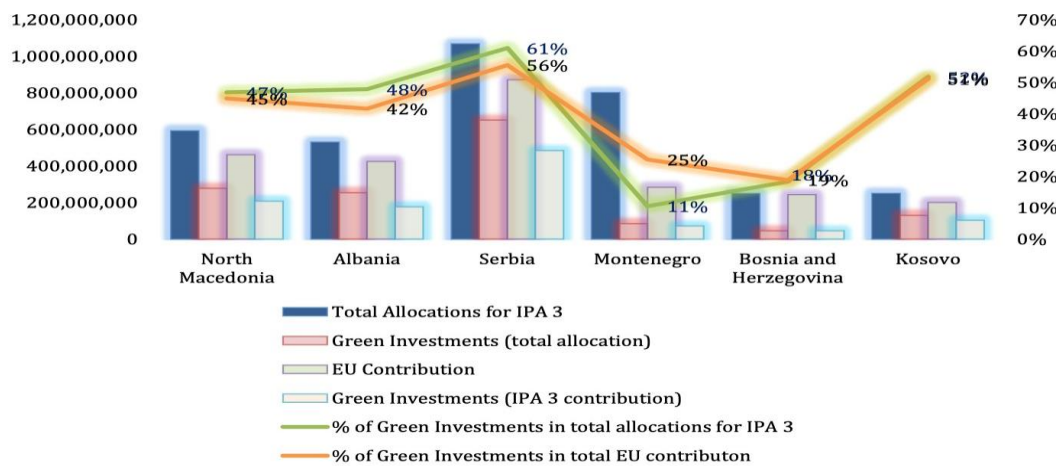


Figure 1 - Green Investments under IPA III in WB6

Despite significant progress made since 2016 in developing innovative specialisation strategies, a lack of alignment remains with recent policies and initiatives, such as the European Green Deal and the Green Agenda for the Western Balkans.

4 CONCLUSIONS

Albania and other Western Balkan countries increasingly align with the EU's green transition goals through regional infrastructure initiatives, sustainable development efforts, and international cooperation. Investments in transport, energy, and digital connectivity reflect Albania's commitment to regional integration and decarbonization, through projects on renewable energy. The country is also developing its renewable energy resources. While the Western Balkan economies have expressed commitment to the Sustainable Development Goals, the European Green Deal, and the Green Agenda for the Western Balkans, implementation of the Green Agenda remains slow. This is mainly due to gaps in legal frameworks and delayed reforms. In many cases, the green transition is still viewed by governments as a top-down requirement driven by the European Union, rather than a nationally owned development priority [1].

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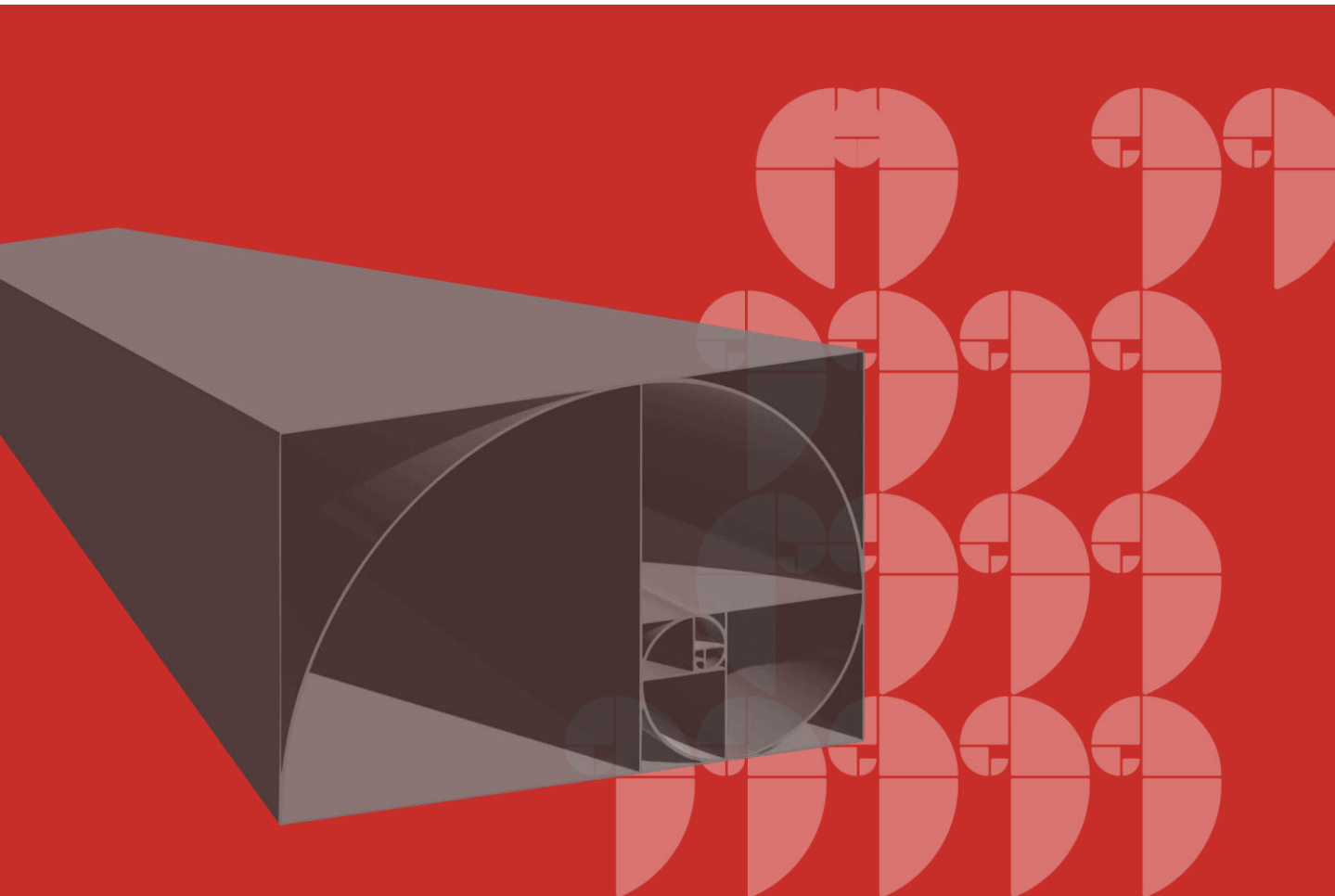
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Tourism and Cultural Heritage



IX Regional

HELIX 25

Enhancing cohesion and long-term competitiveness with circular economy strategies in the hospitality industry. The case of the Costa del Sol tourism ecosystem.

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Abstract

The purpose of this research is to understand the role of the Circular Economy (CE) strategies in the hospitality sector. Through semi-structured interviews to 38 managers of hotels located in the tourism ecosystem of the Costa del Sol (Málaga, Andalucía, Spain) the most effective strategies for integrating CE into hotel operations, with a specific focus on realising both environmental and economic advantages, are identified and analysed. As conclusion, the implementation of circular strategies is driven by a combination of factors, including cost savings, guest expectations, and environmental concerns, but is also hindered by barriers such as financial constraints and a lack of clear regulatory guidance. A significant finding is the strong belief among hotel managers that the widespread adoption of circular strategies can enhance the Costa del Sol's image as a sustainable tourism destination, thereby strengthening its long-term competitiveness in the global market. The potential for regional collaboration and the positive impact on local communities and the environment were also highlighted. Implications for managers and policy makers are included.

Keywords: Circular economy, hospitality sector, Costa del Sol ecosystem.

1 INTRODUCTION

The increasing global emphasis on environmental sustainability and efficient resource management has emerged as a defining challenge of the current era. The hospitality industry, while significantly contributing to global economic activity, has a substantial environmental footprint due to its energy and water consumption, waste generation, and reliance on single-use items. This impact necessitates a transition towards sustainable operational models. Circular economy (CE) is emerging as a crucial model for sustainable development, particularly in industries with substantial environmental impact, such as the hospitality sector. While CE principles offer a path toward sustainability, the correlation between circular strategies and enhanced cohesion and competitiveness requires further research. The tourism sector, in general, is characterised by extensive natural resource consumption, significant waste generation, and adverse environmental impacts. Hotels, restaurants, and other hospitality businesses, specifically, rely heavily on water, energy, food, and materials to provide guest services. This consumption leads to environmental issues, including water scarcity, energy depletion, pollution, and habitat destruction. Recognising these challenges, the hospitality sector needs to adopt sustainable practices that minimise its environmental footprint and promote responsible resource management. Adopting CE principles develops resource efficiency and sustainability in the sector, fostering environmental responsibility. The purpose of this research is to understand the role of CE identifying the best and effective strategies for integrating CE into hotel operations, with a specific focus on realising both environmental and economic advantages. The analysis is focused on a regional ecosystem: the Costa del Sol (Málaga, Spain).

2 THEORETICAL FRAMEWORK

Circular Economy (CE) represents a systemic shift in economic thinking, moving away from the traditional linear model of "take-make-waste" towards a regenerative approach that benefits businesses, society, and the environment [1]. This model, characterised by its reliance on the continuous extraction of natural resources to produce goods that are ultimately discarded, is increasingly recognised as unsustainable due to its inherent inefficiencies and detrimental environmental consequences. In contrast, the CE is defined by its core characteristics of resource efficiency, waste minimisation, and the extension of product and material lifecycles through various interconnected processes [2]. The hospitality sector is increasingly recognising the importance of adopting circular strategies to address its environmental impact and enhance its long-term sustainability. Various circular practices are being implemented across the industry, targeting different aspects of operations. Waste reduction and management are prominent areas of focus, with initiatives aimed at minimising food waste through strategies such as improved inventory management, creative menu design utilising food scraps, and donation programs [3]. CE strategies encompass a range of practices aimed at minimising waste, conserving resources, and maximising the value of products and materials throughout their life cycle; these strategies include reduction, reuse, recycling, redesign, replacement, and rethinking [4]. These strategies are specifically designed to address critical issues such as waste generation and inefficient resource use, which significantly impact tourist areas and the environment. By implementing circular strategies, tourist areas can mitigate these impacts and promote more sustainable tourism practices. This can involve measures such as reducing waste from hotels and restaurants, conserving water in tourist accommodations, promoting the use of public transportation, and supporting local businesses that prioritise sustainability. Reducing water and energy consumption stands out as one of the key areas for achieving substantial improvements in sustainability within the hospitality industry [2]. Hospitality establishments, including hotels and resorts, are typically intensive consumers of both water and energy, utilising these resources for various purposes such as guest accommodations, food service operations, laundry services, and the maintenance of swimming pools and landscaping. Consequently, the implementation of effective water and energy conservation measures can result in substantial reductions in operating costs, while also significantly mitigating the environmental impact associated with these operations. Consumers are increasingly concerned about water consumption and are actively supporting sustainable practices that aim to minimise the negative environmental impacts associated with its use [5]. Additionally, implementing energy-efficient technologies and adopting water conservation measures can significantly lower operational costs for hospitality businesses and simultaneously enhance their overall environmental performance [2]. Beyond these common practices, the hospitality sector is also exploring innovative business models aligned with CE principles. This includes adopting circular design for durable and modular furniture and building materials, extending the lifespan of assets through repair, refurbishment, and remanufacturing, and considering product-as-a-service models for certain amenities to shift the focus from ownership to usage [6].

Sustainable practices, particularly circular strategies, can significantly contribute to both internal and external cohesion within the hospitality industry. By prioritising local sourcing of food, beverages, and other supplies, hospitality businesses can actively engage with and support their local communities, fostering stronger relationships with local producers and artisans and contributing to the overall economic vitality of the region. Furthermore, the adoption of CE principles can lead to the creation of new local economic opportunities and jobs in areas such as waste management, repair and refurbishment services, and the production of sustainable goods [4]. Long-term competitiveness in the hospitality sector is driven by a multitude of interconnected factors. These include the ability to consistently deliver exceptional service quality and a superior customer experience that not only meets but exceeds guest expectations; building a strong and positive brand reputation that resonates with target markets and fosters customer trust and loyalty; continuously embracing innovation and integrating advanced technologies to enhance operational efficiency, personalise guest experiences, and streamline processes; maintaining cost efficiency through optimised operations and strategic resource management; demonstrating adaptability and flexibility in responding to evolving market trends, changing consumer preferences, and unexpected challenges; and attracting and retaining a skilled and motivated workforce by fostering a positive and inclusive work environment and providing opportunities for professional growth and development [7].

Sustainability and resource use efficiency, facilitated by the adoption of CE strategies, are increasingly playing a pivotal role in securing a competitive edge in the hospitality sector. Hospitality businesses that prioritise sustainability are better positioned to attract the growing segment of environmentally conscious customers who are actively seeking out and willing to pay a premium for eco-friendly travel options and accommodations [8]. Furthermore, the implementation of CE strategies often leads to significant

operational cost savings through the efficient management of resources such as energy, water, and materials, and the minimisation of waste generation [9]. A strong commitment to sustainability and resource efficiency, demonstrated through the adoption of circular practices, can significantly enhance a hospitality business's brand reputation and attract positive attention from customers, investors, and other stakeholders who increasingly prioritise environmental and social responsibility [10]. Moreover, employees are often more satisfied and engaged working for companies that demonstrate a genuine commitment to sustainability, which can lead to improved talent retention rates [11]. In essence, sustainability has transitioned from being merely an ethical consideration to becoming a significant driver of long-term competitiveness in the hospitality sector, offering opportunities for both cost leadership and differentiation. The main objective of this study is to identify the best and effective strategies for integrating CE into hospitality operations, with a specific focus on realising both environmental and economic advantages [12].

3 METHODOLOGY

This study adopts a qualitative research design to gain an in-depth understanding of the perceptions, experiences, and practices of hotel and resort managers of hotels located in the tourism ecosystem of the Costa del Sol (Málaga, Andalucía, Spain), concerning the adoption of CE strategies and their subsequent impact on both regional cohesion and long-term competitiveness. Qualitative research is particularly well-suited for exploring intricate phenomena and generating rich, nuanced data that can illuminate the 'why' and 'how' behind observed patterns. This approach allows for the exploration of the subjective experiences and interpretations of industry leaders, providing a deeper understanding that quantitative methods alone might not capture. The tourism ecosystem of the Costa del Sol was chosen as the research setting due to its significance as a prominent international tourism destination and its increasing focus on sustainability initiatives. The region's existing emphasis on sustainable practices provides a relevant and potentially rich context for studying the adoption and impact of circular strategies within its hospitality sector. Interviewing managers in this area is likely to yield valuable insights into both the enabling factors and the challenges associated with integrating CE principles into their operations. Semi-structured interviews to 38 managers of hotels and resorts in the tourism ecosystem of the Costa del Sol were conducted. Most of the participants hold the position of general manager of the hotel, work in a mid-range hotel, medium size, and having between 10-20 years of operation. Furthermore, they show a medium engagement in sustainability (some initiatives are already in place).

4 RESULTS

The thematic analysis revealed varying levels of understanding of CE concepts among the hotel and resort managers. A primary theme identified was the interpretation of the CE with some managers primarily associating it with waste management and recycling initiatives. Another significant theme was the perceived relevance of the CE to the hospitality industry. Most managers recognised the increasing importance of sustainability in the tourism sector and acknowledged the potential for circular strategies to contribute to more environmentally responsible operations. Many expressed a belief that adopting circular practices could enhance their brand image and attract environmentally conscious guests. Opportunities for collaboration and knowledge sharing among hotels and resorts in the region were also highlighted. It emerged that a coordinated regional approach to circularity could lead to greater efficiency, innovation, and collective impact. The potential positive impact on local communities and the environment was another significant theme. Participants believed that widespread adoption of circular strategies could contribute to environmental preservation, resource conservation, and the overall well-being of the local population.

5 CONCLUSIONS

The thematic analysis of interviews with 38 hotel and resort managers revealed a general positive outlook on the potential of CE principles to enhance both regional cohesion and long-term competitiveness. While the level of understanding and the extent of implementation varied across establishments, there was a widespread recognition of the increasing importance of sustainability in tourism and the potential benefits of adopting circular practices. In addition, some managers primarily associate circularity with waste management while others possess a more comprehensive understanding encompassing the entire value chain. The implementation of circular strategies is driven by a combination of factors, including cost savings, guest expectations, and environmental concerns, but is also hindered by barriers such as financial constraints and a lack of clear regulatory guidance. A

significant finding is the strong belief among managers that the widespread adoption of circular strategies can enhance the Costa del Sol's image as a sustainable tourism destination, thereby strengthening its long-term competitiveness in the global market. The potential for regional collaboration and the positive impact on local communities and the environment were also highlighted.

As recommendations for hotel and resort managers, they should conduct comprehensive audits of resource use and waste generation to identify specific areas where circular practices can be implemented or improved. For policymakers and regional authorities, they should develop clear guidelines and regulations to support the adoption of CE principles within the hospitality sector. This study is limited by its qualitative nature and the specific context of the tourism ecosystem of the Costa del Sol.

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Trends and thematic insights into educational technologies: a focus on tourism and hospitality education

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Abstract

This study presents a bibliometric analysis of educational technology research in the context of Tourism and Hospitality Education (T&HE). Drawing on 163 documents published between 2001 and 2025, the analysis reveals a growing body of literature shaped by international collaboration and conceptual diversity. The study identifies key contributing countries, with China, the United States, and Australia leading in publication output, while Australia shows the highest citation impact. Using co-occurrence network analysis six thematic clusters were identified: (1) technology integration and learning outcomes, (2) online and distance education, (3) AI and digital literacies, (4) immersive and experiential learning, (5) pandemic-related platform use, and (6) evaluation and niche applications. These themes reflect both established practices and emerging trends, highlighting the field's interdisciplinary and evolving nature. The findings offer insights into how educational technologies are conceptualized and applied within T&HE and suggest directions for future research, including deeper exploration of underrepresented contexts, AI-driven pedagogy, and longitudinal impact studies. This study contributes a structured overview to guide scholars, educators, and policymakers in shaping a more inclusive and innovative research agenda in educational technology for tourism and hospitality.

Keywords: Educational Technologies, Tourism and Hospitality Education, Bibliometric Analysis

1 INTRODUCTION

The educational technology research, which acts as a multidisciplinary activity, has attracted growing attention from scholars in various fields within the recent years. Even though educational technology research was previously criticized as a relatively under-theorized field [1], recent research in the area trends toward the integration of theoretical frameworks with the increasing attention received from scholars [2]. Throughout this evolution, educational technology was initially defined as the ethical study and practice of facilitating learning and enhancing performance through the creation, use, and management of appropriate technological processes and resources [3]. As the field evolved and intersected with various disciplines, its scope expanded. The latest definition by the Association for Educational Communications and Technology [4] describes educational technology as the ethical application of theory, research, and practice to improve learning, performance, and learner empowerment through the strategic design and use of educational processes and resources.

These technologies have been widely acknowledged for their potential to enhance educational quality, including within higher education settings [5]. Their implementation attracted scholarly attention from both learning [6] and teaching [7] perspective across various studies. They have shown to foster learner confidence and independence [8], enhance student engagement [9] and increase motivation [10], help designing practical classes [11], and enable more personalized learning experiences through the rapid advancement of technology [12]. The use of educational technologies has become increasingly prominent within Tourism and Hospitality Education (T&HE). As the use of these technologies in tourism and hospitality literature spans various areas, such as online courses, social networks, mobile technologies, virtual reality, and digital games; they continue to play significant roles and serve multiple functions within the T&HE field [13]. Their integration into T&HE is considered essential for preparing students to meet industry needs [14] and to develop technology-integrated thinking processes that align with the evolving demands of the sector [15]. To better understand how these tools have been

conceptualized within the T&HE literature, this study presents a bibliometric analysis to identify key research trends, thematic clusters and gaps in the current body of knowledge.

2 METHODOLOGY

This study employed a bibliometric analysis to systematically examine the scholarly literature on educational technologies within the context of T&HE, aiming to trace the field's development, highlight key trends, and identify emerging research areas [16]. Following a PRISMA-informed protocol [17], data were retrieved from Scopus and Web of Science using the same search query applied to title, abstract, and keyword fields: “technology*” AND “tourism education” OR “hospitality education”. The initial search yielded 195 records from Scopus and 168 from WoS (totaling 363). After removing 127 duplicates, 236 records remained. A series of inclusion criteria were applied (English-language publications only, limited to articles and reviews from 2001 onward) and a manual screening eliminated 66 studies unrelated to educational technologies in T&HE, resulting in a final dataset of 163 documents. The analyses were conducted using the R programming environment (version 4.5) and the Bibliometrix package, visualized through the Biblioshiny interface [18].

3 RESULTS

This bibliometric analysis covers a total of 163 documents published between 2001 and 2025 across 75 academic sources, involving 427 individual authors with an average of 3.02 contributors per paper. The dataset reflects a moderately collaborative research environment, including 30 single-authored works, and shows a growing trend in international scholarly engagement (21.47% of publications involved cross-border collaboration). The average number of citations per document is 15.42, and the average document age is 7.04 years, suggesting a mix of foundational and recent contributions. Additionally, 520 unique author keywords indicate strong thematic diversity. Scientific production in the field has steadily increased, particularly after 2010, with a marked surge following the onset of the COVID-19 pandemic in early 2020. The highest annual output was recorded in 2024 with 30 publications, reflecting growing interest in digital learning environments. In terms of geographical contribution, China, the United States, and Australia are the most active countries, with China leading in publication volume. However, Australia stands out for its strong citation impact, highlighting the value of internationally visible and collaboratively produced research in shaping scholarly influence.



Figure 1. Co-occurrence network analysis.

In order to better understand the intellectual and thematic configuration of educational technology research in T&HE, an author keyword co-occurrence network was constructed using the Walktrap clustering algorithm. This visualization maps the conceptual landscape by grouping frequently co-occurring keywords based on their semantic proximity, thereby revealing distinct thematic clusters that reflect the structure, evolution, and diversification of the field. As presented in Figure 1, the following clusters have emerged;

Regional Helix '25 – Transforming regions through innovation, sustainability and collaboration

- **Blue Cluster – Technology Integration and Learning Outcomes:** This dominant cluster centers around the implementation of educational technologies such as e-learning, mobile learning, and technology acceptance models, with an emphasis on pedagogical impact (student engagement, learning, graduate employability). These terms reflect the operational core of T&HE's digital transition and its applied learning goals.
- **Red Cluster – Social and Contextual Dimensions of Online Education:** Keywords like higher education, social media, and distance education converge in this cluster, representing a socio-cultural layer of research focusing on remote education and social interaction. It reflects how digital learning environments are shaped by institutional and societal contexts.
- **Green Cluster – AI and Digital Literacies:** Terms such as artificial intelligence, ChatGPT, digital, literacy, and sustainability comprise this forward-looking cluster, pointing to contemporary innovations and challenges in digital competency and responsible technology use. It underscores an emergent research direction addressing AI integration and the skills necessary to navigate it.
- **Orange Cluster – Immersive Learning and Instructional Design:** With keywords including virtual reality, augmented reality, instructional technology, and design-based research, this cluster focuses on immersive and experience-driven learning strategies. It emphasizes experimental approaches and technology-rich learning environments that are gaining traction in T&HE.
- **Purple Cluster – Pandemic and Platform-Centered Strategies:** Terms such as online learning, online education, and COVID-19 form a focused group that captures the impact of the pandemic on digital learning environments. The presence of teaching and information and communication technology (ICT) shows how instructional delivery and technological infrastructure were re-evaluated during this period.
- **Brown Cluster – Evaluation and Niche Applications:** Composed of terms like learning effectiveness, Web 2.0, and Innotour, this smaller cluster reflects emerging or specialized studies focused on evaluating the effectiveness of specific tools or platforms within technology-enhanced T&HE.

4 CONCLUSIONS

This bibliometric study provides a comprehensive overview of the scholarly landscape surrounding the use of educational technologies within Tourism and Hospitality Education (T&HE). The findings reveal a steadily growing body of literature, shaped by a diverse range of interdisciplinary contributions and increasingly global collaboration. While countries such as China, the United States, and Australia lead in publication output, the higher citation impact of Australia points to the significance of international visibility and collaboration in driving scholarly influence. The co-occurrence network analysis further uncovers the intellectual structure of the field, highlighting key thematic areas such as technology adoption, immersive learning, AI and digital literacies, and pandemic-driven educational adaptations. These clusters reflect both established domains and emergent trends, emphasizing the evolving nature of educational technology applications in T&HE. Implications for future research include a need to:

- **Deepening Pedagogical Insight into Emerging Technologies:** Future research should assess how tools like AI, ChatGPT, and immersive environments influence teaching, engagement, and skill development in T&HE.
- **Strengthening Methodological and Theoretical Foundations:** Longitudinal and comparative research, supported by interdisciplinary frameworks, is needed to better understand long-term impacts and enrich theoretical depth.
- **Enhancing Global and Contextual Representation:** Studies should include underrepresented regions and institutions to capture diverse approaches to educational technology use across contexts.

This study, based on indexed publications from Scopus and Web of Science and primarily focused on author keywords, identifies dominant themes and structural patterns but may not fully reflect the depth and nuanced evolution of thematic development over time. To gain a more detailed understanding of the conceptual shifts observed across the past two decades, future research could benefit from applying a structured thematic evolution analysis using clearly defined parameters that track longitudinal changes more comprehensively. This would also allow the development of more informed and timely research agendas aligned with current and emerging priorities in the field.

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