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Institutional Factors in The Formation of Innovation Ecosystems in Universities

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Abstract

Universities are increasingly recognized as central actors in innovation systems, contributing not only to education and research but also to entrepreneurship, technology transfer, and regional economic development. In this context, the concept of a university innovation ecosystem has gained growing attention in the literature. This study aims to identify and analyze the institutional factors that influence the formation of university innovation ecosystems. The research employs a qualitative analytical approach based on a structured review of academic literature and international policy reports related to innovation ecosystems, academic entrepreneurship, and university–industry collaboration. The analysis identifies several key institutional determinants that shape the development of university innovation ecosystems, including governance and strategic leadership, funding and financial support, technology transfer and incubation infrastructure, university–industry collaboration mechanisms, entrepreneurial culture, and digital infrastructure for innovation management. The findings suggest that innovation ecosystems within universities emerge not only from research excellence but also from the presence of supportive institutional structures and collaborative networks. The study proposes a conceptual framework illustrating how these institutional factors interact to influence innovation outcomes such as patents, industry-funded research, and academic spin-offs. The results highlight the importance of adopting a systemic and institutionally grounded approach to strengthening university innovation ecosystems.

Keywords: University innovation ecosystem; institutional factors; university–industry collaboration; academic entrepreneurship; technology transfer; innovation governance; higher education innovation.

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1. Introduction

In the modern knowledge-based economy, universities are increasingly expected to perform functions that go beyond traditional teaching and research. They are becoming key actors in national and regional innovation systems through entrepreneurship, knowledge transfer, and industry collaboration (Etzkowitz, 1998; Etzkowitz & Leydesdorff, 2000; Reichert, 2019). The transformation of universities into innovation-oriented institutions has strengthened the relevance of the university innovation ecosystem concept, emphasizing networks of actors, resources, and institutional arrangements that shape innovation outcomes (Adner, 2017; Autio & Thomas, 2014; Jacobides et al., 2018).

A university innovation ecosystem can be defined as a set of interdependent institutional structures and

relationships that enable knowledge creation, diffusion, and commercialization. This typically includes research infrastructures, technology transfer offices (TTOs), incubators, accelerators, entrepreneurship education, IP management systems, and partnerships with industry and government (Rothaermel et al., 2007; Siegel & Wright, 2015; Perkmann et al., 2013). Prior research shows that universities' innovation performance depends not only on research excellence, but also on institutional governance, incentive systems, and boundary-spanning structures that connect academia to external stakeholders (Clark, 1998; Guerrero et al., 2016; Padilla-Meléndez & del-Aguila-Obra, 2022).

However, the capacity to build such ecosystems differs significantly across contexts. Universities in many developing and transition economies face institutional barriers such as rigid governance, limited autonomy, insufficient funding, weak IP regimes, and underdeveloped university–industry interfaces, which collectively constrain ecosystem formation (OECD, 2019; World Bank, 2019; Ríos Yovera et al., 2025). Against this background, the objective of this study is to identify and analyze the institutional factors that most strongly influence the formation of university innovation ecosystems, with a focus on governance, funding, support structures, and collaboration mechanisms (Breznitz & Etzkowitz, 2016; Cai, 2021).

Despite the growing body of research on university innovation ecosystems, there is still limited understanding of how institutional factors interact in shaping ecosystem readiness, particularly in emerging higher education systems. Existing studies mainly focus on individual mechanisms such as technology transfer or university–industry collaboration, while a comprehensive institutional framework remains insufficiently developed. Therefore, this study addresses the following research question: What institutional factors play the most significant role in the formation of university innovation ecosystems?

2. Methods

This study employs a qualitative analytical design based on a structured review of peer-reviewed literature and policy-oriented evidence. The review follows systematic principles of identifying, screening, and synthesizing relevant publications on university innovation ecosystems, academic entrepreneurship, and university–industry collaboration (Snyder, 2019; Tranfield et al., 2003). In addition, conceptual insights from innovation ecosystem theory are used to organize institutional factors into governance, resource allocation, support mechanisms, and collaboration networks (Adner, 2017; Jacobides et al., 2018).

To complement the literature synthesis, international policy and benchmarking documents on universities' roles in innovation ecosystems are examined to capture institutional and governance arrangements applied in practice (OECD, 2019; Reichert, 2019). The evidence is analyzed through thematic coding to identify recurring institutional determinants and mechanisms that enable or constrain ecosystem development (Miles et al., 2014).

The analysis focuses on several institutional dimensions, including governance frameworks, research management structures, funding mechanisms, and university–industry collaboration systems. These dimensions were examined to determine their role in supporting innovation activities and fostering entrepreneurial culture within universities.

3. Results

The analysis indicates that the formation of university innovation ecosystems is shaped by several institutional factors.

First, governance and strategic leadership are critical. Universities with stronger autonomy and innovation-oriented leadership are more able to align education, research, and commercialization with ecosystem objectives (Clark, 1998; Guerrero et al., 2016; Padilla-Meléndez & del-Aguila-Obra, 2022). Second, effective ecosystems depend on institutional support structures, particularly TTOs, incubators, and dedicated intermediaries that translate research into applications and facilitate external engagement (Rothaermel et al., 2007; Siegel & Wright, 2015; Perkmann et al., 2013). Evidence also suggests that TTO design and practices influence both the quantity and quality of commercialization outcomes (Markman et al., 2005; Halilem et al., 2025).

Third, funding architecture matters. Sustainable ecosystems typically rely on diversified resources—public funding, competitive grants, private investments, and international funding—enabling universities to develop research capacity and entrepreneurship programs (OECD, 2019; World Bank, 2019). Fourth, strong university–industry–government linkages accelerate knowledge exchange and applied innovation through joint projects, co-funded labs, and collaborative

governance arrangements (Etzkowitz & Leydesdorff, 2000; Cai, 2021; Perkmann et al., 2013). Finally, ecosystem formation is reinforced by entrepreneurial culture and incentives, including training, recognition systems, and career structures supportive of academic entrepreneurship (Siegel & Wright, 2015; Audretsch, 2014; Ríos Yovera et al., 2025).

University–industry collaboration is another essential institutional factor. Strong partnerships between universities and industry facilitate knowledge exchange, applied research, and technology commercialization. Collaborative projects, joint research programs, and industry-funded laboratories contribute significantly to the development of university innovation ecosystems.

Universities that promote entrepreneurial education, innovation training, and startup support programs create an environment that encourages students and researchers to transform ideas into practical innovations.

The interaction of these institutional factors contributes to measurable innovation outcomes at the university level. These outcomes typically include patent generation, industry-funded research projects, academic spin-offs, and scientific publications indexed in international databases such as Scopus. Universities with stronger institutional ecosystems are generally more successful in translating research outputs into economic and societal value.

Table 1. Institutional factors influencing university innovation ecosystems

Institutional factor	**Key mechanisms**	**Expected innovation outcomes**
Governance and leadership	strategic autonomy, innovation-oriented management	alignment of research and commercialization
Funding architecture	public funding, grants, private investment	sustainable research and innovation programs
Technology transfer structures	TTOs, incubators, accelerators	patents, licensing, startups
University–industry collaboration	joint research, industry labs	applied innovation and commercialization
Entrepreneurial culture	incentives, entrepreneurship education	academic startups and innovation initiatives
Digital infrastructure	research management systems, digital platforms	efficient innovation coordination

Importantly, these institutional factors do not operate independently. Governance structures influence the allocation of financial resources and the design of support mechanisms such as technology transfer offices. Similarly, funding availability affects the development of research infrastructure and collaboration platforms with industry partners. Therefore, the effectiveness of a university innovation ecosystem depends on the coordinated interaction of these institutional components.

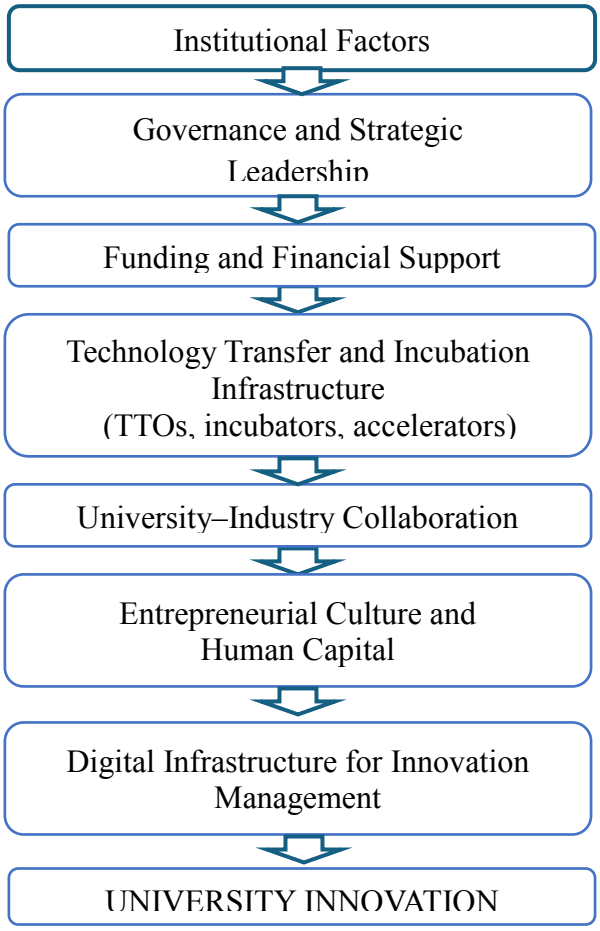

Figure 1. Conceptual Model of Institutional Factors Shaping University Innovation Ecosystems

Figure 1 presents the conceptual framework of institutional factors shaping university innovation ecosystems. The model assumes that several institutional dimensions—governance and strategic leadership, funding and financial support, technology transfer infrastructure, university–industry collaboration mechanisms, entrepreneurial culture, and digital infrastructure—collectively influence the development of innovation ecosystems within universities. These institutional conditions enable universities to generate innovation outcomes such as patents, industry-funded research, Scopus-indexed publications, and academic spin-offs.

Digital infrastructure also plays a growing role in supporting innovation ecosystems. Digital research management systems, data platforms, and collaborative tools improve transparency, coordination, and knowledge sharing within universities and across external partners. As universities move toward digital transformation, these technologies increasingly enable efficient management of research projects, intellectual property, and industry collaboration.

These findings indicate that policymakers seeking to strengthen university innovation ecosystems should focus not only on increasing research funding but also on improving governance autonomy, professionalizing technology transfer structures, and fostering sustained collaboration with industry.

4. Discussion

The findings underline that university innovation ecosystems are not purely technological constructs; they are institutional systems shaped by governance choices, incentive regimes, and boundary-spanning mechanisms. This aligns with innovation ecosystem research emphasizing complementarities among actors, resources, and institutional arrangements (Adner, 2017; Autio & Thomas, 2014). The results also support the view that universities increasingly operate within Triple Helix dynamics, where academia, industry, and government co-evolve through collaboration and hybrid institutional roles (Etzkowitz, 1998; Etzkowitz & Leydesdorff, 2000;

Cai, 2021).

From a managerial perspective, universities seeking ecosystem development should prioritize governance flexibility, investment in intermediaries (TTOs/incubators), diversified funding models, and structured collaboration platforms with industry and government. This also relates to emerging debates on "University 4.0" trajectories where digital and innovation capacities are integrated into university missions and governance (Giesenbauer & Müller-Christ, 2020; Chernaya et al., 2023). In contexts with institutional rigidities, ecosystem development may require staged reforms: strengthening autonomy, improving IP governance, professionalizing TTOs, and building sustained collaboration programs (OECD, 2019; Reichert, 2019).

The results of this study emphasize that building a sustainable university innovation ecosystem requires a systemic approach that integrates institutional governance, financial support, research infrastructure, and collaborative networks. Universities must adopt innovation-oriented strategies and create institutional conditions that encourage creativity, experimentation, and knowledge commercialization.

5. Conclusion

This study identified governance, institutional support structures, funding mechanisms, Triple Helix collaboration, and entrepreneurial culture as key institutional factors shaping university innovation ecosystems. Universities that intentionally design these institutional conditions are more likely to generate innovation outputs, strengthen knowledge transfer, and contribute to socio-economic development (Clark, 1998; Reichert, 2019; Siegel & Wright, 2015). Future research may empirically test these relationships using quantitative indicators and cross-country comparative designs (Snyder, 2019; OECD, 2019).

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