

Role of the Bridge Maker in Innovation Ecosystems

Kristaps BANGA (Corr.)

Faculty of Engineering Economics and Management, Riga Technical University
Riga, LV-1048, Latvia

Elīna GAILE - SARKANE

Professor, Riga Technical University, Faculty of Engineering Economics and Management, Riga Technical University
Riga, LV-1048, Latvia

ABSTRACT

This research explores the crucial role of bridge makers in fostering the success of open innovations within innovation ecosystems. Emphasizing governance structures, this study highlights the importance of creating synergies among participants through effective intermediaries. Bridge makers act as connectors, facilitators, and integrators, crucial for fostering collaboration among diverse stakeholders, aligning interests, and overcoming barriers to innovation. By integrating the bridge maker role into ecosystem strategies, stakeholders can ensure that the connections formed are not only numerous but also robust, inclusive, and capable of driving long-term innovation and collaboration.

Given the fragmented nature of recent literature on the role of bridge makers, and the various terminologies used to describe similar roles, this research aims to provide a clear definition and comprehensive understanding of the bridge maker's role. The objective is to analyze different aspects and names attributed to this role within the context of innovation ecosystems.

This paper concludes by discussing future research avenues that can build on the developed role typology, shedding further light on the process of open innovation ecosystem genesis. By incorporating the bridge maker role into the various ecosystem models, this research suggests that enhanced connectivity and synergy can be achieved, benefiting the entire ecosystem.

Keywords: Bridge makers; Ecosystem Integration; Governance Structures; Innovation Ecosystems; Innovation Ecosystems Roles; Open Innovations

1. INTRODUCTION

Innovation ecosystems are dynamic and complex environments where various actors interact to foster innovation, economic growth, and competitiveness. These ecosystems comprise numerous entities, including startups, companies, academics, research institutions, government agencies, and intermediaries, all collaborating to drive technological advancements and market success [1], [2]. The role of intermediaries in these ecosystems is critical, as they facilitate collaboration, knowledge exchange, and resource sharing among diverse stakeholders [3], [4]. Among these intermediaries, the concept of a bridge maker has emerged as particularly important for creating sustainable and robust connections within the ecosystem. Despite its significance, the literature on bridge makers is fragmented, with various terms

used to describe similar roles. This research aims to provide a clear definition of the bridge maker's role and analyze its impact on innovation ecosystems.

Innovation ecosystems are characterized by high levels of interconnectivity and interdependence among actors [5], [6]. The complexity of these interactions necessitates effective intermediaries who can navigate and manage the diverse interests and resources of the ecosystem participants. Bridge makers play a pivotal role in this context by acting as connectors, facilitators, and integrators. They help to align the interests of various stakeholders, overcome barriers to collaboration, and ensure that the connections formed are not only numerous but also robust, inclusive, and capable of driving long-term innovation and collaboration [7], [1].

The importance of bridge makers in innovation ecosystems can be understood through several key dimensions. Firstly, they enhance connectivity by creating accessible and beneficial connections for all participants. This is crucial for fostering an environment where new partnerships can thrive and innovative ideas can be effectively developed and commercialized [8], [9]. Secondly, bridge makers increase synergies within the ecosystem through infrastructure development. By establishing platforms and frameworks that support continuous and evolving collaboration, they help to create a more integrated and supportive environment [10], [11]. Finally, bridge makers support long-term innovation and collaboration by addressing barriers and fostering continuous engagement. This involves not only connecting stakeholders but also creating the conditions necessary for sustained interaction and resource sharing [3], [12].

Research Question

What is the role of bridge makers in fostering the success of open innovations within innovation ecosystems?

Research Tasks

- **Conduct a literature review:** The first task is to systematically review the existing literature utilizing the Scopus database on bridge makers and similar roles. This involves identifying the various terms used to describe these roles and analyzing the contexts in which they are used. By doing so, we aim to provide a comprehensive overview of the current state of knowledge on this topic.
- **Define the Bridge Maker's Role:** Based on the literature review, we will develop a clear and concise definition of the bridge maker's role within the context

of innovation ecosystems. This definition will highlight the key characteristics and functions of bridge makers, distinguishing them from other similar roles.

- **Explore Integration into Existing Innovation Ecosystem Role Models:** Author will explore how the bridge maker role can be integrated into existing models of innovation ecosystems, such as the MIT TE-SER Model [15]. This involves analyzing the compatibility of the bridge maker role with these models and identifying potential areas for improvement.
- **Identify Future Research Avenues:** Finally, paper will identify future research avenues based on our findings. This includes suggesting areas where further research is needed to validate and expand on our role typology and to shed further light on the process of innovation ecosystem genesis.

The concept of bridge makers extends beyond mere connectivity - it involves the strategic integration of diverse resources and capabilities to create a cohesive and dynamic ecosystem. Bridge makers act as intermediaries who facilitate the flow of knowledge, technology, and resources across organizational boundaries. They play a crucial role in reducing transaction costs, mitigating risks, and enhancing the overall efficiency of the innovation process [7], [4]. This is particularly important in networked markets, where the interdependencies between players can create significant barriers to innovation [13].

The role of bridge makers is also closely linked to the concept of open innovation, which emphasizes the importance of leveraging external knowledge and resources to drive internal innovation [1]. In open innovation ecosystems, bridge makers facilitate the integration of external ideas and technologies, thereby enhancing the innovation capacity of individual firms and the ecosystem as a whole. By creating and maintaining effective linkages between diverse stakeholders, bridge makers help to align interests, foster trust, and promote collaborative problem-solving [14], [12].

Despite the critical importance of bridge makers, the existing literature provides only a fragmented understanding of their role and impact. Various terms, such as agent, broker, facilitator, and intermediary, are used to describe similar functions, leading to confusion and ambiguity [3], [4]. This research aims to address this gap by providing a comprehensive analysis of the bridge maker's role within innovation ecosystems. By synthesizing insights from multiple sources, this study seeks to offer a clear definition and understanding of the bridge maker's functions, highlighting their significance in fostering open innovation and sustainable ecosystem growth.

The findings of this research will contribute to the ongoing discourse on innovation intermediaries and ecosystem dynamics. By integrating the bridge maker role into existing models, such as the MIT TE-SER Model, stakeholders can develop more effective strategies for enhancing connectivity, synergy, and long-term sustainability in innovation ecosystems [15]. This research also underscores the need for adaptive governance and innovative system design frameworks to support the evolving role of bridge makers [1], [6].

The role of bridge makers in innovation ecosystems is multifaceted and crucial for fostering collaboration, enhancing connectivity, and driving long-term innovation. This research aims to provide a clear definition and comprehensive understanding of the bridge maker's role, addressing the fragmented nature of the existing literature and offering actionable insights for stakeholders. By exploring how bridge makers can be integrated into ecosystem strategies and models,

this study contributes to the development of more robust and resilient innovation ecosystems.

2. METHODOLOGY

The methodology outlines the systematic approach taken to conduct this research, ensuring that the findings are reliable, valid, and replicable in future studies. This section includes the research design, data collection methods, and data analysis techniques employed in the study.

Research Design

This research adopts a qualitative approach to explore the role of bridge makers within innovation ecosystems. The study utilizes a systematic literature review methodology to gather and analyze existing research on bridge makers and similar roles. This approach is chosen due to the fragmented nature of the research insights in the literature on this topic, which necessitates a comprehensive synthesis of existing knowledge.

Literature Review

The primary data collection method involves a systematic review of academic literature. The Scopus database is used to identify relevant publications. The following steps were taken to ensure a thorough and unbiased literature review:

1. **Search Strategy:** A comprehensive search was conducted using keywords such as "bridge maker", "intermediary", "connector", "facilitator", "integrator", "linker" and "innovation ecosystem." Boolean operators were used to refine the search results.
2. **Inclusion and Exclusion Criteria:** Publications were included if they:
 - Discussed the role of intermediaries in innovation ecosystems.
 - Were published in peer-reviewed journals.
 - Were written in English.
 - Provided empirical or theoretical insights relevant to the bridge maker role [1], [3],[4].
 - The timespan of reviewed articles is limited to 4 recent years (from 2005 through 2024).

Publications were excluded if they:

- Focused solely on technical aspects without addressing intermediary roles.
3. **Screening and Selection:** Titles and abstracts of the identified publications were screened to assess their relevance. Full texts of the selected publications were then reviewed to confirm their inclusion in the study.
 4. **Data Extraction:** Key information from the selected publications was extracted, including descriptions and definitions of intermediary roles, descriptions of their functions, contexts in which they operate, and their impact on innovation ecosystems.

Data Analysis

The extracted data were analyzed using qualitative content analysis to identify common themes and patterns related to the role of bridge makers. The following steps were taken during the data analysis process:

1. Coding: The extracted data were coded to categorize different intermediary roles, their functions, and the contexts in which they operate, as well as aspects to the bridge maker role. Codes were assigned to text segments that described similar concepts or functions [16].
2. Thematic Analysis: The coded data were then analyzed to identify recurring themes and patterns. Themes were developed to capture the key aspects of the bridge maker role and its impact on innovation ecosystems [16].
3. Synthesis: The identified themes were synthesized to provide a comprehensive understanding of the bridge maker role. This synthesis involved integrating insights from multiple sources to develop a clear definition and conceptual framework for the bridge maker's functions, similarities, and differentiation.

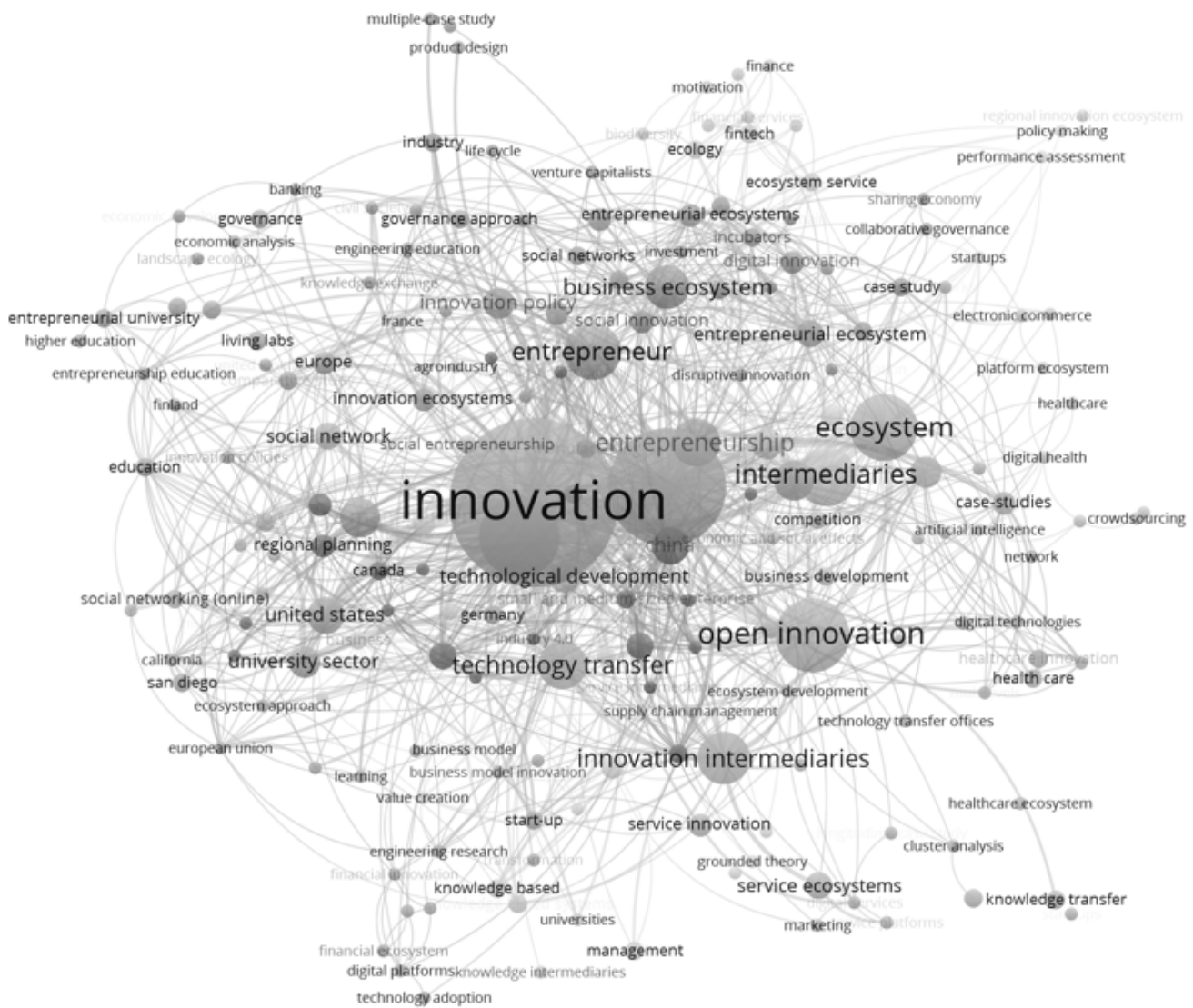
3. RESULTS

Resulted publication count for reviewing: 177 articles, which were then screened for relevance based on their titles and abstracts.

Keyword Mapping in VOSviewer

VOSviewer was applied to identify keyword density among downselected 177 articles. A total number of 1097 keywords were identified and a minimum of 2 occurrences of keywords were selected, which led to 200 keywords at the end, see Chart 1. A total of 8 biggest clusters were categorized based on VOS Viewer analysis: 1) innovation; 2) innovation ecosystem; 3) innovation intermediaries; 4) open innovation; 5) ecosystem; 6) intermediaries; 7) entrepreneur; 8) technology transfer.

Chart 1. VOSviewer visualization author created.



Qualitative content analysis

Following this analysis, the full texts of 48 articles were reviewed to confirm their inclusion. The final selection comprised 25 articles that met all criteria and 15 more were added from selected article references as relevant. These 40 articles then were as the base for qualitative content analysis to identify common themes and patterns related to the role of bridge makers.

13 different terms were selected as a result of qualitative content analysis and coding: agent, broker, bridger, champion, connector/linker, dominator, enabler, facilitator, innovation intermediary, knowledge broker, network catalyst, sponsor, technology transfer agent.

4. FINDINGS

Initial analysis from VOSviewer confirmed author opinion that in the current literature, there is very fragmented information on the innovation intermediaries' roles, and definitions, and even less information and common alignment on the selected research scope – bridge makers. Therefore to answer this research question - what is the role of bridge maker in the innovation ecosystem, author further focused on qualitative content analysis and insights.

Upon reviewing the literature on innovation ecosystems, it becomes evident that various authors describe different roles and their definitions, each complementing the functions of a bridge maker in unique ways. The analysis reveals a diverse array of intermediary roles, highlighting the multifaceted nature of bridge makers. This diversity is due to the different perspectives authors have on designing innovation ecosystem players, leading to a range of names and functions for these intermediaries.

Some authors adopt generalized standards [17], categorizing universities as knowledge transfers, corporations as sponsors, incubators as enablers, and NGOs as community builders. These categorizations are often aligned with models such as the triple, quadruple, and even the six-helix model discussed by Nikitin Iurii, which incorporates universities, industries, government, civil society, environment, and media as critical components of the innovation ecosystem [65]. These models offer a structural perspective, emphasizing sectorial roles rather than the specific functions within the ecosystem [66].

In contrast, other authors delve deeper, analyzing the specific functions and contributions of various participants [67]. This functional approach reveals the complexity and dynamic nature of innovation ecosystems, where roles are not rigidly assigned but evolve based on the ecosystem's needs. For example, studies by Howells [3] and Klerkx & Leeuwis [4] illustrate the critical roles intermediaries play in facilitating innovation through functions such as brokering, knowledge transfer, and network building.

Based on qualitative content analysis author created an overview of intermediaries' roles and definitions associated with bridge makers, see Table 1. This table reveals that the dominant theories include Agency Theory, Social Network Theory, Innovation Systems Theory, and Open Innovation Theory, reflecting the varied functions and strategic importance of bridge makers within innovation ecosystems [2], [3], [18], [23].

Research highlights that bridge makers go beyond traditional

intermediary roles by proactively facilitating market dynamics and promoting sustained growth. They act sometimes even simultaneously as connectors, dominators, enablers, facilitators, innovation intermediaries, knowledge brokers, network catalysts, and technology transfer agents. Each role contributes uniquely to the ecosystem's functionality, efficiency, and innovation capacity [23], [45].

Author concludes that the roles and definitions associated with bridge makers are diverse and very context-dependent. The understanding of these roles within the framework of different innovation models highlights the critical function of bridge makers in driving innovation and ecosystem development. Their ability to adapt and strategically intervene ensures that innovation ecosystems remain dynamic, resilient, and capable of sustained growth.

The literature highlights that bridge makers go beyond traditional intermediary roles by proactively facilitating market dynamics and promoting sustained growth. They act as connectors, dominators, enablers, facilitators, innovation intermediaries, knowledge brokers, network catalysts, sponsors, and technology transfer agents. Each role contributes uniquely to the ecosystem's functionality, efficiency, and innovation capacity [23], [45].

This comprehensive approach underscores the interconnectedness and complexity of modern innovation ecosystems, where collaboration and resource integration across multiple dimensions are essential for success [65].

Summarising all these insights analyses revealed three primary functions of bridge makers: connectors, facilitators, and integrators.

Connectors function: Bridge makers enhance connectivity within the ecosystem by creating accessible and beneficial connections for all participants. They identify potential collaborations and foster partnerships that drive innovation and commercialization [8], [9].

Facilitators function: Bridge makers increase synergies within the ecosystem by developing infrastructures that support continuous and evolving collaboration. They establish platforms and frameworks that integrate diverse stakeholders, promoting a supportive environment for innovation [10], [11].

Integrators function: Bridge makers address barriers to collaboration and ensure sustained interaction and resource sharing. They act as integrators by aligning the interests of various stakeholders, mitigating risks, and enhancing the efficiency of the innovation process [3], [12].

These functions are crucial for fostering an environment where new partnerships can thrive, and innovative ideas can be effectively developed and commercialized. The study underscores the importance of bridge makers in enhancing overall ecosystem efficiency.

In more complex innovation ecosystems, bridge makers are increasingly "making bridges" and engaging in more complex configurations such as 'many-to-one-to-one,' 'one-to-one-to-many,' 'many-to-one-to-many,' and even 'many-to-many-to-many' collaborations [3]. These configurations form both vertical and horizontal relationships within widely distributed innovation networks. The context of these multiple relationships and linkage networks is becoming more significant, highlighting the growing importance of bridge makers in facilitating and maintaining these intricate connections.

Table 1. Intermediaries Roles and Definitions Associated with Bridge Makers (Created by Authors)

Term	Definition	Aspect of Bridge Maker	Source
Agent	Acts on behalf of another party to represent their interests and facilitate transactions or interactions.	Represents the interests of one party and connects them with others, facilitating collaboration and innovation. Helps navigate complex relationships within an ecosystem.	[18], [19], [20], [26]
Broker	An intermediary that arranges or negotiates deals between different parties ensuring both sides benefit from the transaction.	Acts as a mediator to bridge gaps and align interests between different innovation ecosystem participants.	[1], [21], [23], [24], [25]
Bridger	Connects previously unconnected or loosely connected groups within an ecosystem facilitating the exchange of information and resources.	Creates new linkages within the ecosystem. Helps integrate different parts of the ecosystem fostering innovation through increased connectivity.	[2], [5], [7], [9]
Champion	An individual who supports and drives a project from its inception to completion often overcoming obstacles and rallying support.	Builds connections, interacts between partners, and provides access to markets, thus facilitating ecosystem construction.	[18], [27], [28], [29], [30]
Connector/Linker	An individual or entity that actively facilitates the establishment and strengthening of relationships between diverse stakeholders within an ecosystem.	Identifies common goals, aligns interests, and fosters collaborations to create synergies, ensuring effective communication and resource sharing.	[2], [10], [11], [15], [22], [24], [31]
Dominator	An entity that leads an ecosystem by orchestrating interactions and ensuring all actors contribute towards a common goal.	Ensures cohesive functioning of the ecosystem by integrating and managing resources and activities.	[18], [32], [33], [34], [35]
Enabler	Provides the necessary conditions, resources, or support to facilitate the success of initiatives, projects, or collaborations.	Facilitates the ecosystem by providing essential support and resources to other stakeholders.	[1], [2], [15], [36], [37], [38]
Facilitator	An entity that aids the process of collaboration by ensuring effective communication and coordination among participants.	Similar to a bridge maker but focuses more on process facilitation rather than direct connections.	[22], [39], [40], [41], [42], [43]
Innovation Intermediary	Entities or individuals that facilitate the innovation process by bridging gaps between stakeholders providing services like knowledge transfer and brokerage.	Links diverse stakeholders, facilitates knowledge exchange, and supports collaborative innovation efforts.	[1], [3], [4], [7], [44], [45]
Knowledge Broker	Facilitates the transfer and sharing of knowledge between different parties, connecting knowledge creators with knowledge users.	Ensures that valuable knowledge flows between various actors within the ecosystem, promoting innovation and collaboration.	[1], [2], [21], [53], [54], [55]
Network Catalyst	Stimulates and accelerates the formation and growth of networks within an innovation ecosystem, focusing on relationship-building.	Actively creates and nurtures connections within the ecosystem, enhancing its overall functionality and innovation capacity.	[1], [6], [24], [56], [57], [58]
Sponsor	Provides resources, support, and advocacy for projects or initiatives, often within an organizational or ecosystem context.	Supports new ventures by giving resources, financing, and linking entrepreneurs to other ecosystem actors.	[18], [20], [24], [29], [59], [60]
Technology Transfer Agent	Assists in moving technology from the development stage to commercialization, negotiating licenses, forming partnerships, and supporting technology adoption.	Links developers of new technologies with potential users and commercial partners, facilitating the diffusion of innovations.	[1], [6], [28], [61], [62], [63], [67]

5. DISCUSSION

The MIT TE-SER framework [15] outlines various roles within an economic ecosystem, emphasizing the importance of strategic interventions to foster development. The concept of bridge makers proposed by author extends the capabilities of traditional linkers by not only connecting stakeholders but also strategically influencing market dynamics and fostering innovation. This extension is crucial for understanding the broader implications of

intermediary roles in innovation ecosystems.

Comparison with MIT TE-SER Concept

The MIT TE-SER framework [15] and the concept of bridge makers both underscore the importance of intermediaries in facilitating ecosystem growth and innovation. However, bridge makers add an additional layer of strategic intervention, making them more proactive in shaping market dynamics compared to traditional linkers presented by Tedesco [15]. While linkers focus primarily on creating connections and facilitating communication, bridge makers take a more active role in driving collaboration and aligning the interests of diverse stakeholders. This proactive approach aligns with the broader goals of innovation ecosystems and open innovation concepts, which require dynamic and adaptable roles to navigate complex environments inside out and outside in.

Bridge Makers also address some of the limitations identified in the TE-SER framework. For instance, traditional models often focus on sectorial roles, such as universities as knowledge transfers and corporations as sponsors [66]. In contrast, bridge makers adopt a functional approach, emphasizing the need for flexibility and adaptation based on the specific needs of the ecosystem [3]. By analyzing the specific functions and contributions of various participants, bridge makers ensure that the innovation process is more tailored and responsive to changing conditions keeping a united goal.

Scenarios for bridge maker role to enhance MIT TE-SER framework approach

Extension of linker capabilities: In scenarios where simple connections are insufficient, bridge makers can step in to provide strategic direction and influence market behavior, ensuring more effective adoption of innovations. For example, in highly dynamic sectors such as technology or deeptech, where rapid advancements and market shifts are common, bridge makers can help align diverse stakeholders and navigate regulatory challenges to accelerate innovation [23].

Separate role: Reviewing the literature, it becomes evident that various intermediary roles, such as agents, brokers, and facilitators, overlap with the responsibilities of bridge makers. However, bridge makers offer unique advantages, especially when integrated into models like the MIT TE-SER framework. There are specific scenarios where having bridge makers as a separate role from Linkers is advantageous:

Complex Ecosystems: In ecosystems with high interdependence and multiple stakeholders, the role of bridge makers becomes critical. They ensure the integration of diverse capabilities and resources, fostering a cohesive environment for innovation [4], [45].

Long-term Projects: For projects requiring sustained collaboration and continuous innovation, bridge makers provide the necessary infrastructure and strategic oversight [18], [23].

Adaptive Governance: In rapidly changing environments, bridge makers help adapt strategies and align stakeholder interests, ensuring resilience and adaptability [2].

Benefits to MIT Framework

The inclusion of bridge makers in the MIT framework brings several benefits. They enhance the framework's ability to adapt to changing market conditions, promote sustained open innovation, and ensure effective knowledge transfer and collaboration. This proactive approach ensures that the ecosystem remains dynamic and resilient, capable of navigating challenges and seizing opportunities for growth also after initial kickoff. By incorporating bridge makers, the MIT framework can better support the creation of robust, flexible, and scalable innovation ecosystems [65], that last longer.

6. CONCLUSION

This research has answered the central question. The role of bridge makers in innovation ecosystems is pivotal, serving as connectors, facilitators, and integrators who enhance the dynamics and success of open innovation processes. Through a comprehensive analysis, it addresses the fragmented literature and provides a clear bridge maker definition:

“An intermediary focused on developing infrastructure and frameworks that support continuous collaboration, ensuring effective resource sharing and the efficient flow of knowledge within innovation ecosystems, to drive sustained innovation and ecosystem resilience.”

and understanding of their functions and significance, highlighting their essential contributions to fostering connectivity, synergy, and long-term sustainability in innovation environments.

Key conclusions

Enhanced Connectivity: Bridge makers play a crucial role in enhancing connectivity within innovation ecosystems by creating accessible and beneficial connections for all participants. They identify potential collaborations and foster partnerships that drive innovation and commercialization. This connectivity is vital for fostering an environment where new partnerships can thrive and innovative ideas can be effectively developed and commercialized not only short term on a project basis but also much longer.

Increased Synergies: Through infrastructure development, bridge makers increase synergies within the ecosystem. They establish platforms and frameworks that support continuous and evolving collaboration, integrating diverse stakeholders and promoting a supportive environment for innovation. This function is essential for creating a more integrated and supportive innovation ecosystem.

Sustained Interaction and Resource Sharing: Bridge makers address barriers to collaboration and ensure sustained interaction and resource sharing. They act as integrators by aligning the interests of various stakeholders, mitigating risks, and enhancing the efficiency of the innovation process. This role is crucial for supporting long-term innovation and collaboration.

Strategic Interventions: The proactive nature of bridge makers extends beyond traditional intermediary roles. They strategically facilitate market dynamics and promote sustained growth, acting as connectors, dominators, enablers, facilitators, innovation intermediaries, knowledge brokers, network catalysts, and technology transfer agents. This multifaceted approach ensures that innovation ecosystems remain dynamic, resilient, and capable of sustained growth.

Adaptation and Flexibility: Understanding of bridge makers within different innovation ecosystem models highlights the need for flexibility and adaptation based on the ecosystem's specific needs. Bridge makers ensure that the innovation process is tailored and responsive to changing conditions, thereby enhancing the overall ecosystem efficiency.

Integration into Existing Models: Integrating bridge makers role and functions into existing models, such as the MIT TE-SER framework, enhances the framework's ability to adapt to changing market conditions, promote sustained open innovation, and ensure effective knowledge transfer and collaboration. This integration supports the creation of more robust, flexible, and scalable innovation ecosystems.

Recommendations for Future Research

Empirical Studies on Effectiveness: Future research should empirically investigate the effectiveness of the bridge maker role in enhancing the overall innovation ecosystem. Studies could focus on comparing ecosystems with established bridge maker roles to those without, assessing the impact on innovation outcomes, collaboration efficiency, and market success [13].

Context-Specific Analysis: Further research should explore the bridge maker role in different contexts and industries to understand how their functions and effectiveness vary across various innovation ecosystems. This context-specific analysis can provide deeper insights into the strategic interventions required for different ecosystems [5], [6], [15].

Longitudinal Studies: Conducting longitudinal studies can shed light on the long-term impact of bridge makers on innovation ecosystems. Such studies would help in understanding how bridge makers evolve over time and how their strategic interventions influence the sustained growth and adaptability of the ecosystem [28].

Integration with Emerging Technologies: Investigating how bridge makers can leverage emerging technologies, such as artificial intelligence, blockchain and solutions like digital twins of ecosystems, to enhance their connectivity and facilitation functions would be valuable. This research could provide insights into how technology can support bridge makers in creating more dynamic and responsive open innovation ecosystems [14], [67].

Policy and Governance Implications: Future research should also examine the policy and governance implications of integrating bridge makers into innovation ecosystems. Understanding how policy frameworks can support or hinder the role of bridge makers can inform strategies for developing supportive governance structures [22], [48].

7. REFERENCES

[1] H. W. Chesbrough, Open innovation: The new imperative for creating and profiting from technology, **Harvard Business Press**, 2003.

- [2] B.-Å. Lundvall, National systems of innovation: Toward a theory of innovation and interactive learning, **Pinter Publishers**, 1992.
- [3] J. Howells, Intermediation and the role of intermediaries in innovation, **Research Policy**, vol. 35, no. 5, pp. 715-728, 2006
- [4] L. Klerkx and C. Leeuwis, Establishment and embedding of innovation brokers at different innovation system levels: Insights from the Dutch agricultural sector, **Technological Forecasting and Social Change**, vol. 76, no. 6, pp. 849-860, 2009.
- [5] C. Freeman, Technology policy and economic performance: Lessons from Japan, **Pinter Publishers**, 1987.
- [6] F. W. Geels, "From sectoral systems of innovation to socio-technical systems: Insights about dynamics and change from sociology and institutional theory," **Research Policy**, vol. 33, no. 6-7, pp. 897-920, 2004.
- [7] J. Bessant and H. Rush, "Building bridges for innovation: the role of consultants in technology transfer," **Research Policy**, vol. 24, no. 1, pp. 97-114, 1995.
- [8] R. S. Burt, Structural holes: The social structure of competition, **Harvard University Press**, 1992.
- [9] P. R. Carlile, "A pragmatic view of knowledge and boundaries: Boundary objects in new product development," **Organization Science**, vol. 13, no. 4, pp. 442-455, 2002.
- [10] C. Dhanaraj and A. Parkhe, "Orchestrating innovation networks," **Academy of Management Review**, vol. 31, no. 3, pp. 659-669, 2006.
- [11] M. S. Granovetter, "The strength of weak ties," **American Journal of Sociology**, vol. 78, no. 6, pp. 1360-1380, 1973.
- [12] H. Van Lente, M. Hekkert, R. Smits, and B. van Waveren, "Roles of systemic intermediaries in transition processes," **International Journal of Innovation Management**, vol. 7, no. 3, pp. 247-279, 2003.
- [13] B. Chakravorti, "The new rules for bringing innovations to market," **Harvard Business Review**, vol. 82, no. 3, pp. 58-67, 2004.
- [14] A. Hargadon and R. I. Sutton, "Technology brokering and innovation in a product development firm," **Administrative Science Quarterly**, vol. 42, no. 4, pp. 716-749, 1997.
- [15] M. S. Tedesco and T. Serrano, "Roles, values, and social dynamics: A new model to describe and understand economic ecosystems," MIT D-Lab, Cambridge, MA: MIT Press, 2019.
- [16] J. Saldana, The coding manual for qualitative researchers. **SAGE Publications**, 2015.
- [17] Pīlēna, A., Mežinska, I., Lapiņa, I., "Standardization as a Catalyst for Open and Responsible Innovation", *Journal of Open Innovation: Technology, Market, and Complexity*, Vol. 7, No. 3, 2021, Article number 187. doi:10.3390/joitmc7030187
- [18] O. Dedehayir, S. J. Mäkinen, and J. R. Ortt, "Roles during innovation ecosystem genesis: A literature review," **Technological Forecasting and Social Change**, vol. 136, pp. 18-29, 2018.
- [19] K. M. Eisenhardt, "Agency theory: An assessment and review," **Academy of Management Review**, vol. 14, no. 1, pp. 57-74, 1989.
- [20] J. Pfeffer and G. R. Salancik, The external control of organizations: A resource dependence perspective, **Harper & Row**, 1978.
- [21] Miles, I., 2000. Services innovation: coming of age in the knowledgebased economy. **International Journal of Innovation Management** 4, 371-389
- [22] Ozola, L., Lapiņa, I., "Process Approach in Public Sector Institutions and Governance - a Formality or a Necessity?", The 27th World Multi-Conference on Systemics, Cybernetics and Informatics (WMSCI 2023), Proceedings, Virtual Conference, 12-15 September, 2023. USA: **International Institute of**

Informatics and Cybernetics, pp.235-241.

- [23] H. W. Chesbrough, Open innovation: The new imperative for creating and profiting from technology, **Harvard Business Press**, 2006.
- [24] R. Nelson, National innovation systems: A comparative analysis, **Oxford University Press**, 1993.
- [25] Etzkowitz, H. and Leydesdorff, L. (2000). The dynamics of innovation: from National Systems and 'Mode 2' to a Triple Helix of university-industry-government relations, **Research Policy**, vol. 29, no. 2, pp. 109-123. Cambridge, MA: Elsevier.
- [26] Shubik, M. (1987). A Game-Theoretic Approach to Political Economy (Game Theory in the Social Sciences, Volume 2). Cambridge, MA: **MIT Press**.
- [27] J. M. Howell and C. M. Shea, "Individual differences, environmental scanning, innovation framing, and champion behavior: Key predictors of project performance," **Journal of Product Innovation Management**, vol. 18, no. 1, pp. 15-27, 2001.
- [28] E. M. Rogers, Diffusion of innovations, 5th ed., **Free Press**, 2003.
- [29] A. H. Van de Ven, "Central problems in the management of innovation," **Management Science**, vol. 32, no. 5, pp. 590-607, 1986.
- [30] J. R. Katzenbach and D. K. Smith, "The discipline of teams," **Harvard Business Review**, vol. 71, no. 2, pp. 111-120, 1993.
- [31] N. Nohria and R. G. Eccles (Eds.), Networks and organizations: Structure, form, and action, **Harvard Business School Press**, 1992.
- [32] M. Iansiti and R. Levien, The keystone advantage: What the new dynamics of business ecosystems mean for strategy, innovation, and sustainability, **Harvard Business School Press**, 2004.
- [33] R. Adner, "Ecosystem as structure: An actionable construct for strategy," **Journal of Management**, vol. 43, no. 1, pp. 39-58, 2017.
- [34] R. F. Lusch and S. L. Vargo, The service-dominant logic of marketing: Dialog, debate, and directions, **M.E. Sharpe**, 2006.
- [35] G. Parker, M. W. Van Alstyne, and S. P. Choudary, Platform revolution: How networked markets are transforming the economy—and how to make them work for you, **W.W. Norton & Company**, 2016.
- [36] M. Akrich, M. Callon, B. Latour, and A. Monaghan, "The key to success in innovation part I: The art of interestment," **International Journal of Innovation Management**, vol. 6, no. 2, pp. 187-206, 2002.
- [37] G. Dosi, "The nature of the innovative process," in Technical change and economic theory, G. Dosi, C. Freeman, R. Nelson, G. Silverberg, and L. Soete, Eds., **Pinter Publishers**, pp. 221-238, 1988.
- [38] R. R. Nelson and S. G. Winter, An evolutionary theory of economic change, **Belknap Press**, 1982.
- [39] R. Schwarz, The skilled facilitator: A comprehensive resource for consultants, facilitators, managers, trainers, and coaches, **Jossey-Bass**, 2002.
- [40] B. C. Crosby and J. M. Bryson, "Integrative leadership and the creation and maintenance of cross-sector collaborations," **The Leadership Quarterly**, vol. 21, no. 2, pp. 211-230, 2010.
- [41] K. S. Quick and M. S. Feldman, "Distinguishing participation and inclusion," **Journal of Planning Education and Research**, vol. 31, no. 3, pp. 272-290, 2011.
- [42] Ansell, C., & Gash, A., "Collaborative Governance in Theory and Practice", **Journal of Public Administration Research and Theory**, Vol. 18, No. 4, 2008, pp. 543-571.
- [43] K. G. Provan and P. Kenis, "Modes of network governance: Structure, management, and effectiveness," **Journal of Public Administration Research and Theory**, vol. 18, no. 2, pp. 229-252, 2008.
- [44] B. Van der Meulen and A. Rip, "Mediation in the Dutch science system," **Research Policy**, vol. 27, no. 8, pp. 757-769, 1998.
- [45] G. M. Winch and R. Courtney, "The organization of innovation brokers: An international review," **Technology Analysis & Strategic Management**, vol. 19, no. 6, pp. 747-763, 2007.
- [46] R. A. F. Seaton and M. Cordey-Hayes, "The development and application of interactive models of industrial technology transfer," **Technovation**, vol. 13, no. 1, pp. 45-53, 1993.
- [47] S. R. Shohert and M. Prevezer, "UK biotechnology: institutional linkages, technology transfer and the role of intermediaries," **R&D Management**, vol. 26, no. 3, pp. 283-298, 1996.
- [48] W. W. Powell and P. J. DiMaggio (Eds.), The new institutionalism in organizational analysis, **University of Chicago Press**, 1991.
- [49] W. R. Scott, Institutions and Organizations, 2nd ed., **SAGE Publications**, 2001.
- [50] T. B. Lawrence and R. Suddaby, "Institutions and institutional work," in The SAGE handbook of organization studies, S. R. Clegg, C. Hardy, T. B. Lawrence, and W. R. Nord, Eds., **SAGE Publications**, pp. 215-254, 2006.
- [51] L. G. Zucker, "Institutional theories of organization," **Annual Review of Sociology**, vol. 13, pp. 443-464, 1987.
- [52] P. J. DiMaggio and W. W. Powell, "The iron cage revisited: Institutional isomorphism and collective rationality in organizational fields," **American Sociological Review**, vol. 48, no. 2, pp. 147-160, 1983.
- [53] M. Meyer, "The rise of the knowledge broker," **Science Communication**, vol. 32, no. 1, pp. 118-127, 2010.
- [54] V. Ward, A. House, and S. Hamer, "Knowledge brokering: The missing link in the evidence to action chain?" **Evidence & Policy**, vol. 5, no. 3, pp. 267-279, 2009.
- [55] C. Lightowler, D. McNeish, and R. Middlemiss, "The impact of knowledge brokering on research use in policy and practice: A case study of the Scottish improvement science initiative," **Evidence & Policy**, vol. 13, no. 4, pp. 679-703, 2017.
- [56] R. Gulati, D. A. Dialdin, and L. Wang, "Organizational networks and knowledge transfer," **Academy of Management Journal**, vol. 45, no. 4, pp. 776-793, 2002.
- [57] M. Granovetter, "Economic action and social structure: The problem of embeddedness," **American Journal of Sociology**, vol. 91, no. 3, pp. 481-510, 1985.
- [58] W. W. Powell, K. W. Koput, and L. Smith-Doerr, "Interorganizational collaboration and the locus of innovation: Networks of learning in biotechnology," **Administrative Science Quarterly**, vol. 41, no. 1, pp. 116-145, 1996.
- [59] J. K. Pinto and D. P. Slevin, "Project success: Definitions and measurement techniques," **Project Management Journal**, vol. 19, no. 1, pp. 67-72, 1988.
- [60] C. J. Fombrun, "Strategies for network research in organizations," **Academy of Management Review**, vol. 7, no. 2, pp. 280-291, 1982.
- [61] B. Bozeman, "Technology transfer and public policy: a review of research and theory," **Research Policy**, vol. 29, no. 4-5, pp. 627-655, 2000.
- [62] P. R. Carlile, "Transferring, translating, and transforming: An integrative framework for managing knowledge across boundaries," **Organization Science**, vol. 15, no. 5, pp. 555-568, 2004.
- [63] M. L. Tushman and P. Anderson, "Technological discontinuities and organizational environments,"

Administrative Science Quarterly, vol. 31, no. 3, pp. 439-465, 1986.

[64] B. Clarysse, M. Wright, J. Bruneel, and A. Mahajan, "Creating value in ecosystems: Crossing the chasm between knowledge and business ecosystems," **Research Policy**, vol. 43, no. 7, pp. 1164-1176, 2014.

[65] Nikitin, I. (2022). Six Helix Model of the innovation ecosystem of research and innovation. **International Science Journal of Management, Economics & Finance**, 1(2), 1-7. doi:10.46299/j.isjmef.20220102.1

[66] Carayannis, E. G., & Campbell, D. F. J. (2009). 'Mode 3' and 'Quadruple Helix': Toward a 21st-century fractal innovation ecosystem. **International Journal of Technology Management**

[67] Robertsons, G., Lapiņa, I., "Digital Transformation as a Catalyst for Sustainability and Open Innovation", **Journal of Open Innovation: Technology, Market, and Complexity**, Vol. 9, No. 1, 2023, Article number 100017, pp. 1-14.