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**Hubs de Inovação Corporativos: de Inovação Aberta para função
de Gestão de Ecossistemas**

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**Corporate Innovation Hubs: from Open Innovation to Ecosystem
Management function**

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À minha mãe e ao meu pai, a quem devo meu coração.
Aos meus irmãos, amigos e à família que Deus me regalou.
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“The accumulated clutter of day-today existence – the lapses of conscience, the unpaid bills, the bungled opportunities, the dust under the couch, the inescapable prison of your genes – all of it is temporarily forgotten, crowded from your thoughts by an overpowering clarity of purpose and by the seriousness of the task at hand. At such moments something resembling happiness actually stirs in your chest.”

–Jon Krakauer, *Into the Wild* (1997)

“Longe de mim, longe do coração de teu servo, Senhor, que a ti se confessa, a ideia de encontrar a felicidade não importa em que alegria! A felicidade é uma alegria que não é concedida aos ímpios, mas àqueles que te servem por puro amor: tu és essa alegria! Alegrar-se de ti, em ti e por ti: isso é felicidade. E não há outra.”

–Santo Agostinho, *Confissões* (2007)

RESUMO

Barcellos, F. M. (2022). *Hubs de Inovação Corporativos: de Inovação Aberta para função de Gestão de Ecossistemas*, (Dissertação de Mestrado). Faculdade de Economia, Administração e Contabilidade, Universidade de São Paulo, São Paulo.

O engajamento com as comunidades externas pode demandar uma reconfiguração dos elementos organizacionais e da forma como as empresas inovam. Em resposta ao desafio da inovação aberta e ambidestra, muitas empresas criam Hubs de Inovação Corporativos (do inglês, *Corporate Innovation Hubs*, CIHs) separando as rotinas de inovação incremental do desenvolvimento de inovação radical, ao mesmo tempo em que engajam com múltiplos ecossistemas. Criar ou manter propostas de valor focal em um ecossistema é uma tarefa desafiadora para os gestores, sendo objeto de estudo da literatura sobre gestão de ecossistemas (do inglês, *Ecosystem Management*, EM). Entretanto, existem poucos estudos focados nas formas organizacionais de EM ligados à gestão da inovação (especialmente a radical). Daí, surge a pergunta que orienta esta pesquisa: como surgem funções de gerenciamento de ecossistemas em unidades ambidestras? Primeiramente, é realizada uma revisão sistemática da literatura sobre os campos de ambidestria, ecossistema e inovação radical para construir um modelo conceitual de orquestração de ecossistemas para inovação radical com uma tipologia de mecanismos de envolvimento com ecossistemas baseada no tipo de ecossistema; ou seja, ecossistema de (1) inovação, (2) empreendedorismo, e (3) conhecimento. Em segundo lugar, um estudo de caso comparativo com quatro empresas que lançaram e desenvolveram seu próprio CIH revela os quatro constructos (mandato, orientação, identidade e estrutura e processos díades) de um Hub de Inovação Corporativa partindo de Inovação Aberta e evoluindo passando por três fases até chegar ao papel de Orquestrador de Ecossistemas.

Palavras-chave: gestão de ecossistemas; ecossistemas; hub de inovação corporativo; ambidestria; inovação radical.

ABSTRACT

Barcellos, F. M. (2022). *Corporate Innovation Hubs: from Open Innovation to Ecosystem Management function* [Master's thesis, School of Economics, Business, and Accounting of the University of São Paulo].

Engaging with external communities might reshape organizational attributes and the way firms innovate. Responding to the ambidextrous and open innovation challenge, many firms implement Corporate Innovation Hubs (CIH), separating incremental innovation routines from radical innovation development and engaging with multiple ecosystems. Creating or sustaining focal value propositions in an ecosystem is a challenging managerial task and the research object of the ecosystem management (EM) literature. However, there are limited studies focused on the organizational forms of EM linked to (especially radical) innovation management. Thence, the question that guides this research arises: guiding this inquiry arises: *how do ecosystem management functions emerge at ambidextrous units?* Firstly, a systematic literature review of the ambidexterity, ecosystem, and radical innovation fields is applied to build a conceptual model of ecosystem orchestration for radical innovation and a typology of ecosystem engagement mechanisms based on ecosystem type, *i.e.*, (1) innovation, (2) entrepreneurial, and (3) knowledge ecosystem. Secondly, an inductive-comparative case study on four firms that launched and developed their own CIH unveils the four building blocks (mandate, orientation, identity, and the dyad structure and processes) of a Corporate Innovation Hub evolving through three phases to an Ecosystem Orchestrator role.

Keywords: ecosystem management; ecosystems; corporate innovation hub; ambidexterity; radical innovation.

LIST OF FIGURES

Figure 1 - Phases of the systematic review.....	33
Figure 2 – Accumulated publications related to ecosystem and ambidexterity year on year (2011-2021)	36
Figure 3 - Publications each year	37
Figure 4 - Keywords map of the period 2011-2017	40
Figure 5 - Keywords map of the period 2018-2021	42
Figure 6 - Keywords map of 2021 publications	43
Figure 7 - Co-citation analysis plot	45
Figure 8 – Organizational mechanisms framework.....	46
Figure 9 – A proposed framework based on the literature	51
Figure 10 - Main steps of the empirical research methodology	53
Figure 11 - Data Structure	57
Figure 12 - Framework for an evolutionary process of an ecosystem management hub	67

LIST OF TABLES

Table 1 – Top 10 articles ordered by times cited (2021 – WoS/Scopus).....	35
Table 2 – Articles published per journal	37
Table 3 – Research themes and perspectives from the 2011-2017 period.....	41
Table 4 – Mechanisms related to firm-ecosystem interactions and purposes.....	49
Table 5 - Case details	55
Table 6 - Representative supportive data for each second-order theme	58
Table 7 - Ecosystem engagement mechanisms identified	75
Table 8 - Comparing cases during Phase 1	80
Table 9 - Comparing cases during Phase 2	81
Table 10 - Comparing cases during Phase 3	82
Table 11 - Characterization of building blocks of a corporate innovation hub in each phase for each case	83

SUMMARY

1. INTRODUCTION	17
1.1. INTRODUCTION	17
1.2. RESEARCH PROBLEM	20
1.3. OBJECTIVES	20
1.4. JUSTIFICATION	21
1.5. CONTRIBUTION	21
1.6. METHOD	22
1.7. RESEARCH STRUCTURE	23
2. LITERATURE REVIEW	24
2.1. CONCEPT REVIEW	24
2.2. METHOD FOR THE LITERATURE REVIEW	32
2.3. DESCRIPTION OF THE SAMPLE	34
2.4. BIBLIOMETRIC ANALYSIS PROCEDURES	35
2.5. DESCRIPTIVE STATISTICS	37
2.6. BIBLIOMETRIC ANALYSIS	39
2.7. CONTENT ANALYSIS	46
2.8. LITERATURE REVIEW: FINAL REMARKS	50
3. EMPIRICAL RESEARCH METHOD	52
3.1. METHOD FOR THE EMPIRICAL INVESTIGATION	52
3.2. DESCRIPTION OF THE EMPIRICAL SAMPLE	53
3.3. DATA SOURCE.....	54
3.4. DATA ANALYSIS	55
4. RESULTS	66
4.1. PHASE 1: EMERGING HUB.....	68
4.2. PHASE 2: BROKERING HUB.....	71
4.3. PHASE 3: ORCHESTRATING HUB.....	76
5. DISCUSSION	79
5.1. PROPOSING A NEW FRAMEWORK: AN EVOLUTIONARY PROCESS OF AN ECOSYSTEM MANAGEMENT HUB.....	79
6. CONCLUSION	87
6.1. RESEARCH QUESTION IMPLICATIONS	87
6.2. THEORETICAL CONTRIBUTIONS.....	87
6.3. LIMITATIONS AND FUTURE RESEARCH	90
7. REFERENCES	92
APPENDIX A – SEARCH SYNTAXES AND LITERATURE REVIEW LISTING OF ARTICLES	101
APPENDIX B – INTERVIEW SCRIPTS	107

1. INTRODUCTION

1.1. Introduction

In 2015, facing a decline in beer sales worldwide regardless of the long-lasting growth strategy through Mergers and Acquisitions (M&A), AB InBev had a considerable challenge: find new ways to grow. ZX Ventures started that year as a nameless separate division full of innovative people under the motto “let us build spectacular businesses” and a mission of identifying the market’s disruptive movements (Felitti, 2016; Handley, 2019). Thus, AB InBev expanded partner engagement and began scouting and investing in startups or marketplaces holding plentiful consumer data. Not long after, the first built in-house ventures rose, like the successful Zé Delivery, a digital platform connecting a network of restaurants and distributors with customers demanding instant cold beverages through delivery drivers¹.

The AB InBev story portrays how traditional firms set up novel structures and processes to span their boundaries and create solutions articulating products or services from different players in a coherent approach. This multinational brewing company is executing activities of venture capital investments (ZX Ventures), startup incubation, acceleration, and engagement (The 100+ Accelerator), shared research centers (GITeC), incorporating new ventures in their products and solutions offerings (Beer Garage and ZX Ventures), and even launching their own digital platforms (BEES, Zé Delivery). AB InBev, in summary, is creating, participating, and transforming ecosystems of distinct types.

An ecosystem is a group of independent, interdependent, heterogeneous, loosely-connected actors that share a common output at the system level (Adner, 2017; Hannah & Eisenhardt, 2018). The actors participating in ecosystems may be mature companies or startups, universities and research institutes, the government and regulatory authorities, and other types of organizations connected informally (instead of formal supplier-customer contracts) and interdependently while coherently sharing a common output (Gomes, Flechas, et al., 2021; Thomas & Autio, 2020).

The innovation ecosystems are the meta-organizations centered on a focal value proposition, whose main output is value creation for customers. The actors involved are engaged in a

¹ For more information on AB InBev innovation strategy access www.ab-inbev.com/what-we-do/innovation, also www.zx-ventures.com, www.100accelerator.com, www.bees.com, ze.delivery. Other well-known mature companies are following similar ecosystem-related strategies for nurturing innovation. To cite a few, companies like BT Plc (www.bt.com/about/innovation/how-bt-innovates), EDP (www.edp.com/en/innovation), and SAP (<https://www.sap.com/about/company/innovation.html>).

necessary role for the product or service development, rollout, and distribution (Gomes, Facin, et al., 2018; Gomes, Flechas, et al., 2021). This type of ecosystem is well known and discussed in the literature (Adner & Kapoor, 2010; Gomes, Facin, et al., 2018; Gomes, Salerno, et al., 2018; Scaringella & Radziwon, 2018), and presents some key characteristics such as the presence of cooperation and competition among actors (Hannah & Eisenhardt, 2018) and technological modularity (Jacobides et al., 2018). As an example, AB InBev leads Zé Delivery and another innovation ecosystem called BEES, a technological platform for connecting their own product offerings plus partners' offerings to a network of bars and restaurants while also delivering business intelligence.

Instead, the entrepreneurial ecosystems are not centered in a systemic innovation, but they are configured by a group of new ventures trying to bring about new business models and defined customers, through experimentation and sharing individual results within the ecosystem (Baaziz, 2019; Spigel & Harrison, 2018). This can be facilitated through regional configurations (Carayannis et al., 2018). Besides new ventures themselves, there are other actors involved in this type of ecosystem: startup accelerators, venture capital funds, the government, universities, angel investors, etc. Expanding their innovation strategies, AB InBev has deployed the regionalized startup accelerator program called 100+ Accelerator, plus the startup scouting and investment by ZX Ventures, engaging with entrepreneurial ecosystems in different regions.

Lastly, the knowledge ecosystem has an output of research-based knowledge and associated applications. There is a process of collective learning and knowledge share: the focus is the research output, or knowledge itself. In this way, there is no explicit competition among actors for there is no value proposition nor capture (Clarysse et al., 2014). Continuing the given example, AB InBev installed a shared research and development (R&D) facility in Leuven called Global Innovation Technology Center (GITeC), where different organizations, people, and resources join forces to explore new emerging technologies. Among other engagement manners, AB InBev also searches for qualified technical staff and new knowledge, through partnerships with universities in several countries (Duvenage, 2017).

Known mechanisms for engaging with knowledge ecosystems are building or participating in shared research centers (knowledge hubs) (Clarysse et al., 2014; Youtie & Shapira, 2008), funds for researchers' grants (Craig Boardman & Ponomariov, 2009), ideation hackathons, and by sharing resources for developing new ventures. Different mechanisms for engaging with the entrepreneurial ecosystem are startup scouting and acquisition, corporate venture capital, corporate accelerator, corporate incubator, strategic partnerships, venture builder, venture client, hackathons, challenge prizes, and sharing resources for developing research (Siota &

Prats, 2021). When taking the innovation ecosystem into account, a firm may create an ecosystem aiming the launch of new products and services (Adner, 2006; Adner & Kapoor, 2010), for instance through the launch and management of a digital platform connecting customers and complements (Ding et al., 2019; Gawer, 2020), and may also undertake one or more ecosystem-role that, combined, generate the common output (Hannah & Eisenhardt, 2018).

Engaging with external communities might reshape organizational attributes and the way firms innovate (Altman et al., 2022). Mature firms increasingly play the “ecosystems’ game” by setting a strategy to create, participate or transform an ecosystem (Gomes, Flechas, et al., 2021; Thomas et al., 2022) in search of developing and delivering radical innovations to old or new customers (Adner, 2006, 2017; Faridian & Neubaum, 2021; Reeves et al., 2019). These radical innovations (RIs) create brand-new product lines, transform markets, reinvent customer interactions, deliver unmatched solutions to real-life problems, and enrich customer value. They are the foundation for long-term success for an organization (Leifer et al., 2000; O’Connor et al., 2008).

Companies are aiming for radical innovations while sustaining mainstream business with incremental innovation, *i.e.*, ideas transformed into valuable products and services for customers by following a linear (usually massive) process called funnel or value chain (Clark & Wheelwright, 1992; Cooper, 1990, 2008; Hansen & Birkinshaw, 2007; Mitchell & Goffin, 2010; Salerno et al., 2015). Both types of innovation are deemed essential to sustain the business in the long run (Bessant et al., 2005; Christensen et al., 2015; Leifer et al., 2000; Raisch et al., 2009). The ability to harmonize the mainstream operations and incremental innovation mechanisms with radical innovation projects is at the core of ambidexterity studies in large firms (Lin et al., 2013; Markides & Chu, 2009; O’Connor & DeMartino, 2006; Raisch et al., 2009; Turner et al., 2013).

Responding to this innovation challenge under the imperative of openness, firms create ambidextrous units called Corporate Innovation Hubs (CIH), separating incremental innovation routines from radical innovation development and engaging with multiple ecosystems (Remneland Wikhamn & Styhre, 2019), just like AB InBev has done through ZX Ventures and other initiatives.

Scholars define CIH as boundary-spanning independent units detached from mainstream business structures that are used to support innovation through exchanging knowledge and scouting new ideas, concepts, and technologies (Amann et al., 2022; Giaccone & Longo, 2016; Monteiro & Birkinshaw, 2017). The literature on CIH developed around its definition,

structures, and design (Giaccone & Longo, 2016; Moré et al., 2018; Remneland Wikhamn & Styhre, 2019), programs and activities (Del Sarto et al., 2022; Weiblen & Chesbrough, 2015), and describing the emergence process for enabling open innovation (Alam et al., 2022; Remneland Wikhamn & Styhre, 2022). Nevertheless, there is a lack of discussion about CIH under the Ecosystem Management (EM) research domain.

Selecting and aligning partners toward a systemic innovation, resolving cooperation and competition paradoxes, and upholding cross-side network effects are examples of challenging management tasks inherent to creating or sustaining focal value propositions, which oblige a firm to manage the ecosystem (Gomes, Flechas, et al., 2021; Hannah & Eisenhardt, 2018; Helfat & Raubitschek, 2018). The EM is closely connected to innovation management (Gomes, Facin, et al., 2022). However, scant research focuses on the organizational dimension of the EM function, its relationship to each type of ecosystem and link to strategic innovation management (Altman et al., 2022). Additionally, more needs to be known about the evolutionary process of the CIHs, which starts as a boundary-spanning structure and has different possibilities for development paths.

Hence, from these two streams, the research question guiding this inquiry arises: *how do ecosystem management functions emerge at ambidextrous units?*

This study connects these streams proposing that Corporate Innovation Hubs might evolve into an ecosystem management function under radical innovation pursuit, engaging with different types of ecosystems, classified in the literature based on the nature of the shared output: innovation ecosystems, entrepreneurial ecosystems, and knowledge ecosystems (Bogers, Sims, et al., 2019; Scaringella & Radziwon, 2018; Thomas & Autio, 2020).

1.2. Research Problem

This work is at the intersection of the research streams of organizational ambidexterity and ecosystem management, answering the following research question: *how do ecosystem management functions emerge at ambidextrous units?*

1.3. Objectives

The main goal of this research is to develop a framework that will illustrate how ambidextrous units in the form of Corporate Innovation Hub evolve through phases and take the role of an orchestrator.

This research also has secondary objectives.

(1) Identify and describe the building blocks of the evolving CIH.

- (2) Propose a conceptual framework of how an established firm manages different ecosystems for radical innovations.
- (3) Identify the mechanisms that enable managing each type of ecosystem for developing radical innovation, both in the literature and empirically.

1.4. Justification

Firms are implementing ambidextrous units and interacting with ecosystems for more radical innovations. New product offerings are only possible to be made through a series of complementors, like in the solar panel ecosystem, which involves different actors for funding, sales, design, manufacturing of solar panels, racking, and installation (Hannah & Eisenhardt, 2018). Hence, engaging with different ecosystems and orchestrating partners is necessary to generate new customer value sources (Gomes, Hourneaux Junior, et al., 2022; Toigo et al., 2021). In this context, how Corporate Innovation Hubs (*i.e.*, an ambidextrous unit) evolve to the role of ecosystem orchestrator is not yet clear. In addition, the engagement mechanisms for radical innovation in ecosystem management ambidextrous unit is not yet well studied in the literature, and this justifies the effort of bridging the literature and bringing empirical evidence on how firms organize to orchestrate different types of ecosystems. For example, O'Connor et al. (2018, p. 352) highlight a necessary synergy between companies and academic scholars that could collaborate on research programs to “identify ongoing challenges to innovation success or provide beta sites for testing new tools or techniques.” The interaction with the entrepreneurial ecosystem is also a trend, where firms deploy several mechanisms to scout, incubate, and accelerate startups while transforming. In all cases, several unresolved difficulties emerge, which could be approached from a different perspective. For instance, when innovation projects are executed along with universities, it is common to occur some problems like knowledge ownership and identifying partners; however, this could be tackled with a more comprehensive view of this university-firm interaction and deploying ecosystem management actions like building more relationships and orchestrating the knowledge ecosystem.

1.5. Contribution

This research is relevant to theory and practice. First, it *provides a framework for an evolutionary process of an ecosystem management hub*, contributing to ecosystem research and innovation management literature theory from an organizational point of view. Second, this research describes the *four building blocks (i.e., mandate, orientation, identity, and the dyad*

structure and processes) of corporate innovation hubs and their evolution through the Emerging, Brokering, and Orchestrating phases.

Third, this study proposes that *a corporate innovation hub may evolve into an Orchestrating Hub and surpass the Brokering Hub phase*, which adds to the growing research stream of the CIH evolutionary journey (e.g., Remneland Wikhamn & Styhre, 2022; Toigo et al., 2021) that has previously failed to explore the ecosystem management aspect satisfactorily. The fourth and final contribution was *the developed typology and categorization of ecosystem engagement mechanisms in pursuit of radical innovations through a systematic literature review and empirical data*. Firms are implementing different mechanisms (i.e., activities, structure, or processes) for engaging with different ecosystems (Colombelli et al., 2020; Gomes, Flechas, et al., 2021; Hannah & Eisenhardt, 2018; Steiber & Alänge, 2021). Other scholars also indicate that firms can implement ambidexterity not limited to the organizational level through leveraging ecosystem level ties for that purpose (Faridian & Neubaum, 2021; Gomes, Flechas, et al., 2021). Nevertheless, the literature on radical innovation management has developed around the unit of analysis of the firm (Leifer et al., 2002; O'Connor et al., 2008, 2018), project (Herstatt et al., 2004; Pich et al., 2002; Rice et al., 2008), and individual (McMullen & Shepherd, 2006; Pertusa-Ortega et al., 2020) levels, with scarce references to the ecosystem level. The chosen setting for this research was fitting because CIHs are particularly suitable for radical innovation development purposes (Berger & Brem, 2016), even though they also may cover incremental innovations like business units digitalization, improving processes or bettering customer experience (Salomaa, 2018). The results complement the ambidexterity and innovation management streams by elucidating which mechanisms are applied to each type of ecosystem.

1.6. Method

In this research, two different methods will be applied in the sequel. Firstly, a systematic literature review is applied comprehending the ambidexterity, ecosystem, and radical innovation fields, generating insights about how organizations implement mechanisms for each type of ecosystem and offering a typology of ecosystem engagement mechanisms used in the context of developing radical innovations.

Second, an inductive-comparative case study on four firms that launched and developed their own CIH is applied. It unveils the four building blocks of a Corporate Innovation Hub evolving through three phases to an Orchestrator role. It is investigated how organizations mature the

Hub's mandate, orientation, and identity while building and expanding the structure and processes.

1.7. Research Structure

The structure of this work is as follows. **Chapter 1** introduces the research problem context, the study's relevance, objectives, justification, propositions, and contribution. **Chapter 2** presents the methodology, discussion, and results from the systematic literature review, with a resulting conceptual framework. It also contains the necessary main concepts and state-of-the-art literature discussion of themes related to this research: radical innovation, ecosystem management, and ambidexterity. **Chapter 3** describes the empirical case study method and the research design. **Chapter 4** presents the results of the case studies. Finally, **Chapter 5** contains the discussion, conclusions, implications, contributions to theory and practice, future research, and limitations.

2. LITERATURE REVIEW

This chapter introduces the relevant background concepts related to this research: ecosystem definition and types, ecosystem orchestration, ecosystem management, strategic innovation, ambidexterity, Open Innovation, Innovation Function, and Corporate Innovation Hubs. Then, the systematic literature review follows. First, the review methodology is explained, then the bibliometric and content analysis justifies ambidexterity, radical innovation, and ecosystem literature gaps. The final section contains the proposed conceptual framework to connect these literature streams, summarizes theoretical findings, and formulates directions for the empirical part of this research.

2.1. Concept review

2.1.1. Ecosystem definition and types

Following the definitions by Adner (2017), Gomes et al. (2021), Hannah and Eisenhardt (2018), and Thomas and Autio (2020), an ecosystem is a group of independent, interdependent, heterogeneous, loosely-connected actors that share a common output at the system level. The actors participating in ecosystems may be mature companies or startups, universities and research institutes, the government and regulatory authorities, and other types of organizations connected informally (instead of formal supplier-customer contracts) and interdependently while coherently sharing a common output. An essential element of ecosystems is that the global output forcedly relies on complementarity and interdependence (Gomes, Flechas, et al., 2021; Jacobides et al., 2018).

Thomas and Autio (2020), aspiring to propose an order to the conceptual heterogeneity of the ecosystem literature, systematized the ecosystem topology based on the common global output. Firstly, (1) an *innovation ecosystem* is present if the common output is a value offer as a product or service to a known targeted group or market. Its subtypes present in the literature are business ecosystems, which emphasize the community around which a focal firm operates; modular ecosystems, highlighting the collective distributed production of value to a targeted audience; and platform ecosystems, in which technological interdependencies and their coordination are underlined. Secondly, (2) an *entrepreneurial ecosystem* has the characteristic of being circumscribed within a region and has the goal to “facilitate the start-up and scale-up of entrepreneurial new ventures, who compete with innovative business models” (Thomas & Autio, 2020, p. 18). Thirdly, (3) a *knowledge ecosystem* can also be configured regionally but

is situated in a pre-competitive stage and has the output of advancing and generating knowledge while translating into new possible products and services. This last type of ecosystem reflects the increasingly common processes of open innovation.

2.1.2. Ecosystem orchestration and ecosystem management

Ecosystem orchestration can be defined as the configuration of ecosystem partnerships, value proposition deployment, and governing ecosystem alignment (Linde et al., 2021). For instance, some orchestration activities include creating digital platforms, setting up technology campuses, attracting new actors for the ecosystem, building consortia (Visscher et al., 2021), directing the ecosystem roles and responsibilities, establishing resource allocation processes, and creating effective communication channels amongst the participants (Linde et al., 2021).

Instead of a rigid and highly controlled management, the orchestrating organizations apply some degree of control over the ecosystem participants by delimiting strategic directions, participation rules, processes, and other requirements that define boundaries for the interactions between ecosystem complementors and between the orchestrator and complementors (Altman et al., 2022). Altman et al. (2022) call this type of control the “translucent hand,” in between the Smithian “invisible hand” (open self-regulated market) and the Chandlerian “visible hand” (rigid, hierarchical control). This translucent hand management has different control levels, either more stringent or looser rules.

In the knowledge ecosystem realm, the orchestrator figure has a lower control level but shall seek to establish a knowledge realm within which the joint research will take place, also having the challenge of defining the direction (*i.e.*, a common research goal) while balancing individual members own goals (Järvi et al., 2018). To accomplish this, the orchestrator can monitor ecosystem members’ research, activities, and contributions against preset criteria and plans (Järvi et al., 2018).

For the entrepreneurial ecosystem, the orchestrating firm will act in such a way that the output – new ventures with innovative business models – maximizes its own benefit. The orchestrator controls the admission of members in the ecosystem based on their potential contribution and supervises their participation in the innovation process (Giudici et al., 2018). By deploying different mechanisms, the orchestrator can attract and encourage actors (*e.g.*, firms, entrepreneurs), purposefully articulate them, generate connections and reinforce its role as a broker, *i.e.*, an intermediary actor that facilitates transactions between other actors who lack access to or trust in one another.

While being an actor in an innovation ecosystem, a firm may create, engage with, or influence this ecosystem. This set of actions is known as ecosystem management (EM), defined by (Gomes, Flechas, et al., 2021, p. 10) as the “design, planning, and management of all activities related to the distributed value creation and capture of a systemic innovation for a targeted audience.” EM is composed of three different views: (1) the process view focuses on sponsoring complementors and managing innovation, coordination, collaboration, interdependence, evolvability, participation, bottlenecks, knowledge, and uncertainties. (2) The configurational view consists in defining boundaries, architecture, and activities, while its focus is on differentiation and integration among actors, co-specialization, changing ecosystem structure and governance, orchestration and mapping roles, flows, resources, capabilities, and configurations. In addition, this view embraces the orchestration activities of the ecosystem. (3) The competitive view goal is to create a unique value proposition regarding rival ecosystems. The focus is on the ecosystem’s number of markets, breadth and depth of value creation, quality and price of focal offerings and complements, building and deploying strategic resources and capabilities, leveraging ecosystem protection and barriers, and reducing the cost of governance in distributed value creation.

As an example, Helfat and Winter (2011) show that Microsoft actively managed the ecosystem centered on internet browsers for computers with intentional and sustained efforts to build demand. Microsoft deployed marketing strategies to guarantee that key players like website builders, developers, and influencers (pundits, press) would adopt the new browser. Furthermore, Microsoft imposed a condition on the computer manufacturers (group of actors) to effectively set the computer’s default browser to Microsoft’s Internet Explorer for their customers. Microsoft successfully managed the ecosystem’s: (1) processes by sponsoring complementors and managing participation; (2) configuration by delimiting a rule of default browser usage; (3) competitiveness by leveraging the network effects (Gawer, 2020), thus creating a barrier and strengthening the competitive position regarding rival ecosystems.

2.1.3. Radical Innovation

Following Leifer et al. (2001, p. 102) in their definition of radical innovation (RI), RI can be described as “a product, process or service with either unprecedented performance features or familiar features that offer significant improvements in performance or cost.” Many scholars have described radical innovations in terms of their effects: they transform customer and supplier relationships, create new markets, and make current products obsolete (Leifer et al.,

2000; O'Connor, 2008; O'Connor et al., 2018). RI is also associated with the long-term growth of a company (Bessant et al., 2005).

In this sense, RI can be described as a new platform or business domain that profoundly impacts both market (new value offered, with unprecedented benefits) and the firm (expansion into new market and technology domains, increased revenue and profits) (O'Connor et al., 2008). In addition, scholars have also pointed out the high uncertainty involved in radical innovations, especially market and technology uncertainties (Leifer et al., 2000; Rice et al., 2008).

Some terms are either synonyms or closely related to radical innovation. For instance, radical innovation is also called breakthrough innovation (O'Connor et al., 2008; O'Reilly III & Tushman, 2004) or even major innovation (O'Connor, 2008). For its effects, disruptive innovations may also be radical, as they either create previously inexistent markets or reach an unforeseen level of low-price and high quality compared to existing products (Christensen, 1997; Christensen et al., 2015). Additionally, discontinuous innovation (Bessant et al., 2005) also has a close link to radical innovation, as it is defined as “the implementation of new technologies, products, or business models that represent a dramatic departure from the current state of the art in the industry” (Birkinshaw et al., 2007, p. 67).

O'Connor et al. (2018) and Markides (1998) consider a broader scope when they use the term *strategic innovation* to include those commonly called radical, breakthrough, disruptive, game-changing, and transformational innovation associated with the highest levels of uncertainty, but also include evolutionary and adjacent innovations, with less but significant uncertainties. Strategic innovations are those that go beyond incremental, low-uncertainty, controlled-risk innovations and require different management approaches for them.

Understanding this discussion about radical innovation terms is vital to identify which keywords scholars use when studying radical innovation and capture a broader set of research papers when searching the literature as part of the systematic literature review. Afterward, individual papers can be analyzed and identified whether it is about radical innovation or approaches different research streams or goals.

2.1.4. Ambidexterity

Organizational ambidexterity was firstly described as the application of managerial and organizational skills needed both to compete in a mature market, in which competitive advantage comes from cost optimization, efficiency, and the search for incremental

innovations, and to develop new products and services with radical innovation, speed, and flexibility (Tushman & O'Reilly, 1996). Moreover, this concept has been developed almost exclusively as a capability rather than managerial actions (Turner et al., 2013).

When an established company seeks to innovate more radically, executives will encounter situations where they must make conflicting decisions to a mainstream organizational strategy oriented toward incremental innovation. Direct conflicts may arise during the definition of critical tasks, resource allocation, competencies, organizational structures, controls and rewards, culture, and the role of leadership (Leifer et al., 2002; O'Reilly III & Tushman, 2004) due to the intrinsic difference between incremental and radical innovation processes or projects. The organization for incremental innovation is scale-oriented, justifying the implementation of processes with clearly delimited stages, controlled risks, and very high strategic alignment (Clark & Wheelwright, 1992; Cooper, 2008; Salerno et al., 2015). With this mentality, established companies can sell more products to their most profitable customers just waiting for a "new version" of a product that already meets their needs (Christensen et al., 2015).

This configuration for incremental innovation, along with the cost-cutting mentality and short-term vision, among other factors, are incompatible with radical innovation. Moreover, even if an organization succeeds in radical innovation projects led by a few talented leaders who overcome organizational inertia at a high cost, this is not enough to guarantee that the business will sustain itself in the long term; it is necessary to seek the creation of a capability to innovate more radically on an ongoing basis (Leifer et al., 2000; O'Connor & DeMartino, 2006).

At the organizational level, the literature recognizes three approaches to ambidexterity: sequential (or temporal), structural (or simultaneous), and contextual (O'Reilly & Tushman, 2013; Turner et al., 2013). Organizations that shift their structures over time to resolve the conflicting alignments required for innovation and efficiency in the face of new competitors, market shifts, and discontinuities follow the sequential approach (Tushman & O'Reilly, 1996). Structural (or simultaneous) ambidexterity is achieved by establishing autonomous exploration units structurally separated from exploitation units – each with its own processes, structures, and culture – while strategically aligned to and integrated into the existing senior management hierarchy (O'Reilly III & Tushman, 2004). Contextual ambidexterity is a capacity to maintain coherence among business-as-usual activities and activities aimed to pursue (more) radical innovations within the same organizational structure. Even without a separate structure, the organization is adaptable and able to reconfigure activities across business units, responding to market change and demands (Gibson & Birkinshaw, 2004). Many authors consider the validity

of this approach in their criticism of the structural ambidexterity for reaching a balance between exploration and exploitation (Luger et al., 2018; O'Connor & DeMartino, 2006).

While all these discussions are mainly related to the firm level, there is also evidence of ambidexterity leveraged by an ecosystem approach, especially when incumbent firms must maintain traditional streams of revenue while simultaneously pursuing new sources of revenue (new products/services) through an ecosystem strategy (Adner, 2006; Adner & Kapoor, 2010; Altman et al., 2022; O'Reilly & Tushman, 2013).

2.1.5. Open Innovation, innovation function and Ecosystem Management function

The Open Innovation (OI) paradigm focuses on knowledge transfer mechanisms to search for and absorb new sources of innovation. More specifically, firms seek complementary knowledge, risk reduction or risk sharing, and access to complementary competencies, new markets, and technologies. (Chesbrough, 2004; Secundo et al., 2019; West et al., 2014).

O'Connor (2006) highlights the relationship between open innovation and radical innovation, presenting that if open innovation is managed in balance with internal development capabilities, it can enhance radical innovation because there will be a dual source of ideas (external and internal). Furthermore, the process of transforming these discoveries into business opportunities will be a more interactive process with the market and technology partners. However, some obstacles jeopardize well-executed open innovation, such as intellectual property issues, unbalanced power between parties involved due to a lack of appropriate agreements, and firms' tendency to close owned research and development divisions. These barriers can be tackled by developing capabilities, governance, processes, and a culture that promotes collaboration (Bogers, Chesbrough, et al., 2019).

Nonetheless, on the one hand, generating ideas is essential no matter their origin. On the other hand, identifying the context, incubating, and applying necessary resources to commercialize the technology are much more valuable (Mitchell & Goffin, 2010). In order to overcome these challenges, a firm must be organized to launch strategic new products systematically. A literature stream proposes that a firm must build the capacity to innovate more radically on an ongoing basis (O'Connor, 2012; O'Connor & DeMartino, 2006) using the creation of a business discipline and consequent business function, *i.e.*, a recognized group within the organization that has responsibility and accountability concerning a specific mission within the company (O'Connor, 2012). O'Connor (2012) suggests that innovation must be treated as a business function, such as marketing or sales. A function is a recognized group

within the organization that has responsibility and accountability for a specific mission within the company. Creating a business function to manage innovations is done to create a management system that can promote systematic learning and experimentation until an opportunity matures and reaches the market: it is necessary to have talented people with expertise in innovating, metrics, and governance systems (O'Connor et al., 2008, 2018). This innovation function is accountable for managing through three stages: (1) ideation (or discovery of opportunities), (2) incubation, and (3) scaling (or acceleration). Even if a firm executes all three disciplines, it is neither technology nor organizational design but leadership that must ensure a supportive context for these innovations through top executive sponsorship, the separation of exploration and exploitation units, and a prepared leadership capable of balancing these demands (O'Connor et al., 2008; O'Reilly & Binns, 2019).

As discussed in section 2.1.2, firms must respond to the EM necessity. Orchestrating partners for a systemic innovation requires a new business function different from other traditional external actors-related functions, like the supply-chain management function, because of the diverse nature of the relationship (business relationships with complementors rather than strict suppliers) (Gomes, Facin, et al., 2022). Hence firms need to establish a proper function for managing ecosystems to overcome the inherent complexity of this endeavor (Gomes, Facin, et al., 2022). This EM function is a formal or informal structure, either centralized or decentralized, with proper roles and a twofold general purpose of (1) addressing the integration problem across actors and (2) leveraging interdependence in the ecosystem. The EM function addresses the needs of managing the relationships with external players, matching partners' products to create new offerings, and coordinating multi-party go-to-market.

2.1.6. Corporate Innovation Hubs

Corporate Innovation Hubs (CIH) are an implementation of ambidexterity in corporations, due to their more independent structure and processes, for the sake of generating innovations through building links to external actors (Amann et al., 2022; Leonardi & Bailey, 2017). It may assume different configurations that shape or expand its orientation. For instance, the CIH can be the prominent corporate corner for alliances with knowledge (Clarysse et al., 2014) and entrepreneurial ecosystems (Weiblen & Chesbrough, 2015). This configuration can also vary over time by expanding collaboration initiatives (Steiber & Alänge, 2021). In the literature, it can be found the CIHs as distinguished units oriented toward new business development, managing partner scouting, external knowledge sourcing process, evaluation and

experimentation of ideas, projects, and businesses opportunities until they are fully developed (Giaccone & Longo, 2016; Kirschbaum, 2005; Monteiro & Birkinshaw, 2017).

Interactions with external partners are made through informal and formal processes, sometimes through a physical space (Moré et al., 2018). The Hub also facilitates informal relationships and ongoing knowledge exchange between the corporation and external partners, as well as between the partners themselves. In parallel, CIH determines a form of governance for its activities. For instance, defining rules about who is allowed to connect to the hub or how intellectual property is going to be controlled (Remneland Wikhamn & Styhre, 2019).

Establishing a CIH contributes to innovation at the individual and organizational levels when an inclusive leadership is present. Furthermore, the hub can become a cultural-game-changing instrument for the organization since it fosters the innovative behavior of OI project members (Miyao et al., 2022).

Even though CIHs share similarities with corporate accelerators (*e.g.*, engaging with startups; building a network of connected external players), they are not the same phenomenon. In fact, business incubators and corporate accelerators are better defined as programs rather than business units (Amann et al., 2022). Corporate accelerators are defined as “company-supported programs of limited duration that support cohorts of startups during the new venture process via mentoring, education, and company-specific resources” (Kohler, 2016, p. 348). Pauwels et al. (2016) understand corporate accelerators as a new incubation model, which “is broadly defined as the way in which an incubation entity provides support to start-ups to improve the probability of survival of the portfolio companies and accelerate their development” (p. 14). However, another literature stream places both incubation and acceleration as complementary mechanisms, the former being applied to nurture new ventures in early-stage and the latter to “late-stage” startups, *i.e.*, with a developed product ready for scale (Shankar & Clausen, 2020). The term “corporate incubation” is related to internally generated new ventures, while “business incubators” are company-supported programs for startups, usually associated with a physical space (Kohler, 2016).

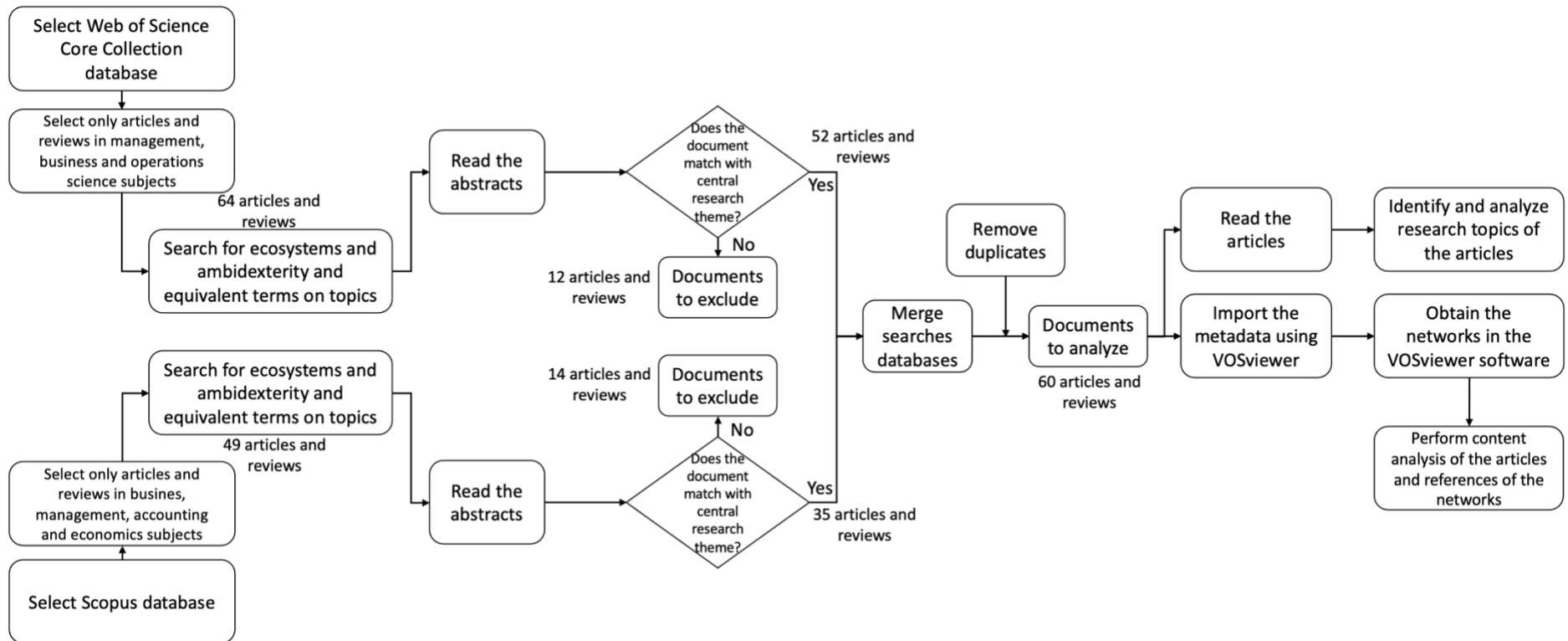
Del Sarto et al. (2022) describe how corporate accelerators impact startup innovation performance. The exchange between startups and the presence of mentors increases incremental innovation performance, while radical innovation performance is positively affected by an open knowledge ecosystem environment where knowledge flow between startups and universities is facilitated.

2.2. Method for the literature review

The research question that guides this scientific inquiry is “*how do ecosystem management functions emerge at ambidextrous units?*” pointing out to finding how to connect the literature stream of ecosystem management and the stream of ambidexterity for radical innovation. So as to start addressing this question, a systematic review of the literature is applied following Carvalho et al. (2013), Gomes et al. (2019), and Gomes, Facin, et al. (2018), employing bibliometric and citation analysis, as well as content analysis. This study seeks to expand theories on ambidexterity considering the ecosystem level by developing a conceptual framework that bridges separate bodies of literature. Firstly, it is described how the literature has evolved. Then, based on bibliometric indicators and content analysis, it is shown how fragmented and dispersed the literature on these topics is, as well as the trends and gaps in the literature.

Concerning the systematic literature review of this research, the bibliometric techniques are employed to quantify the written communication process (Ikpaahindi, 1985), while citation analysis is suitable to identify relevant scientific papers within a field of research as well as their interrelationships (Chai & Xiao, 2012). Additionally, content analysis is applied to investigate and interpret a research subject through an objective, systematic, and quantitative content description. The combination of bibliometric and content analysis helps to recognize literature trends, the most frequently discussed topics and fields, and gaps that may exist within the literature. Figure 1 shows the phases of the systematic review

Figure 1 - Phases of the systematic review



Source: author's data

2.3. Description of the sample

As a start, Clarivate Analytics' Web of Science (WoS) Core Collection database was chosen for the bibliometric analysis. Scaringella and Radziwon (2018) help to justify this decision: First, the magnitude of the collection of journals and articles; second, the possibility to access older and seminal sources; and third, almost every journal included in other databases are also present in WoS. Besides, in terms of bibliometric data, this database provides a complete set of information about research documents, such as abstracts, authors, institutions, citations, cited references, and journal impact factors, which are necessary and valuable for bibliometric, social network, and content analysis.

Three major research fields were chosen, (1) management, (2) business, and (3) operations management science. Following Christofi et al. (2021), Pertusa-Ortega et al. (2020), and Raisch & Birkinshaw (2008), the search terms related to ambidexterity were defined as (1) ambidexterity or ambidextrous (2) exploitation and exploration (3) radical and incremental innovation (4) double-loop and single-loop learning (5) stability and transformation in organizational adaptation. For the ecosystem keyword, only (1) the suffix "ecosystem*" was chosen, following Bogers et al. (2019) and Tsujimoto et al. (2018). These terms were searched in "topic," *i.e.*, title, abstract, author keywords, and Keywords Plus®. Keywords Plus® is the result of Thomson Reuters' editor's review highlighting additional relevant but overlooked keywords that were not previously listed either by the author or publisher. As for document types, only peer-reviewed articles and reviews were considered. Subsequently, all abstracts were read to check whether the definition of ambidexterity and ecosystem were aligned with this research.

This WoS database search strategy enables the screening of articles that connects ambidexterity to ecosystems. Executing the search on November 3rd, 2021, resulted in 64 documents. After fetching these papers and reading all abstracts, another selection was made. Pure ecology-related papers were removed; plus, the selected articles contributed to ecosystem and ambidexterity literature. One article had to be removed because it was not found in the journal archive². Subsequently, the database included 52 articles or reviews relevant to the construction of the bibliometric analysis.

In order to increase the sample size, the same logic of search was put on Elsevier's Scopus database, searching the ecosystem and ambidexterity terms in title, abstract, and keywords of

² An article titled Higher Education Entrepreneurial Ecosystems: Exploring the Role of Business Incubators in an Emerging Economy was not found in the International Review of Entrepreneurship journal archive website <https://ier.uek.krakow.pl/index.php/pm/issue/archive> by November 3rd, 2021

articles and reviews, selecting two subject areas (1) Business, Management & Accounting, and (2) Economics, Econometrics and Finance, which provided 49 results of which 22 were not duplicate from WoS sample, but only 8 documents were selected after reading all abstracts. The final database consisted of 60 articles/reviews published in 43 journals from 2011 to 2021 as the final sample for the systematic literature review (see Appendix A for the syntaxes used and a complete listing of articles found). Further searches in SAGE, Taylor & Francis Online, Wiley Online Library, Informs Pubs Online, Springer, and Emerald Insight yielded no other relevant article different from the final 60.

2.4. Bibliometric analysis procedures

This study followed the bibliometric analysis procedures of Carvalho et al. (2013) and Gomes et al. (2018, 2019) procedures for the bibliometric analysis. Microsoft Excel was used to run the descriptive statistics analysis and build tables. Table 1 presents the 10 most cited articles in the working sample, including the Academic Journal Guide (AJG) journal rating as of 2021 from the Chartered Association of Business Schools. The AJG's ratings are given by a community of academics that apply peer review, editorial, and expert judgments on hundreds of academic papers and count with statistical citation information ("Academic Journal Guide 2021: Methodology," 2021).

Table 1 – Top 10 articles ordered by times cited (2021 – WoS/Scopus)

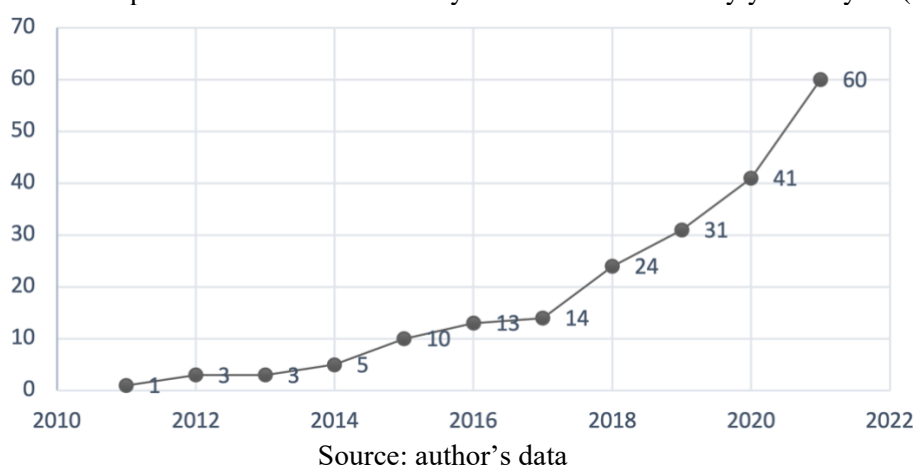
<i>Article</i>	<i>Journal</i>	<i>Citations</i>	<i>AJG 2021</i>
<i>Helfat & Winter (2011)</i>	Strategic Management Journal	462	5
<i>Santoro et al. (2018)</i>	Technological Forecasting and Social Change	145	3
<i>Seebode et al. (2012)</i>	R & D Management	101	3
<i>Carayannis et al. (2015)</i>	Journal of Technology Transfer	99	3
<i>Carayannis et al. (2018)</i>	R & D Management	81	3
<i>Hienerth et al. (2014)</i>	Journal of Product Innovation Management	72	4
<i>Wei et al. (2014)</i>	R & D Management	64	3
<i>Cozzolino et al. (2018)</i>	Journal of Management Studies	42	4
<i>Teece (2017)</i>	Advances in Strategic Management	29	2
<i>Markkula & Kune (2015)</i>	Technology Innovation Management Review	22	1

Source: author's data

Software VOSviewer, used by several scholars since being launched 11 years ago (Orduña-Malea & Costas, 2021; van Eck & Waltman, 2010), was applied to create and visualize three networks: keywords, and co-citation analysis of references. Inside VOSviewer, articles, authors or keywords are grouped based on their weight, *i.e.*, the total number of links and total link

strength, into non-overlapping clusters with homogeneous characteristics (van Eck & Waltman, 2010). A link between two items (*e.g.*, two keywords) is defined when both items appear in the same document. The weight or strength of the link is the number of documents that this co-occurrence happens, *i.e.*, link strength designates the number of publications in which two keywords occur together. The total link strength is the sum of all link strengths of that item. In a keyword co-occurrence map, the total link strength indicates, then, which are the topics most commonly researched together with others.

Figure 2 – Accumulated publications related to ecosystem and ambidexterity year on year (2011-2021)

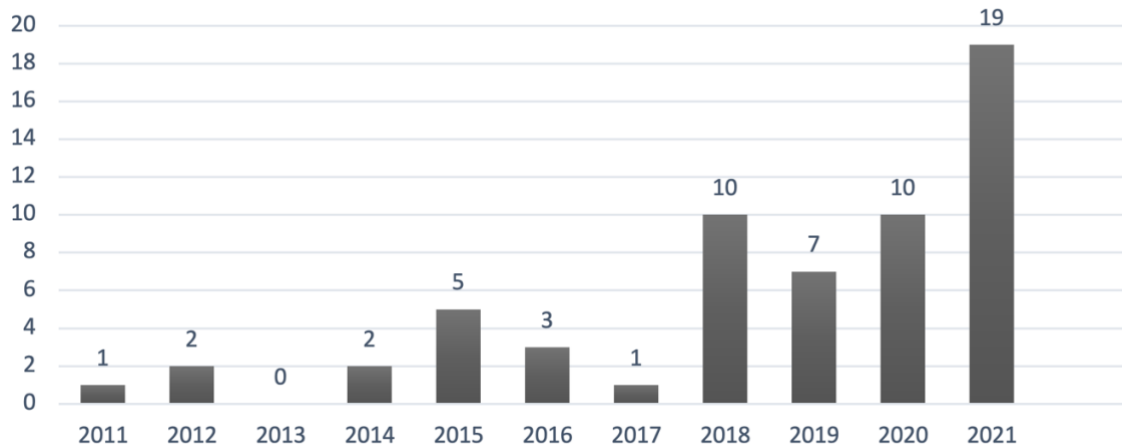


Three keyword maps were built using both author keywords and Keywords Plus®. Due to the goal of identifying the commonly connected topics and the literature trends in terms of research topics, all keywords were considered in the analysis by setting a minimum of one appearance for each term but limiting the plot to the 35 items with the highest total link strength from software calculation. This provided a solution to the small dataset in the analysis, with only a few keywords occurring more than once. Figure 3 helps identify literature trends. In that Figure, a significant increase in publications is seen starting in 2018. Hence, to have insights into keyword evolution trends, one keyword map was built from 2011 through 2017, and a second map for 2018-2021. Finally, to shed light on the most recent topics, a single map was built for 2021. The rise and decline of research themes can be identified through the analysis of these maps.

Afterward, the co-citation analysis of references was made to provide a historical view of the research field with its seminal articles and authors. Furthermore, this network can reveal the use of references such as books or conference papers, which were not considered in the WoS and Scopus database search. Finally, a sample of 61 documents was selected, the minimum

citation number was set to five, and two articles that regarded the case-study methodology were removed from the final plot, resulting in 30 documents.

Figure 3 - Publications each year



Source: author's data

2.5. Descriptive statistics

Figure 2 illustrates the accumulation of publications related to ecosystem and ambidexterity extracted from WoS and Scopus. Helfat and Winter's work, published in 2011, appears as the very first paper in the field, discussing the differences between operational and dynamic capabilities. Building on ambidexterity literature, Helfat and Winter state that firms can use dynamic capabilities to extend or modify features of the business ecosystem they are inserted. At the same time, they are also required to make ambidexterity possible, for instance, the integrative capabilities, which render it possible to coordinate different organizational units and firms.

Figure 3 shows the number of published articles per year since 2011. Nearly 77% of all articles were published since 2018, which is significant to demonstrate the recent increasing academic interest. Furthermore, it is also to notice a pulverization of journals publishing in this field. Only eleven journals (26%) have published more than one article. Table 2 presents all journals that have published articles in this field of research of this analysis.

Table 2 – Articles published per journal

Journal	Articles Published
Technological Forecasting and Social Change	5
International Journal of Technology Management	3
R & D Management	3

Technology Innovation Management Review	3
Business Process Management Journal	2
IEEE Transactions on Engineering Management	2
Journal of Business Research	2
Journal of Management Studies	2
Journal of Technology Transfer	2
Management Decision	2
Small Business Economics	2
Asian Journal of Technology Innovation	1
Business Horizons	1
Competitiveness Review	1
Creativity and Innovation Management	1
Critical Studies on Corporate Responsibility, Governance and Sustainability	1
Energy Policy	1
Entrepreneurship, Innovation, and Platforms	1
European Journal of Innovation Management	1
IEEE Engineering Management Review	1
International Journal of Innovation	1
International Journal of Innovation Management	1
International Journal of Project Management	1
Journal of Business Strategy	1
Journal of Cleaner Production	1
Journal of Leadership Studies	1
Journal of Open Innovation: Technology, Market, and Complexity	1
Journal of Personal Selling & Sales Management	1
Journal of Product Innovation Management	1
Journal of Service Research	1
Journal of Services Marketing	1
Journal of the Academy of Marketing Science	1
Learning Organization	1
Organizational Dynamics	1
REGGE - Revista de Gestão	1
Research in Competence-Based Management	1
Resources, Conservation and Recycling	1
South African Actuarial Journal	1
Strategic Management Journal	1
Strategy Science	1
Technovation	1
Teoria e Prática em Administração - TPA	1
Triple Helix	1

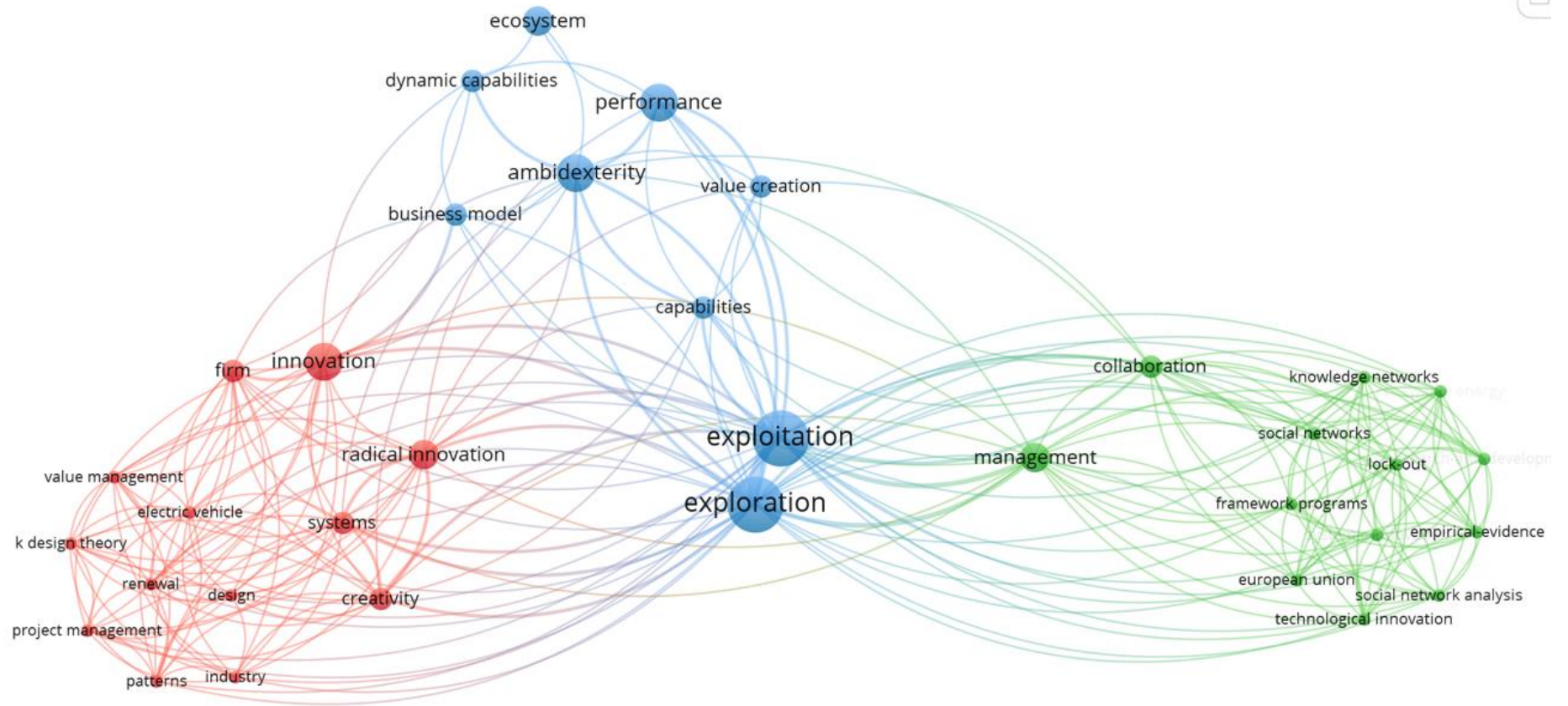
Source: author's data

2.6. Bibliometric analysis

2.6.1. The keyword network and keyword evolution

Regarding the first set of keywords relative to articles dated from 2011 to 2017 from Figure 4, it is possible to capture the main themes in the first stage of this research field. Three clusters were found. In the left (red cluster), the terms are related to innovation management in firms, either radical or incremental (connected to ambidexterity). The blue cluster at the top and middle indicates research topics around firms' internal phenomena and theories, like capabilities, configurations, and company goals. On the right, the green cluster aggregates the outside of the firm view, like social and knowledge networks, regions, and inter-organizational collaboration. The keyword "ecosystem" is in the internal firm view cluster, which means that in the first phase (2011-2017), the ecosystems were only studied from the perspective of internal firm capabilities and their implications to the ecosystem around it; additionally, the weak links imply little depth. The ecosystem research stream is manifested in the green cluster, but the discrepant labels show that this research stream was still ambiguous, in line with Gomes et al. (2021) findings that, during this period, the ecosystem research stream was situated in an experimenting phase. For example, "European Union" and "framework programs" can indicate regional entrepreneurial ecosystems, while knowledge networks and technological innovation are more closely related to the Open Innovation paradigm. From Figure 4, it can be stated that the innovation management literature stream is separated from the ecosystem research stream during the 2011-2017 period, but it can also be implied that ambidexterity is related to both.

Figure 4 - Keywords map of the period 2011-2017



Source: author's data

Table 3 – Research themes and perspectives from the 2011-2017 period

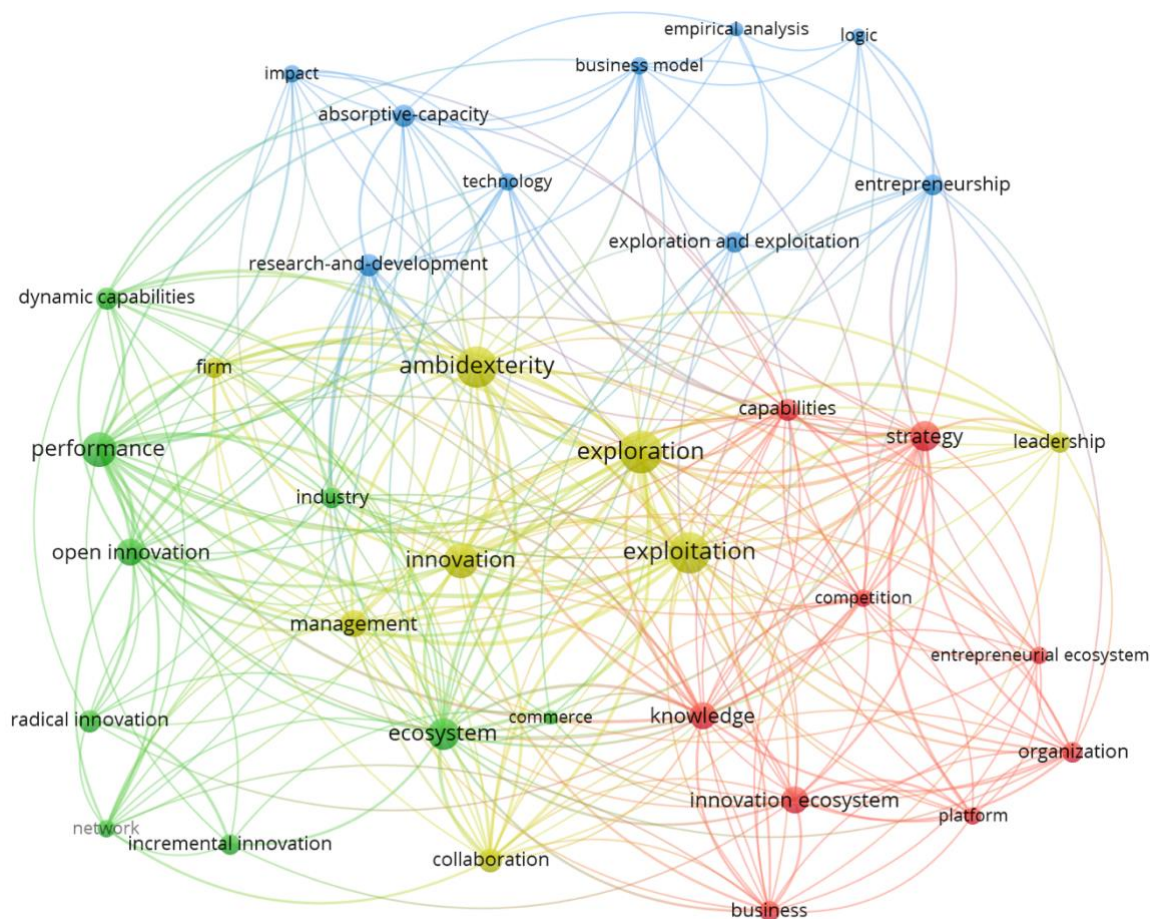
<i>Cluster</i>	<i>Themes</i>	<i>Main keywords</i>
<i>Red</i>	Innovation management	Innovation; radical innovation; creativity; project management; renewal
<i>Blue</i>	Internal view of the company	Dynamic capabilities; business model; exploration; exploitation; ambidexterity; performance
<i>Green</i>	External view of the company – social and knowledge networks, open innovation, regional ecosystems.	Social networks; knowledge networks, collaboration; European union

Source: author's data

Figure 5 helps identify new research streams emerging from 2018 to 2021. The most significant insight from this figure is that the innovation management cluster was completely dissolved. At the same time, the ecosystem concept is more developed and better detailed (*e.g.*, typified), which is implied from the emergence of keywords like “entrepreneurial ecosystem” and “innovation ecosystem.”

Business models, radical innovation, and value creation are not central themes now as they were in the first stage. Instead, the emergence of the keywords: “startup” and “entrepreneurship,” “knowledge” and “knowledge flow,” along with “open innovation,” demonstrate the growing interest in the different types of ecosystems around the firm, the players, and the relationships and flows that may be settled.

Figure 5 - Keywords map of the period 2018-2021

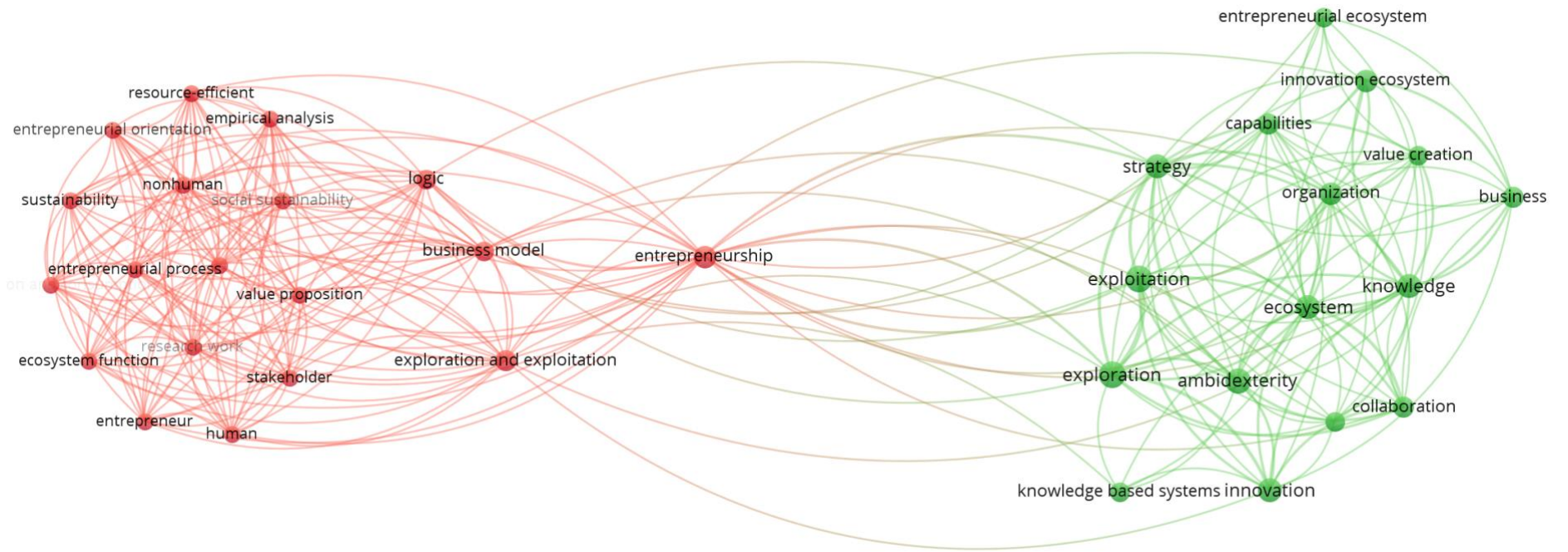


Source: author's data

Concerning Figure 6, the 2021 keywords are divided into two groups. The red cluster on the left refers to entrepreneurial settings and innovations concerning ecological and social value. The right green cluster manifests that the most recent research on ambidexterity and ecosystems relies on different types of ecosystems, especially innovation and entrepreneurial ones, but also references knowledge and knowledge-based systems, which can account for the knowledge ecosystem.

What is clear from the keyword analysis, its evolution, and current topics is the fragmented, unbridged research streams of ambidexterity and ecosystems when firms are organizing for radical innovations. The innovation management stream was modest in the first period of publications (2011-2017) but in the end it became even less evident.

Figure 6 - Keywords map of 2021 publications

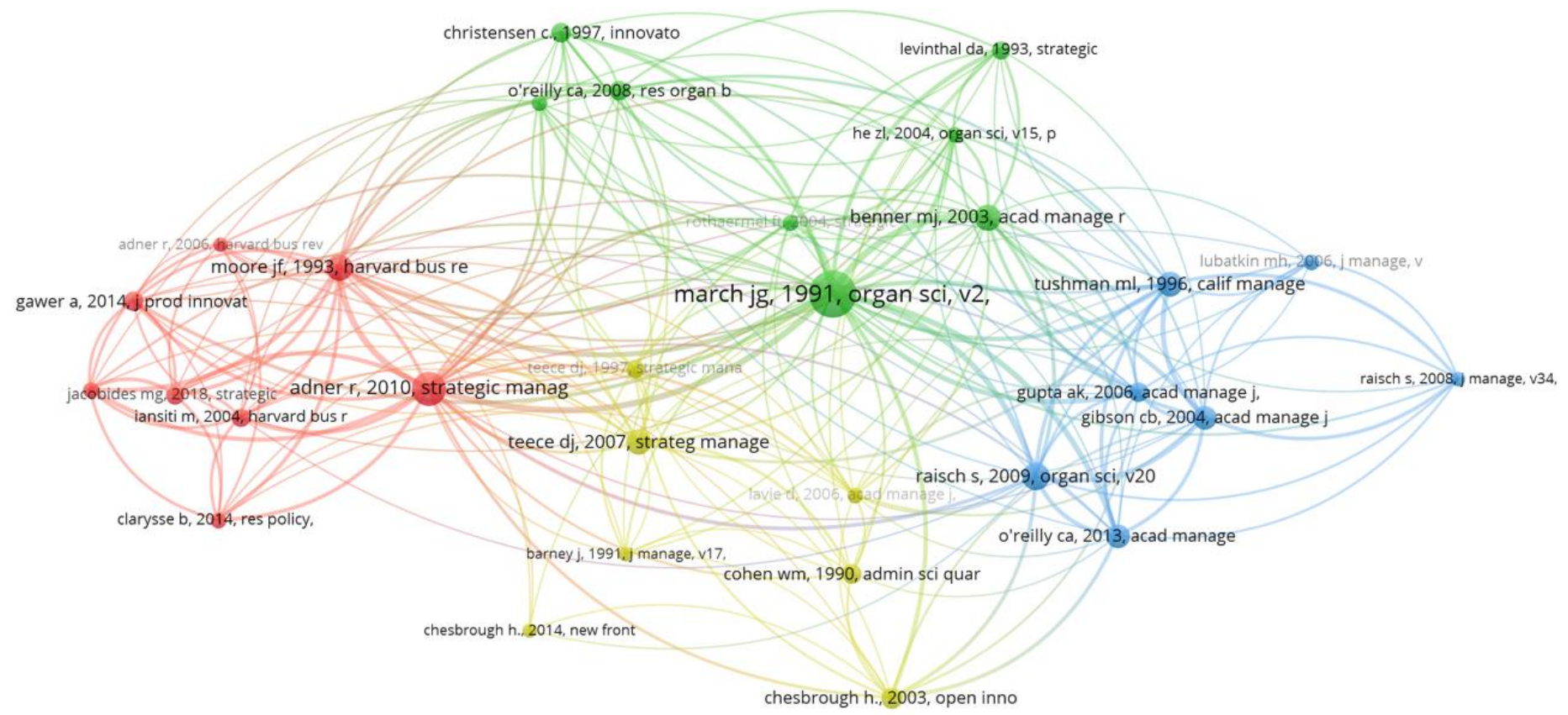


Source: author's data

2.6.2. Theoretical foundations and current themes

Four clusters can be identified in Figure 7, which shows the co-citation analysis. The first one, in green, is the origin of exploration-exploitation literature, mainly connected to the organizational learning theory. This cluster might have been divided to detach the disruptive innovation theory, represented by Christensen (1997) and O'Reilly & Tushman (2008). The second one is the ambidexterity literature, in blue, which takes inputs from the explore-exploit literature. However, the authors do not focus on connecting to the ecosystem literature stream (in red), showing more interest in demonstrating how firms organize for more radical innovations, how they react to changing environments, and how it affects the firm's structures, processes, culture, innovation, and performance. The third cluster is related to open innovation, knowledge, and technology transfer, highlighted in yellow. Chesbrough and Cohen are key authors in open innovation and absorptive capacity, respectively. Lastly, the red cluster is the ecosystem literature. It can be seen that the ambidexterity and the ecosystem literature are unbridged as there are two different and separated clusters for the ecosystem literature (in red) with weak links to the ambidexterity literature (in blue), showing that few authors cite papers from both streams. Thus, they are not sufficiently connected in the literature.

Figure 7 - Co-citation analysis plot

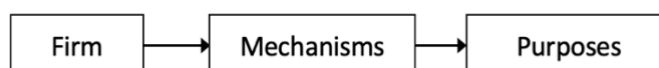


Source: author's data

2.7. Content analysis

While the bibliometric analysis indicates that the body of knowledge on the ambidexterity and ecosystem streams for radical innovation is fragmented and dispersed, the content analysis is employed to propose a conceptual framework for investigating this issue. The following sections present a conceptual framework that bridges the different bodies of literature on ambidexterity and ecosystem. In developing this conceptual framework, the starting point was the research goal to identify, in the literature, the mechanisms applied by organizations in their interactions with different ecosystems. Mechanisms are how an organization achieves a purpose and consist of hierarchical structures (roles and relationships), processes, and their activities or interactions (Miles et al., 1978; Pajunen, 2008). Figure 8 presents a simplified understanding of organizational mechanisms.

Figure 8 – Organizational mechanisms framework



Source: adapted from Miles et al. (1978) and Pajunen (2008)

2.7.1. Ambidexterity mechanisms for ecosystem ties

From the literature sample, it was identified that many scholars agree that managing and developing radical innovation requires an ecosystem approach in order to succeed (Carayannis et al., 2018; Gomes, Flechas, et al., 2021; Hiennerth et al., 2014; Inoue, 2021; Lo & Theodoraki, 2021; Visscher et al., 2021) that firms apply ambidextrous strategies to manage innovation at the ecosystem level (Alänge & Steiber, 2018). Mechanisms related to each type of ecosystem – knowledge, entrepreneurial, and innovation ecosystems – could be identified either separately or simultaneously being applied by organizations in search of radical innovations.

For instance, Cozzolino et al. (2018) recognize that when an established firm faces disruption from new entrants, it is necessary to adapt the business models to respond to disruptors. To do so, these firms increase external knowledge access and develop open business models. The example given was an Italian news firm called GEDI, which accessed external knowledge by participating in a research consortium formed by MIT's Media Lab (*knowledge ecosystem related mechanism*). With the knowledge created and flows, the firm transformed from being a product company into a multi-platform business (*innovation ecosystem related mechanism*)

by launching two different news platforms: one being a platform for students' newspapers in schools that also provided selected news for the leading newspaper. A second one was a system to receive newsfeeds from ordinary citizens. After these platforms did not yield the sought success, the GEDI started scouting disruptors for acquisitions or alliances and experimenting with a new platform (*entrepreneurial ecosystem related mechanism*). The platform connected unpaid bloggers and aggregated content from external publishers from the major news companies while introducing a refined advertising-based value capture dimension (*innovation ecosystem related mechanism*).

Enhancing the understanding of creating an innovation ecosystem and maintaining the competitive position on it at the firm level, Visscher et al. (2021) propose an integrated multi-layered ecosystem management approach. In one layer (explorative), the focal firm should align its innovation strategy with various knowledge institutes and pursue knowledge flows to identify opportunities for future innovation (*knowledge ecosystem related mechanism*). At the same time, they should elaborate those opportunities in alignment with other companies (*entrepreneurial ecosystem related mechanism*) while simultaneously being active at the exploitative layer, where the real value is added and captured (*innovation ecosystem related mechanism*).

Cozzolino et al. (2021) published the results from a 15-year longitudinal study on the digital advertising ecosystem showing that incumbent producers might cooperate with entrant platforms to sell less valuable or remnant inventories (*innovation ecosystem related mechanism*) in line with Visscher et al. (2021). Another possible action by incumbents is to create their own platform and then aggregate some technological components that entrants provide (*innovation ecosystem related mechanism*).

Lo and Theodoraki (2021) describe a nested entrepreneurial ecosystem deployed by a large firm (Renault) as a collaborative space for establishing a context for collaborative innovation and experimentation (*entrepreneurial ecosystem related mechanism*), leading to two radical innovation projects that were incorporated into Renault innovation processes (*innovation ecosystem related mechanism*).

Steiber and Alänge (2021) reaffirmed that crowdsourcing ideas is another practice for leveraging possible solutions for business problems. Moreover, they presented firms investing in new ventures and experimenting with temporary risky projects to gain speed (*entrepreneurial ecosystem related mechanisms*) and co-locating researchers from external companies to generate serendipitous encounters and radical innovation perspectives (*knowledge ecosystem related mechanism*). In the case of AstraZeneca, this led to the

development of a digital patient-monitoring system (*innovation ecosystem related mechanism*). Steiber and Alänge (2021) found that new venture acquisitions can play an essential part in firm transformation, leading to entirely new product lines (*innovation ecosystem related mechanism*) and demanding new investments in startups (*entrepreneurial ecosystem related mechanism*). That was the case of the Stena Metalls' Halosep method of recycling and reusing waste streams from incineration plants.

Another empirical study, this time with a large financial firm in Brazil, brought evidence that more people in the bank increased their ability to “think innovation,” fostering the required corporate mindset to promote radical innovation (*innovation ecosystem related mechanism*) through two initiatives: first, a joint program with startups with a dedicated physical location for players' integration (*entrepreneurial ecosystem related mechanisms*); and second, intensifying partnerships with Brazilian or foreign research institutes for knowledge transfer and joint development of innovation projects (*knowledge ecosystem related mechanism*) (dos Santos & Marx, 2021).

Following Secundo et al. (2019) framework, incumbent companies might take place as an intermediary between research institutes, universities, and complementors, promoting knowledge transfer (for new patents and R&D projects) (*knowledge ecosystem related mechanism*) to propose new products or services (*entrepreneurial ecosystem related mechanism*) that will be then brought to market around an ecosystem (*innovation ecosystem related mechanism*).

Some other ambidexterity mechanisms could be identified in the literature, like the High-Tech Campus, an academic firm unit from Philips to team up with a high-quality technical workforce (*knowledge ecosystem related mechanism*) while incubating startups and preparing spinouts (*entrepreneurial ecosystem related mechanism*) (Seebode et al., 2012). Also, LEGO's range of processes for triggering real-time user-to-user interaction, like nonmonetary incentives, is implemented to nurture new sources of innovation from users and maintain competitive leadership (Hienerth et al., 2014). Gastaldi et al. (2015) present empirical evidence that academic institutions can help generate informal startups (*knowledge and entrepreneurial ecosystems related mechanism*).

As seen, the literature shows a strong connection between the entrepreneurial and knowledge ecosystems through the interchange of knowledge and ideas for new possible technologies and applications. It can also be deduced that established firms must succeed in orchestrating all ecosystems simultaneously to achieve sustainable success in radical innovations (Cozzolino et al., 2018; Steiber & Alänge, 2021; Visscher et al., 2021). Table 4 presents a summary of found

mechanisms, their purposes, and if they are related to innovation, entrepreneurial or knowledge ecosystems. Figure 9 contains the proposed conceptual framework based on the content analysis. The literature shows a strong connection between the entrepreneurial ecosystem and the knowledge ecosystem through the interchange of knowledge and ideas for new possible technologies and applications.

Table 4 – Mechanisms related to firm-ecosystem interactions and purposes

<i>Ecosystem</i>	<i>Mechanisms</i>	<i>Purpose</i>
<i>Innovation Ecosystem</i>	<ul style="list-style-type: none"> • Launch of new owned platforms (Cozzolino et al., 2018, 2021; Kopalle et al., 2020) • Participation into existing platforms (with low-end products) (Cozzolino et al., 2021) • Orchestration of innovation sources (customers, complementors, developers) (Abdulkader et al., 2020; Cozzolino et al., 2018; Secundo et al., 2019) • Exploitation of new products and services (Secundo et al., 2019) 	<ul style="list-style-type: none"> • Value creation and value capture (Visscher et al., 2021) • Establishment of competitive leadership (Gomes, Flechas, et al., 2021; Kopalle et al., 2020)
<i>Entrepreneurial Ecosystem</i>	<ul style="list-style-type: none"> • Alliances (Cozzolino et al., 2018, 2021) • Joint programs (dos Santos & Marx, 2021) • Experimentation (Cozzolino et al., 2018; Hienerth et al., 2014) • Collaborative spaces (Lo & Theodoraki, 2021; Steiber & Alänge, 2021) • Partner scouting (Abdulkader et al., 2020) • Corporate Venture and Acquisition (Cozzolino et al., 2018; Steiber & Alänge, 2021) • Corporate Incubator and Accelerator (Seebode et al., 2012; Steiber & Alänge, 2021) • Democratic governance (Lo & Theodoraki, 2021) 	<ul style="list-style-type: none"> • Development of new innovative projects (Lo & Theodoraki, 2021) • Risk reduction or uncertainty mitigation for radical innovation under development (Hienerth et al., 2014) • Finding solutions for organization's demands (dos Santos & Marx, 2021) • Knowledge use (Carayannis et al., 2018)
<i>Knowledge Ecosystem</i>	<ul style="list-style-type: none"> • Collaborative spaces for research (Cozzolino et al., 2018; Steiber & Alänge, 2021) • Teaming up and joint research (Cozzolino et al., 2018; Seebode et al., 2012; Steiber & Alänge, 2021) • Academic firm units (Carayannis et al., 2018) • Free revealing of internal knowledge (Podmetina et al., 2018) • Orchestration of external knowledge sources and networks (Cozzolino et al., 2018; Podmetina et al., 2018) 	<ul style="list-style-type: none"> • Foresight of research streams (Secundo et al., 2019) • Patents (Centobelli et al., 2019) • Knowledge creation / production (Carayannis et al., 2018) • Knowledge flows/knowledge exchange

- | | |
|--|---|
| <ul style="list-style-type: none"> • Knowledge crowdsourcing (Podmetina et al., 2018; Steiber & Alänge, 2021) | <ul style="list-style-type: none"> (Carayannis et al., 2018; dos Santos & Marx, 2021; Steiber & Alänge, 2021; Visscher et al., 2021) |
|--|---|

Source: author's data

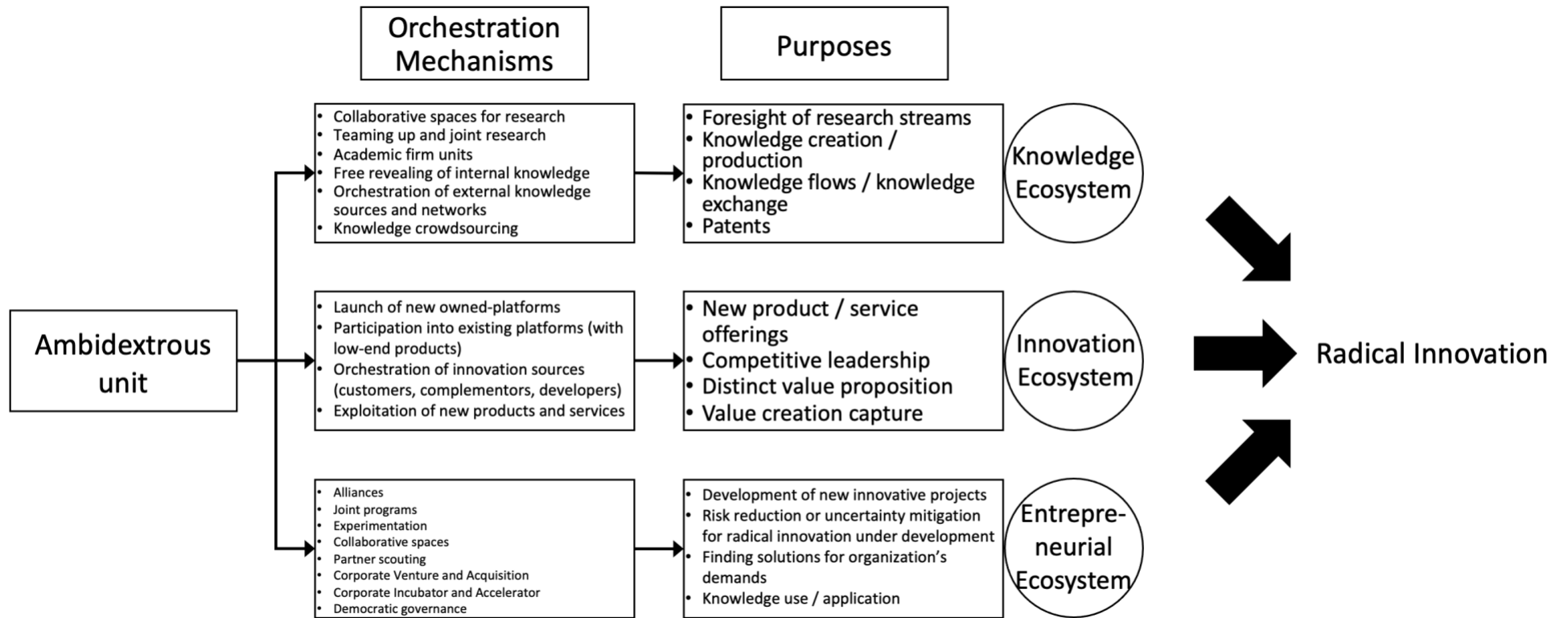
2.8. Literature review: final remarks

The systematic literature review was divided into two parts: bibliometric and content analysis. The bibliometric analysis indicated the fragmentation and dispersion of the literature on ambidexterity, ecosystem, and radical innovation, besides the significant growth of these streams from 2018. Moreover, the keywords maps help acknowledge the scarce reference to studies concerning organizational structures but focusing on organizational learning. The developed conceptual framework shown in Figure 9 is one approach for bridging these literature streams.

The content analysis shows that firms implement ambidextrous strategies to manage innovation at the ecosystem level by employing ecosystem engagement mechanisms. Furthermore, considering the organizational dimension of the firm, the current literature explains which capabilities are necessary for engaging with ecosystems and how firms manage organizational learning. However, there are limited studies about the organizational structure of ambidextrous units like Corporate Innovation Hubs. For instance, it is unclear how CIHs develop over time and how they are designed to perform ecosystem management for the firm.

To summarize, the literature review helped identify gaps, outline empirical case characteristics, and draw an interview script whose aim was to collect data about organizational structures and processes at firms that engage with different ecosystems while holding radical innovation projects.

Figure 9 – A proposed framework based on the literature



Source: author's data

3. EMPIRICAL RESEARCH METHOD

3.1. Method for the empirical investigation

The research question guiding the empirical investigation is “*how do ecosystem management functions emerge at ambidextrous units?*” which leads to a qualitative approach with an exploratory goal because prior theory overlooks this question (Eisenhardt, 1989; Yin, 2014). Therefore, an inductive case-study method in three phases was applied: (1) phenomenon observation; (2) finding existing relationships within the facts; and (3) generalization of the relationship within similar facts, including those unobservable (Edmondson & Mcmanus, 2007; Eisenhardt, 2021).

A comparative case design was followed because this type of design is suitable for generating accurate and generalizable theory by identifying similar (or equal) antecedent features and highlighting the different processes and consequent outcomes (Eisenhardt, 2021). For example, a similar study as the one proposed here was performed by Ding et al. (2019), who selected two companies as study objects with similar initial elements. However, from the conducted interviews, different processes were captured, and these authors could derive two different platform strategies, their mechanisms, and process models. To cite another, McDonald and Gao (2019) selected two ventures with similar initial settings, *i.e.*, the same initial intent and similar profiles, intending to analyze how ventures manage strategic reorientations (aka “pivots”). This multiple-case approach also responds to Remneland Wikhamn and Styhre (2022), who called for additional innovation hub evolution studies “in other industry sectors or geographical areas, as this would help us further unpack the capabilities, tactics, and governance mechanisms needed when engaging in this dynamic phenomenon” (p. 17)

In addition, like in other qualitative studies (Gomes, de Faria, et al., 2021; Ott & Eisenhardt, 2020), the longitudinal and retrospective perspectives were combined in this research to mitigate interviewee bias (Eisenhardt & Graebner, 2007). Both rely on interviews, but the former is applied to collect information and build an explanation for the real-time case situation. At the same time, the latter is conjointly analyzed with archival data to allow a reconstruction of past events.

There were five data collection and analysis stages in this research:

(1) Theoretical sampling of cases: choosing ten firms with similar backgrounds and required elements.

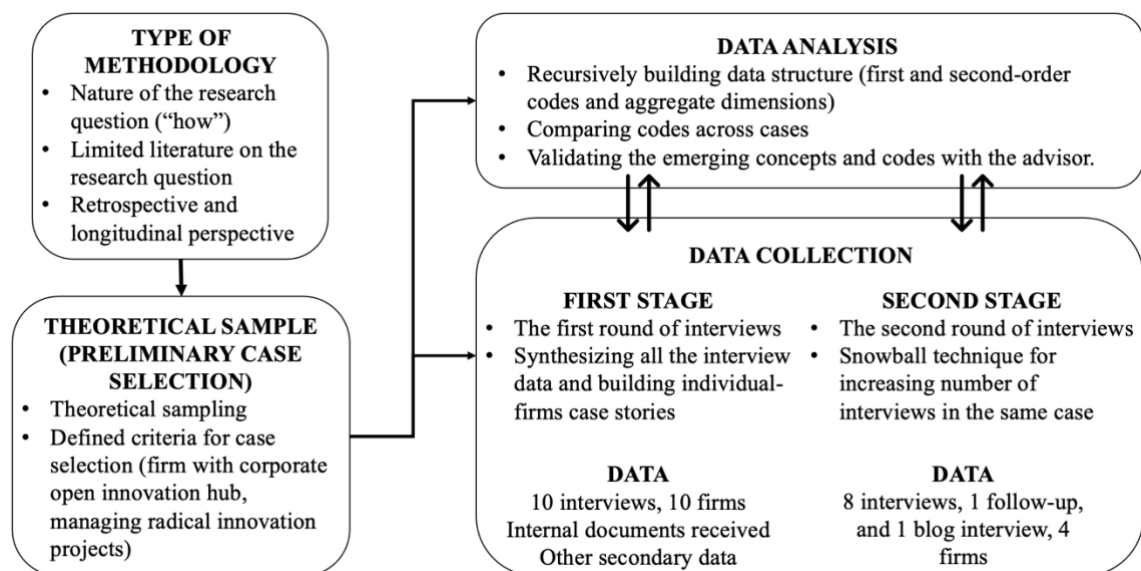
(2) First round of interviews: improving understanding of cases and the phenomenon.

(3) Narrowing the number of cases to where the phenomenon is more evident, selecting more interviewees, and identifying first patterns.

(4) Second round of interviews: generating a more detailed and accurate account of the phenomenon; refining and validating patterns.

These four steps were followed while recursively building data structure (first and second-order codes), comparing codes across cases, and validating the emerging concepts and codes with the advisor. Figure 10 depicts the main steps of the empirical research methodology.

Figure 10 - Main steps of the empirical research methodology



Source: author's data

3.2. Description of the empirical sample

Initially, this research was set to explore the phenomenon of ambidextrous firms engaging with different ecosystems for radical innovation. The systematic literature review presented a typology of implemented engagement mechanisms for each type of ecosystem. Thus, the selection of cases was not random because it should provide insights into that phenomenon (Eisenhardt, 1989, 2021): ambidextrous units with mechanisms to engage with different ecosystems in their pursuit of radical innovations. Because of the nature of this phenomenon, the companies chosen for the case study presented the following initial elements: (1) mature companies, (2) with an ambidextrous unit (an innovation hub), (3) which pursue radical innovation, (3) and create, participate, or transform different ecosystems. The study objects were mature, established firms in the Brazilian market. Nine firms in seven industries were

selected following these criteria after searching for established firms in media, social networks, and academic publications while reviewing available annual reports. The industries (and the respective number of firms) included in this sample were: Financial Services (2), Information and Communication Technologies (aka ICT, 2), Mining and Metallurgy (1), Cosmetics (1), Chemical (1), Pharmaceutical (1), and Energy (1).

However, when collecting empirical data to validate the first proposed conceptual framework, the phenomenon of the innovation hubs' evolutionary trajectory emerged, driving attention to the Ecosystem Management function they became. The literature offered limited guidance on how innovation hubs evolved (Alam et al., 2022; Remneland Wikhamn & Styhre, 2022), while the literature on ecosystems was insufficient to describe and explain the trajectory of the ecosystem management function.

Thus, this research expanded and was rearranged to identify how corporate innovation hubs evolve into ecosystem orchestrators. The same elements were also at the base for the longitudinal study to gain deeper insights into the innovation hub unfolding process as well as the identification of ecosystem engagement mechanisms implemented and how they simultaneously orchestrate different ecosystems.

After recognizing the phenomenon in a Mining and Metallurgy firm's social media, it was added to the sample. Finally, four firms remained in the analysis after narrowing the number of cases to where the evolutionary journey of the hub was manifested more clearly. Their fictitious names and actual segments are Khnum (Chemical), Hathor (Cosmetics), Thoth (ICT), and Ptah (Mining and Metallurgy). They were all multinational companies. Khnum and Hathor were headquartered in Brazil, which was not true for Thoth and Ptah. Strategic innovation projects were identified in every case, being more or less radical depending on the case and period studied.

3.3. Data source

The data sources were (1) semistructured interviews with leaders, participants, and some partners of innovation hubs in each company, (2) archival materials like published magazine interviews, podcasts, technical publications, press releases, and a few shared internal documents; and (3) previous research reports written by scholars, analysts, and industry observers. By combining past and current data, a longer-term observation was possible.

Regarding the interview methodology, multiple in-depth semistructured interviews were the primary data source. All respondents were asked to provide a present and historical view of the hub's evolution, the main processes, activities, and structures to engage with different

ecosystems. Ultimately, all who helped plan and start the hubs were interviewed to grant a holistic view of the evolutionary journey and how mechanisms were applied for different ecosystem creation, participation, or transformation. Employees working in each hub were also interviewed to understand the cultural context better and retrieve more detailed information about processes and activities.

The interviews had a duration of approximately 60 minutes. Appendix B contains the initial and the adjusted for the second round. For the sake of ensuring data validity, non-directive questions were preferred, interviewers from different hierarchical levels, and making use of event-tracking (Eisenhardt, 1989) as a parameter for data quality alongside data triangulation.

Archival materials, previous research, and the first interviews were the means to understand the cases' background and context. In contrast, other interviews were directed to map and detail the mechanisms for each type of ecosystem and the prominent characteristics of the hub's evolutionary process. Table 5 provides the main details about the sample used for building the data structure, including who the informants were, by case.

Table 5 - Case details

<i>Cases</i>	<i>Description</i>	<i>Roles</i>	<i>Data type</i>	<i>ID</i>
<i>Khnum</i>	Multinational chemistry company	1st Hub Leader	Interview	I-3
		2nd Hub Leader	Interview	I-14
<i>Hathor</i>	Multinational cosmetics company	Connections' Manager	Interview	I-4
		2nd Hub Leader	Interview	I-17
<i>Thoth</i>	Multinational ICT company	VP (Hub Sponsor)	Blog Interview	B-1
		1st Hub Leader	Interview	I-7
		Connections' Manager	Interview	I-12
<i>Ptah</i>	Multinational mining and metallurgy company	Consultancy Partner	Interview	I-18
		1st Hub Leader	Interview and Follow-up	I-13 F-1
		Connections' Manager	Interview	I-15
		BU Partner	Interview	I-16

Source: author's data

3.4. Data analysis

Following Gioia et al. (2013), the empirical data was iteratively organized into first and second-order themes to provide the abstraction from the empirical realm, the narratives, to the theoretical (conceptualization) realm. Three coding steps were performed, as in other qualitative research (e.g., Gomes et al., 2020).

The first step centered on thoroughly analyzing the transcripts, highlighting phrases and passages related to ecosystem engagement mechanisms and radical innovation projects. This

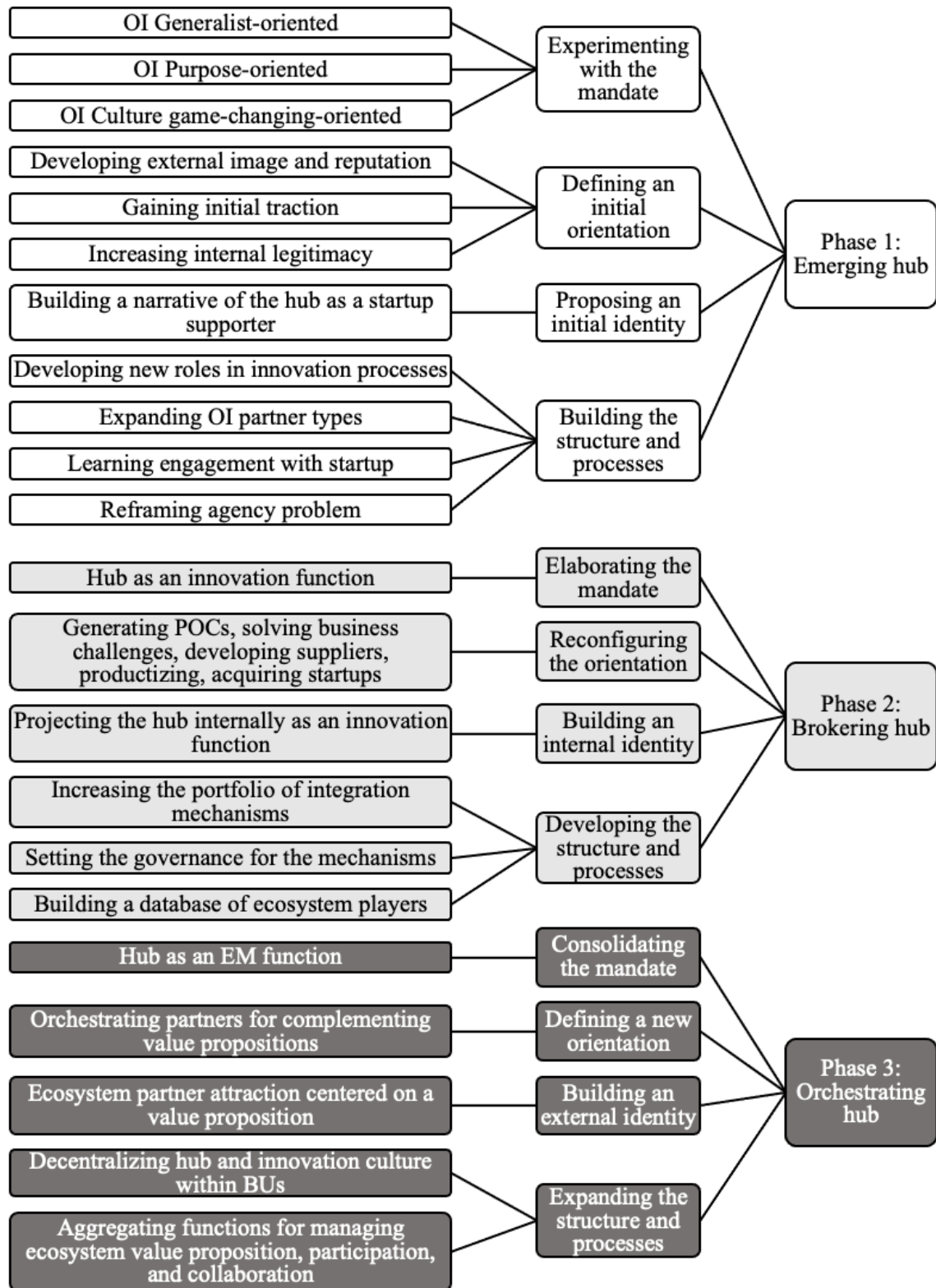
way, the primary open codes emerged. After the fifth interview, a pattern of a hub trajectory seemed to emerge, so it was necessary to return to the literature and understand what was already studied. Five more interviews were undertaken and analyzed, providing more data to build the initial first-order coding structure under an elaborated research question guidance.

After the second round of interviews, all transcripts were analyzed to generate first-order codes. Afterward, the second step focused on finding patterns in the first-order categories, which then were combined through triangulation (*e.g.*, internal documents, interviews, press releases, and annual reports), which enabled the forming of second-order themes representing distinct concepts. These codes were refined through continuous case comparison, regular discussions with the advisor, and return to available literature for confirmation of existent constructs and elaboration of new ones.

The third step involved categorizing the constructs into theoretically and empirically grounded aggregate dimensions using literature insights as guidance to build on first and second-order categories. Two distinct analyses were employed: the first to identify and categorize ecosystem engagement mechanisms implemented in the hubs and the second to characterize the hub phases. In order to reach the latter result, it required a chronological ordering of the first-order themes to the point in time where they were most evident in each case. It had engendered four different building blocks – the mandate, the orientation, the identity, and the dyad structure and processes – which could be categorized into three different hub phases.

The overall data structure can be seen in Figure 11. To summarize, the transcripts provided 346 quotations that were further refined to 22 first-order codes and 12 higher-order nodes organized in order, depicting a corporate hub progression from an emerging status through a brokering stage to the orchestrating phase. Table 6 contains illustrative quotes from each case's interviews in addition to the data presented in Chapter 4 below.

Figure 11 - Data Structure



Source: author's data

Table 6 - Representative supportive data for each second-order theme

<i>Phase I: Emerging hub</i>	<i>Case</i>	<i>Illustrative Quotes</i>
<p>I) Experimenting with the mandate <i>A - OI Generalist-oriented</i> <i>B - OI Purpose-oriented</i> <i>C - Culture game-changing-oriented</i></p>	Khnum	<p>A1. N/A B1. “I want those [entrepreneurs] who will reduce water consumption. I want those who will take basic sanitation to places where there is none. That is what we were looking for. Startups with a strong environmental and social purpose”. 1st Hub Leader, I-3 C1. N/A</p>
	Hathor	<p>A2. “We used to talk that the hub objective was to be Eyes and Ears, understand how the market is evolving, discover good business opportunities.” Connections’ Manager, I-4 B2. “[One selected startup] had a social dimension, so we kept them in the program and broke the [minimum recurring revenue] rule.” 2nd Hub Leader, I-17 C2. N/A</p>
	Thoth	<p>A3. “[A senior leader told me] ‘I want to build some kind of innovation hub, maybe some kind of technology research institute, but I do not know how to start.’” 1st Hub Leader, I-7 B3. N/A C3. “[The hub] had an educator role. We organized several workshops about open innovation, funding, innovation, digital development, agile [...]. It had a very strong educational and cultural function, including with the executives”. Consultancy Partner, I-18</p>
	Ptah	<p>A4. “[The Latam CEO] started to always be very provocative in a positive sense, to get people to think and connect with what was happening in the world. And from these provocations, we were constantly faced with the ecosystem of open innovation. I mean startups, but not only startups. And still without a clear strategy on how to generate value from it”. 1st Hub Leader, I-13 B4. N/A C4. “Since it all began, we understood that innovation had to go through people, and we created a strategy whose one of the cornerstones was the innovation culture. [...] It is curious because people did not talk much about it then, and a few weeks ago, a person asked me if this had been on purpose. [...] ‘Where did this idea come from?’ [I answered] ‘Look, I don’t think it was strongly deliberate, we didn’t have a crystal ball to know, but we had this firm [belief]: that people were the channel of transformation, so we invested in the culture of innovation.’” 1st Hub Leader, I-13</p>
	Khnum	<p>D1. “We invited all these people for the Demo Day. We had a public of more than 200 people from inside and outside Khnum, investors, startups, and other big players from the ecosystem”, 1st Hub Leader, I-1 E1. “We set up an acceleration program, which was not actually an acceleration program. It was a 45-day support program for entrepreneurs that afterward became an acceleration program.”, 1st Hub Leader, I-1 F1. “We tried to involve the internal public as much as possible. [...] And the company leadership] started to see much more value in the project. So it was no longer something that I was pushing, that we had to push them to</p>
<p>II) Defining an initial orientation <i>D - Developing external image and reputation</i> <i>E - Gaining initial traction</i></p>		

F - Increasing internal legitimacy

participate, to engage; it became something that they demanded: ‘I want to participate, I want to be part of it; I see value in this,’” 1st Hub Leader, I-1

Hathor D2. “There is some media work that happens, we have a spontaneous brand that already exists when we talk about the Hathor Co. as an acceleration program, and we actively work for that.”, Connections’ Manager, I-4
 E2. “We had the first batch that happened in a more experimental format to discover, to understand [...], and so it was called [Version Zero]”, Connections’ Manager, I-4
 F2. “[We made an effort] to understand which startups made more sense to us, to have a more continuous journey, which categories shine more brightly for both CEO and VP, and which ones we found easier to approve the internal pitch.” 2nd Hub Leader, I-17

Thoth D3. “I think there was an objective, as an innovation area, of being known. [...] Firstly, being known inside the organization, and then externally. [...] I think it is a trajectory of showing value [...] Then people get to see it, things start to appear in the media, and things start to gain momentum”, Consultancy Partner, I-18
 E3. “In the beginning, it was like ‘let us think about a process to go into the areas and identify pains and search for startups, and then develop a design sprint process here to work together, and make joint solutions?’”, Consultancy Partner, I-18
 F3. “[Without any previous request], the CFO called me saying: ‘We’ll present the budget tomorrow; I’m waiting for your part.’ Well, then you see me literally stopping everything and [...] making a budget from scratch for the hub”. 1st Hub Leader, I-7

Ptah D4. “[We finally achieved] very high visibility after a few years working with open innovation in a very serious way, putting ourselves in the market, winning several awards,” 1st Hub Leader, I-13
 E4. “We started with innovation [...] it is very natural that the portfolio stays very focused on H1. [...] We could] identify ‘quick-wins’ as the initial strategy.”, 1st Hub Leader, I-13
 F4. “At the beginning of [the hub], we had the hub’s board. The president of the board was the CEO. Besides the CEO, there were also some vice presidents besides our own. And two other people from outside. So, since the beginning, we always had this practice and this space”. 1st Hub Leader, I-13

Khnum G1. “[We had] very capable people at Khnum, and very good people. [...] So we thought,] ‘well, there are entrepreneurs out there needing help. Why don’t we put these things together and get the entrepreneurs to talk to the people here?’”. 1st Hub Leader, I-3

Hathor G2. “We know [founders] who are doing excellent jobs, who used to be in big multinationals able to make appointments quickly, but when they lose that corporate “surname,” they get the door slammed in their face. Our program tries to bring a solution to that.”. VP (Hub Sponsor), Blog Interview

Thoth G3. “[The plan was to] go through an initial phase (funding) and then a second phase with a startup accelerator and corporate venture.” 1st Hub Leader, I-7

Ptah G4. “It was imperative that the startups became aware we were interested in them. And that we wanted to listen to them and that we could indeed take advantage of what they were proposing to us”. 1st Hub Leader, I-13

III) Proposing an initial identity

G - Building a narrative of the hub as a startup supporter

IV) Building structure and processes

H - Developing new roles in innovation processes

I - Expanding OI partner types

J - Learning engagement with startup

K - Reframing agency problem

- Khnum** H1. “There was a head, who was my line manager; me, who ran the day-to-day operations; and an intern, who was my right and left arm. [...] Within the acceleration program, we had the role of creating connections. We would go to the companies and say, ‘John Doe, we have a startup here that matches you.’” 1st Hub Leader, I-3
 I1. “At the beginning of the first year, we wanted to call universities to participate, so we visited some, including to see whether there were any startups in the incubators, etc., since we were searching for startups that used [plastic and chemistry] in their solutions, which is part of the Hub thesis.”. 1st Hub Leader, I-3
 J1. “We were testing [this entrepreneur support program], right? We didn’t know exactly what we were doing. It was a test. Those mentorships were also part of a testing process. “. 1st Hub Leader, I-3
 K1. “We created a program for supporting entrepreneurs, but later we saw that it was too little. The following year we made a much more robust 4-month program with a much closer follow-up of the entrepreneurs.”. 1st Hub Leader, I-3
- Hathor** H2. “For example, we [have the role of] putting our design team to talk to the startups and draw up this persona map. [...] There was also this key person to look at some back-office activities, make some more institutional connections or things like that. [...] And I have this role of navigating through external communities.”. Connections’ Manager, I-4
 I2. “There are some of these programs [of the Brazilian entrepreneurial ecosystem] that are, let’s say, target places where we know we will find startups more or less in this profile that we are hoping to find.”. Connections’ Manager, I-4
 J2. “So we were not very clear about how this journey between mentors would be. [...] We called this first program [Version Zero] to show this instrumental character for the company and also for the startups to understand that it was the first one and for them to help in this construction with us”. 2nd Hub Leader, I-17
 K2. “We work with improving the pitch of these startups, helping with valuation and how to improve their value proposition for future investments.”. 2nd Hub Leader, I-17
- Thoth** H3. “There are people [...] taking care of products that [...] are not yet our core, with room for us to create, to be a little more innovative. There are people responsible for [innovations in] the core business: our biggest income source.” Connections’ Manager, I-12
 I3. “We have, let’s say, goals with each of the ecosystem’s pillars. So, ‘what do we want with universities?’ ‘A, B, and C’; ‘what do we want with startups? What can we offer?’“. Connections’ Manager, I-12
 J3. “In the past, I think [the OI initiatives] were kind of done depending on the goal, depending on ‘hey, a business opportunity emerged here; what do we do?’ And then, because of some mistakes and learnings, we understand that there must be a more defined process and that everyone understands each [open] innovation method.”. Connections’ Manager, I-12
 K3. “Our idea is to be very transparent, not going to the market and talking to anyone if we do not have something to offer. [...] We have some of this concern because sometimes we talk to a startup, we speak ten times, and nothing comes out because we have nothing to offer at that moment, there is no project... So it’s a bit like being frustrated on both sides.”. Connections’ Manager, I-12

Phase 2: Brokering hub

V) Elaborating the mandate *L - Hub as an innovation function*

VI) Reconfiguring the orientation

Ptah	<p>H4. “There was a person specifically focused on this part of connecting with startups, but she also held other connection roles that were very much linked to relationships and training.”. Connections’ Manager, I-15</p> <p>I4. “[Besides startups,] we had a great relationship - until today, we have it - with other institutions and structures that are hubs for startups. [...] I approached them precisely to see how the relationship was and everything else and how we could constantly enrich this relationship. We never interrupted the relationship with any of them.”. Connections’ Manager, I-15</p> <p>J4. “We were still in a model of Ptah understanding how to work with startups: understanding how this kind of negotiation worked, how the MVP worked (we did not know much about how an MVP worked, a POC, and everything else; it is not service provision, it is co-creation...)”. Connections’ Manager, I-15</p> <p>K4.”We had a success rate, measured by both what the startup thought about our connection and what the business unit thought about our connection. It went from sixty to ninety percent of credibility, of trust, in the type of relationship we were establishing.”. Connections’ Manager, I-15</p>
Khnum	<p>L1. “When I took over Khnum’s Hub, my main challenge was to make it a business connection front between Khnum and the entrepreneurial ecosystem. To stop being just a program of private social investment, a program of social responsibility and reputation, and start being a program with an actual business bias, of market development for Khnum.”. 2nd Hub Leader, I-14</p>
Hathor	<p>L2. “[We became this] focal point, which helps not only to facilitate this communication of the whole group with these startups but also helps to filter, [...] and gives some level of analysis that is necessary to understand who these startups are, those which are participating in the acceleration program or other possible actions. The final scenario [at Hathor] was the following: IT as who solves H1 and our Hub (Area) as who is looking at what is H2 or H3.”. Connections’ Manager, I-4</p>
Thoth	<p>L3. “Regarding innovation, we are the main sponsor; maybe there could be a project with a university that comes via [another part of Thoth] or via other people, and we join in to compose the main scenario. After all, we already have some frames designed and some partnerships in place... But, theoretically, when this is not done, and we are going to start from scratch, it begins with us.”. Connections’ Manager, I-12</p>
Ptah	<p>L4. “Our focus here today (at H1) is to run the proof of concept, not to implement the project, because the project implementation is up to the area; we make this first bridge to identify the pain, identify the partner, link, lead the experimentation or developing the MVP to validate the hypotheses along with the proof of concept. But the implementation is the area’s responsibility. Just like paying, right? We are not the ones paying for the project”. BU Partner, I-16</p>
Khnum	<p>M1. “As we were doing internal marketing, a person from a unit in [another state] saw that we were accelerating Startup_A and closed a deal with them in that state. Today they are a supplier of their products for Khnum all over Brazil. They have Khnum as a customer.”. 1st Hub Leader, I-3</p>

M - Generating POCs, solving business challenges, developing suppliers, productizing, acquiring startups

Hathor M2. “We validate the problems and the possible fit. That would be the first successful stage, *i.e.*, when we understand whether or not there is a fit, but by then, we have already learned a little bit about the technology that the startup develops. A second moment would be precisely the POC: let’s test and run projects. We have The Prototyping Lab, so sometimes we can get away from this prioritization queue within IT, but sometimes we can’t, and this gives a hold on the project. [...] A third step would be the rollout. It is a little more complicated, and we imagine it in the long term because they are startups in this traction phase.”. 2nd Hub Leader, I-17

Thoth M3. “We even thought about the journey of this startup, from the moment they first meet us, then contact us, then establish a relationship, then we will make a POC... There is a whole design for this journey.”. Connections’ Manager, I-12

Ptah M4. “We always look for the maximum number of startups that can serve us, and we present to the business unit which is the expertise of each one; the BU supports us, technically, in choosing which ones would be the most appropriate, and then we make a Pitch Day. When it is related to a “challenge,” it works like this: [...], the area brought us that pain or that opportunity, and we go find the startup that can meet that pain, solve that problem. “. Connections’ Manager, I-15

VII) Building an internal identity
N - Projecting the hub internally as an innovation function

Khnum N1. “We come in with the Hub as a tool to help the business area reach its goal of increasing the sale of recycled plastic. The CEO recognized, ‘we believe in Open Innovation as a way for sustainable development.’“. 2nd Hub Leader, I-14

Hathor N2. “We are now encouraging people from outside our area (but inside the company) to send startups to us. And then, the startups they send also end up falling into this funnel of startup selection, and we decide which is the best route for them [...] The Prototyping Lab nowadays plugs better into our value streams (priorities and what is being developed) and the acceleration program a little less in this sense.”. 2nd Hub Leader, I-17

Thoth N3. “There was also a role in internal relationships with the people responsible for each major area (engineering, IT, etc.) to jointly identify the main pains and how they could be addressed via open innovation. In addition, establishing and maintaining the relationship with other business areas, the areas of support...”. Consultancy Partner, I-18

Ptah N4. “We have been acting and conquering our space within the company and have been fomenting innovation, the concept, and the mindset, in such a way that the process before was pushed, and today the process is organic because you already have this well disseminated in the company, with several people thinking about innovation. Indeed, our role is to guarantee that this flame keeps burning.”. 1st Hub Leader, I-13

VIII) Developing structure and processes
O- Increasing portfolio of integration mechanisms
P - Setting the governance for the mechanisms

Khnum O1. “[We launched Program#2 for startups at earlier stages because] there is a considerable percentage [...] that cannot [...] transform an idea, validate and get it off the paper. [...] What we realized was a well-defined thesis of acceleration [at Program#1] [...] This restricted a lot of the types of startups we accelerate. If we didn’t open the funnel and manage to get more businesses to develop in this sense, we would start to lack startups for [Program#1] after a few years. [...] And the return expectation with these startups was zero. The KPI there was actually how many would survive after the acceleration”. 2nd Hub Leader, I-14

P1. N/A

Q1. N/A

Q - Building a database of ecosystem players

- Hathor** O2. “Something that is happening, for example, right now, at this very moment, is that we identified some startups at a level of maturity far above what we believe we can deliver as value to them during the acceleration program. So we say, ‘look, maybe you are more suited to talk to CVC, maybe you are more suited to talk to Venture Building, or maybe it makes more sense to think of you as a supplier than an accelerated startup.’ And that is fine because, for the startup, it is perfect to have Hathor as a possible customer or to move forward with some other relationship or affinity model. So now the conversation goes more in this direction.”. Connections’ Manager, I-4
P2. “We also reduced the number of startups to have a better connection with them, to try to improve the selection, bring them closer to the CEO and VPs with monthly meetings, and a greater focus instead of getting a lot of people in, to be able to direct them” 2nd Hub Leader, I-17
Q2. N/A
- Thoth** O3. “Now we also have a tech team, the technology specialists, because when we are about to close an NDA with startups on the pitch day, the idea is that this team already has held previous meetings with the startup to understand whether or not these startups have viable technology and systems to work with us. Because - imagine that - I loved a startup, we closed the deal, and when we get to see it, their system does not talk to ours, so we have to go back ten steps to integrate them. Because of some mistakes [in the past], we decided to have this structure.”. Connections’ Manager, I-12
P3. “We have circle meetings, so... the guy who connects business needs with the hub needs me. So, even though the meeting should be only between the BU and him since he needs me for some initiatives, I have to be in this meeting, and the tech guy also has to be in this meeting. So they created this little circle model of who has to be in each session, and there is a whole forum in the discussion, how it goes on to be agile, and so on.” Connections’ Manager, I-12
Q3. “We are developing [...] a database with a list of startups, divided by segments, doing clustering like ‘this one is golden, this one is silver, this one we keep in touch with more, the other one is not...’ and so on.” Connections’ Manager, I-12
- Ptah** O4. “Throughout our journey, we became more sophisticated. From the moment we felt more prepared and more mature, we began to refine our way of doing innovation, bringing in other elements. For instance, [...] CVC. We did not have it at the beginning, so we added it. We included the corporate venture builder; we included projects that were more at horizons 2 and 3, more disruptive projects... This journey grew more robust, and our structure gradually diversified to embrace different types of innovation.”. 1st Hub Leader, I-13
P4. “I would say that this relationship with the C-Level executives has been intensifying over time. For example, this recurring meeting with the industrial VP did not exist initially. It came up later. We continually create forums to align some subjects, open new fronts, and get to know the priority for the area, you know? Understand the BU interests, so we don’t keep opening fronts without the area being interested. I would say that this, which already existed, was intensified with time” 1st Hub Leader, I-13
Q4. “We understood that the Hub’s core was connection itself, and one must have an intelligent base of contacts to have a rich connection. [...] We started to create our own database of relationships, including not only startups but also the hubs that can bring us solutions, *i.e.*, startups with solutions.” Connections’ Manager, I-15

Phase 3: Orchestrating hub

IX) Consolidating the mandate

R - Hub as an EM function

Khnum R1. N/A

Hathor R2. “[We work towards establishing] a subsequent partnership with the startup, which will sell their products in our channels, our marketplaces. We already offer it during the [acceleration] program... it will eventually be an acquisition, an investment. There are not so many opportunities outside this.” 2nd Hub Leader, I-17

Thoth R3. “From the moment we developed the product and showed how this scale has to be done, [the business unit] starts to do the scale, to sell, in short... [...] Sometimes we even involve a third party. There was even some recent news in the media that a hospital was one of our partners. We put together a startup, the clinical hospital, and the Business Partner responsible for the healthcare market to deliver the product.” Connections’ Manager, I-12

Ptah R4. “Within this logic [of creating value for our clients], we have been developing partnerships; integration with science and technology centers, and working on top of the construction processes (which is one of our main markets) where we know that the pains of the construction companies are the most diverse” 1st Hub Leader, F-1

X) Defining a new orientation

S - Orchestrating partners for complementing value propositions

Khnum S1. N/A

Hathor S2. “A startup we had last year takes care of the distribution of near-expired products by forecasting demand versus expiration date. We can direct them to our Supply because they are the ones who make the demand prediction... It could be to our franchisees because they are the ones who have the product at hand. The ones who will need to ‘get rid’ of this product and make the sale will be the franchisees... We can think about direct sales, etc.” 2nd Hub Leader, I-17

Thoth S3. “Most of the time, the contact of where we are going to test something when we need a third party comes from us because of our base of connections, right? So... “Which partner are we going to test with? Honestly, I mean... a lot of people are crazy about running new things without much cost, aren’t they? So, “hey, we are going to run a test with you, and we are going to do it in that hospital.” For them, it is fantastic, isn’t it? Because they are testing and participating in something new, they will be in the media... “ Connections’ Manager, I-12

Ptah S4. “This is a new working model, where we bring knowledge from inside the company and transform it into a business outside the company (it can be through a spinoff, a startup... it can be a startup that developed something for us, or that we will create that particular product in partnership with it... it can be a transfer of knowledge where we will work with royalties or something of this kind). “ Connections’ Manager, I-15

XI) Building an external identity

T - Ecosystem partner attraction centered on a value proposition

Khnum T1. N/A

Hathor T2. “Hathor believes that beauty is everywhere and aims to innovate, in a responsible manner, the way beauty is in our lives and always solve the pains of our consumers and business partners. That is why we created our Hub, as a way to develop a new generation of beauty with startups”, C-Level of Technology, Article in Newspaper (2.2)

Thoth T3. Same as S3 - interpreting from an identity perspective.

Ptah T4. “Today, our capacity to attract startups is very robust. When we launch a challenge, when we put up an initiative and invite startups (not only startups but also players in the ecosystem), we get a massive response.” 1st Hub Leader, I-13

XII) Expanding structure and processes

U - Decentralizing hub and innovation culture within BUs

V - Aggregating functions for managing ecosystem value proposition, participation, and collaboration

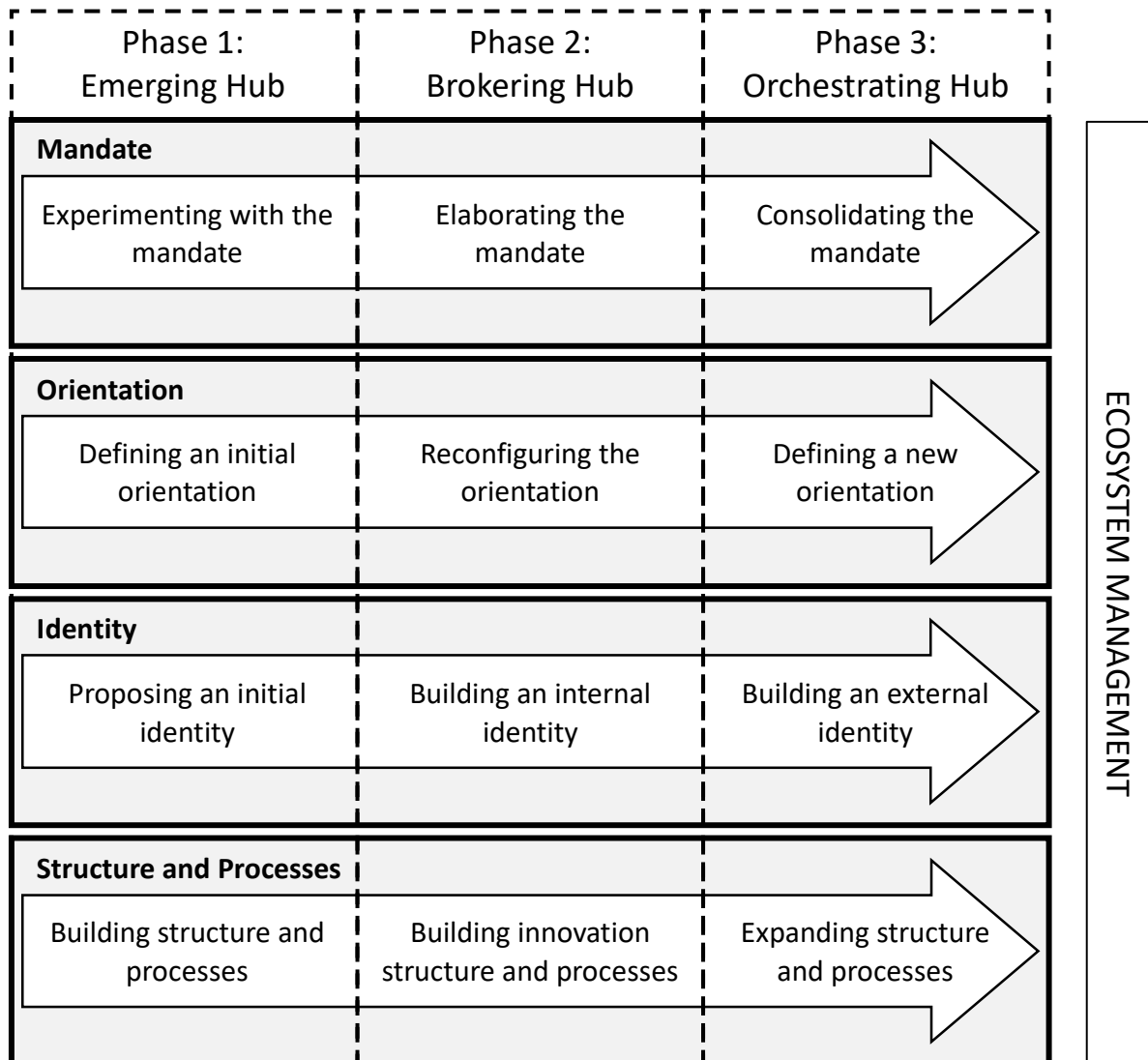
Khnum	U1. Failed attempt: “We tried to implement a very robust intrapreneurship program within a company that wasn’t at that moment yet, even with a four-year-old Hub.” 2nd Hub Leader, I-14 V1. N/A
Hathor	U2. “After a few months, with the improvements that we implemented during the program already being felt and already reaping results, we can have new conversations with the startups, and because of the mentoring [mechanism], the startups have built internal networking that helps them to do business here, without necessarily needing us as the Hub team bridging the gap.” 2nd Hub Leader, I-17 V2. “They would be entering our channel (Marketplace). We start to earn revenue with the startup; we highlight them on our page; we begin to work with them and develop [product] categories that maybe we would not have such a careful look at them if they entered the generic categories ‘pool.’” 2nd Hub Leader, I-17
Thoth	U3. “Our idea is to have this startup’s database so that [anyone from the company] can browse it themselves. A database or dashboard where we put all the players we work with [...] and make it available for those who also work with startups that are not on our focus because they are not necessarily dealing with digital products, but it is Thoth’s focus... And they can use our expertise, ask for advice, and so on, but we will not run the POC. They will.” Connections’ Manager, I-12 V3. “As we have an idea, we can speak to several people in the market and do projects with many. I think this is a great point. And we can make partnerships for what we cannot manufacture and would need it, like “Hey, we don’t have the hardware, we don’t have the scale for hardware. Who can manufacture hardware?” so we get a company or a hub that does it, that has that capacity.” Connections’ Manager, I-12
Ptah	U4. “[The Hub as] a great orchestrator that I mentioned at the beginning, which didn’t exist, ended up becoming this. Today it is spread all over Brazil. We do not have “Hub-folks” as a physical space, but people who think about innovation in a decentralized way scattered throughout Brazil, people we call innovation envoys.” 1st Hub Leader, I-13 V4. “We have got the first case. Their [startup] solution is fascinating... focused on our clients in the civil construction industry. It is not our core business, but we sell a lot to construction companies, and it is a solution that aggregates a lot [of value] to the construction process, which ends up being a differential.” BU Partner, I-16

Source: author’s data

4. RESULTS

This chapter presents an evolutionary framework for corporate hubs based on the analysis of the four cases studied, illustrated by Figure 12. Four primary constructs are vital to the Hub's development process, which are the Hub's (1) mandate, (2) orientation, (3) identity, and (4) structure and processes. The mandate is understood as the formal role of the Hub for the organization. The orientation comprises the focus towards which the Hub leaders are pointing, involving a set of immediate goals. The identity is the understanding of what the Hub is about, what it aims to achieve, and how it will do it, agreeing on the core characteristics of the underlying purpose of the Hub. As Gioia et al. (2000) proposed, identity is not a rigidly enduring notion but can be frequently revised, facilitating organizational change. Finally, the structure and processes specifically designed for the Hub. These constructs had a changing figure as the Hub evolved. The findings are separated into three parts, describing the three phases derived from the analysis (emerging, brokering, and orchestrating Hub) and the activities involved in shaping the hubs' mandate, orientation, identity, structure, and processes.

Figure 12 - Framework for an evolutionary process of an ecosystem management hub



Source: author's data

4.1. Phase 1: Emerging Hub

The initial phase of the hubs could be identified as an *emerging* phase. Leaders of the Hubs were *experimenting with the mandate, proposing an initial identity, building the structure and processes, and defining an initial orientation* until the Hub could evolve from experimentation to a better-defined figure for the corporation and the ecosystem. The process started with a decision from top management or their support to a bottom-up initiative.

4.1.1. Experimenting with the mandate

Experimenting with the mandate means that the hub leader was working with the senior leadership on establishing the Hub's mandate, built on the initial motivations. All informants reported that the Hub would necessarily be "open" for the sake that it would connect to external players such as established innovation hubs, startups, and universities to foster innovation. Nevertheless, the mandate was not clear but sufficient to function as a compass for the hub development.

Three experimental mandates were identified: (1) generic, (2) purpose-oriented, and (3) culture game-changer. In the first one, the intention was to make the Hub able to create business opportunities for the corporation through open innovation (OI) initiatives. In the second one, a strong sense of purpose, such as environmental sustainability, social responsibility, and animal welfare, was placed at the foundations of the Hub that would connect to external players with the same purposes. Lastly, in the culture game-changer experimental mandate, the Hub was to become a reference in activities aiming at the change of behavior of individuals in the mainstream for a more participative, more open to risks, more technically prepared to initiate, lead, or participate in innovation projects in the corporation.

In three cases studied, the hub leaders experimented with more than one mandate simultaneously. The exception was Khnum, whose focus was mainly on connecting with purpose-aligned external players, especially entrepreneurs whose focus was "*improving society using chemistry,*" as Khnum's 2nd Hub Leader stated (I-14). Their hub emerged as a bottom-up initiative but counted on initial and increasing support from the top management. With a similar purpose-oriented approach, Hathor developed the Hub's mechanisms aligned with their top management's decision to create new products that are vegan and not tested on animals. Nevertheless, Hathor also intended to create a corporate innovation hub capable of generating other business ideas by connecting to external entrepreneurs. Thoth and Ptah's Hubs also shared this generic open innovation intent. Besides, they were also driven by the top management. For

example, one respondent (I-18) at Thoth said that the C-Level executives “*noted that the ICT market was changing and had a ‘fear of missing out.’ So, they said, ‘we need an innovation initiative.’*” At the same time, Hub Leaders at both companies recognized the necessity of a culture-game-changing set of activities and included it as part of the Hub’s mandate.

4.1.2. Defining an initial orientation

Furthermore, the Hubs initially were *defining an initial orientation*. It meant deciding the first immediate goals the Hubs would pursue and all activities towards them. The data evidenced three main orientations: (1) gaining initial traction, (2) developing the external image and reputation, and (3) increasing internal legitimacy.

The first orientation, as informants said, was to start with deploying trial activities and aiming at less complex innovations (faster to implement) to deliver the first results, enable learning and gain initial traction.

The second orientation was towards developing the Hub’s image and reputation through organizing events like Demo Days and Pitch Days to present positive results of the Hub activities. Another way of doing it was through one physical space (for Path), which was understood as an open innovation symbol (both internally and externally), or marketing through media work essential to connect to external players.

Thirdly, increasing internal legitimacy through building internal relationships, presenting results to the C-Level executives, and showing value creation with incremental innovation. The 1st Hub Leader gives an illustration about dealing with some resistance coming from a part of the Thoth’s executives and building legitimacy:

The IT director changed his attitude. First, he was hesitant about the Hub and very harsh with me. But, in the end, he became one of our most valued sponsors as soon as he and I sat down, and I explained how it all worked with a pen and paper. He even went to China for [an international entrepreneurial ecosystem event].

4.1.3. Proposing an initial identity

Another part of the initial phase was about *proposing an initial identity*. The informants clarified that hubs built an initial narrative for the internal and external public that they would be a point for startup connection and support. For instance, at Khnum, the 1st Hub Leader (I-3) was proud of inspiring entrepreneurs:

We would gather everyone in a room during a one-day event; we presented Khnum and aligned expectations. We always brought an outstanding, experienced entrepreneur to talk to them about his/her entrepreneurial trajectory because they needed inspiration.

4.1.4. Building the structure and processes

The last crucial initial set of actions was *building the structure and processes* of the ambidextrous unit. It contained the activity of *expanding partner types*, given the Open Innovation strategy in execution, which had led to the implementation of a boundary-spanning structure. Informants described how they approached other corporate hubs, universities, and research labs. *Developing new roles in innovation processes* was another activity in the emerging phase, such as the role responsible for connecting with the entrepreneurial ecosystem players or the people responsible for integrating with the mainstream, mapping business opportunities, and managing joint projects with external players. These were derived from several informants explaining the Hub and its activities. For example, after explaining his job of making bonds with other hubs and startups, the Connections' Manager at Hathor (I-4) complemented:

The process of managing the executives' agendas, organizing these dates [for mentoring entrepreneurs], and this part of contacts ended up with [Jane Doe]. [...] We also had this other figure, a tech person who would get the information from the business areas so that we could prioritize.

Then, *learning engagement with startups*, aligned with the strategy of gaining initial traction, informants affirmed that when the Hub started, the people and the company had little knowledge about startups and engagement mechanisms. For example, the 1st Hub Leader of Khnum (I-3) said that the mentorships for startups "was a very experimental process," and the Connections' Manager at Ptah (I-15) affirmed that:

The Hub did intense work of "startup-language" education in the internal areas. In fact, when I took over [the connection role], I didn't know how to deal with startups; I didn't have this previous relationship.

Which is complemented by the Hub Leader at the same company (I-13):

The Hub started by following a 'startup concept' - testing things, learning what was best and what worked, and opening space and paths in this direction, both inside and outside the company.

Finally, the hub leaders were *reframing the agency problem*, as deduced from the data, putting the interests of startups as primary goals, and making an effort to meet their needs, even if it meant a burden for the Hub and the mainstream. For example, at Khnum and Hathor, their Hubs launched a consultancy service for startups using mainstream resources, with the criteria being to choose and allocate the best company resources based on startup needs, which overloaded the mainstream workforce due to unregarded business needs.

4.2. Phase 2: Brokering Hub

The second phase was focused on the Hub's brokering service between the mainstream and the ecosystem for radical innovation management. It included activities related to *elaborating the mandate, reconfiguring the orientation, building an internal identity, and developing structure and processes.*

4.2.1. Elaborating the mandate

Regarding the mandate, the Hub Leaders worked on establishing the Hub as an innovation function managing radical innovation projects for the corporation, aligned with the C-Level executives' priorities. As a result, the Hub became a focal point for startup connections in the company while managing both ecosystem engagement mechanisms and the innovation process at the business units. The Consultancy Partner at Thoth (I-18) described the Hub as an external function coupled to the business units and accountable for the expertise in innovation management:

The Hub does not necessarily innovate; it enables innovation. The areas are the ones that do it. It helps the Areas with the method, open innovation, funding, and other innovation tools. It helps them innovate.

Another respondent at Thoth, a person with the role of bridging the needs of the business areas with the ecosystem possibilities called Business Unit (BU) Partner (I-16), has also reported:

We must do this tracking, this management, but we are not the protagonists of the projects. We want the protagonists to be the areas, the research centers, and the startups in the ecosystem making this happen. That is why I like to use the term "facilitator."

4.2.2. Reconfiguring the orientation

Second, another essential task was *reconfiguring the orientation* to align Hub goals and subsequent undertakings to accomplish the mandate of an innovation function. More specifically, it concerned generating proof of concepts to test startup solutions on a smaller scale in mainstream operations not only for helping startups develop their products but doing it specifically for solving business challenges, developing startups to become suppliers (developing supply chain through procurement process), developing products (white-label products), and scouting startups for acquisition. For example, at Khnum, they reached a successful case by connecting an acceleration program participant startup to a partner, one of the largest fragrance suppliers in the world. After following up on the development of the

product, Khnum procured it. At Hathor, a respondent (I-17) described the goal of enabling a startup to become a supplier and its process.

We end up customizing [the trajectory of] the technology startups to allow constant contact with the areas they are going to serve rather than necessarily going through a complete beginning, middle, and end trail of product improvement. They end up getting much more into the solution architecture part, the required advances, and issues to be addressed to become our supplier, something more focused on this part.

That was sometimes followed by directing the startup to the mergers and acquisitions area (M&A) for acquiring the startup. A solid orientation to productize was identified at Thoth. The Connections' Manager explained one possible approach (I-12).

Suppose we need a faster business, a white label, something less challenging to productize. In that case, we often go via startups, which already offer ready-made products that will be, many times, [more easily] adapted to our scenario.

Ptah's Business Partner provides an insight (I-16) into this reconfiguration by commenting on the new key performance indicators.

Today we have Innovation KPIs, something that, three years ago, we still needed to figure out the best way to do. Our KPIs are the number of projects started, running tests, and 'fail-fast.' [...] We make this first bridge to identify the business pain, pinpoint the partner, link, make a test or develop the MVP to validate the hypotheses during the proof of concept.

4.2.3. Building an internal identity

A third necessary action in this phase was *building an internal identity*. The hub leaders worked on projecting themselves as an innovation function for the mainstream, being a focal point for recognizing and articulating opportunities, evolving them into a business proposition, and preparing the areas for rollout. Informants reported that it was necessary to continually explain what the Hub was about and recognize it as a facilitator of innovation. Used words varied "facilitator," "provoker," and "motivator." Exemplifying with an example at Ptah, a Connections' Manager (I-15) confirmed that *"the areas can pursue their POCs by themselves; however, they usually talk to us first."* The underlying reasons are the network of connections and the innovation management know-how. This proactive attitude from the mainstream happened after a long process of explaining the Hub's role and showing its value.

4.2.4. Developing the structure and processes

In addition, the activity of *developing the structure and processes* also distinguished the second phase, encompassing the (1) increase of the integration/engagement mechanisms'

portfolio, (2) set-up of the governance for the mechanisms, and (3) building of a database of ecosystem players in a digital platform.

Concerning the portfolio of integration mechanisms, the interviewees nominated more mechanisms when describing the second phase. Subsequently, it was possible to recognize two patterns: (a) the integration mechanisms with the mainstream, including a differentiation based on levels of innovation (from incremental to more radical), and (b) the ecosystem engagement mechanisms distinguished by ecosystem type.

Respondents informed that, after an initial launch of ecosystem engagement mechanisms, they had to align them better with the organization's objectives because they were very startup-centered (a situation caused by the agency problem in Phase 1), so these mechanisms were enhanced in both directions (startup and corporation). For example, the 2nd Hub Leader at Khnum (I-14) stated:

When people from the sales team select these startups, one of the selection criteria is precisely the business potential (increasing sales), which would previously have been negatively seen considering the way we used to operate because that (potential) was not the goal.

Hathor executives' criteria were also applied with more emphasis by the Hub, echoing in the selected categories of startups. They were also interested in being closer to the startups to "promote this intimacy with our senior management," as the VP (Hub Sponsor) declared. Thus, their number in the acceleration program was reduced.

At Ptah's Hub, expert people from the mainstream also have a role in scouting startups, as described by the 1st Hub Leader (I-13):

Who are Ptah's key people who can help us evaluate whether a startup offering is good? So, we invite them no matter from which area they come from, even out of our country.

The mentoring initiative at Hathor and Khnum was also improved for both the startups and the corporation, demanding less time from the senior leaders involved in the process and more tailor-made for the startup challenges. For example, at Khnum, the 2nd Hub Leader (I-17) described the new criteria:

The matches between the mentor (a Khnum senior leader) and the startup were no longer made solely based on the challenge the startup had but included the opportunities it presented to Khnum and that the mentor could offer it, and vice-versa. So it was a win-win.

And the 2nd Hub Leader at Hathor affirmed that this mechanism is less time-consuming for the senior leaders because

The mentors are now developing this feeling: “I already understand the program; I don’t need an onboarding. I only need to know what the business pain of this specific startup is, but I already have a notion of what this pain might be. So, in the briefing, I will only understand it better.”

Ptah and Thoth’s Hubs also improved the integration with the mainstream. For example, they organized team communication and recurring meetings to discuss ways to address corporate objectives, such as business challenges, which startup to forward to M&A, and aligning ecosystem mechanisms to innovation thesis.

Another group of mechanisms is linked to innovation management at different levels. Thoth defined a group of people responsible for more radical innovation, “*who are indorsed with a good margin to create, to be more innovative,*” using the Connections’ Manager (I-12) words, and a different team for incremental innovation, which are the Business Partners (previously existent). Ptah’s 1st Hub Leader also pointed out that the Hub initially focused on incremental innovation (H1), even though more radical innovation (H2 and H3) opportunities were already mapped. However, in Phase 2, they launched a new structure dedicated to more radical innovation management while defining governance for the mechanisms, which will be described later. At Hathor, in Phase 2, there was still an ongoing definition of innovation fronts and defining accountability, as observed by the 2nd Hub Leader (I-17):

In principle, our accelerator program handles more H2 and H1 than our Prototyping Lab, which focuses more on H3. Nevertheless, the Lab can also work with H2. [...] sometimes it seems more reasonable that the Lab got closer to a hub of universities or research hubs and be more driven to this side of scientific investigation than to this side of productization and scaling existing startups.

There was an increase in the portfolio of engagement mechanisms for different types of ecosystems. Informants delineated a clear distinction between entrepreneurial and knowledge ecosystem engagement mechanisms and their drives. Regarding the latter, Hub Leaders scouted knowledge centers, like universities and research labs, with the main reason for building joint labs and joint research to collaborate and meet the requisites of base research and innovations, both incremental and radical. For example, Ptah and Khnum are interested in metal and chemistry new applications which demand a physical lab for experimentation. Part of Hathor and Thoth’s needs was access to advanced software technologies and hardware applications. Other motives were scouting startups on campus and talent sourcing. Thoth and Ptah also employed other mechanisms, like knowledge crowdsourcing and knowledge-spreading events, targeting ideation, discovering opportunities, and co-creation. A Connections’ Manager at Ptah (I-15) exemplifies:

We continually launch challenges, both for students and professors, precisely to bring more knowledge and enable us to co-create. This boosts the company's employees internally (who also participate) and makes the innovation culture occur more fluidly.

These mechanisms evolved in scope and volume: what in the previous phase were trials became partnerships, research, intellectual property, and radical innovation under development. Thoth's Connections' Manager (I-12) comments about two alliances and the longer development life cycle for higher uncertainty projects:

Nowadays, we have partnerships. For example, we have a 5G lab with [a university] and another lab at [another university]. These challenges that go to a laboratory take longer because they are academic projects, they are doing tests, etc. Consequently, we understand that this product life cycle will take longer for this product to come out. Afterward, we will think about scale.

Informants showed how they were progressing regarding entrepreneurial ecosystem engagement mechanisms. After establishing the initial ones, the Hub matured to a point ready for increasing the portfolio. For example, by launching new acceleration programs for earlier-phase startups (Khnun), introducing tailored mentoring besides the existing generic one (Khnun and Hathor), structuring corporate venture capital and venture building (Ptah), building a community between partnered startups (Khnun and Hathor), partnering with renowned business accelerators and incubators (Khnun and Thoth).

Table 7 lists innovation, knowledge, and entrepreneurial ecosystem engagement mechanisms found in each case study, marking with a "Y" or "N" where they were or were not identified. Blank cells indicate inconclusive instances (lack of data).

Table 7 - Ecosystem engagement mechanisms identified

	<i>Engagement Mechanisms</i>	<i>Khnun</i>	<i>Hathor</i>	<i>Thoth</i>	<i>Ptah</i>
<i>Entrepreneurial Ecosystem</i>	Collaborative space	N	N	N	Y
	Joint Programs (Corporate Hackathons, Calls, and Innovation Challenges)			Y	Y
	Corporate Venture Building and Acquisition		Y		Y
	External presence: scouting partners and communities	Y	Y	Y	Y
	Connection agents: facilitate connections for startups (partners, customers, channels, investors)	Y	Y	Y	Y
	Lead startup product experimentation		Y	Y	Y
	Corporate Incubator and Accelerator (Training, consulting, mentoring, following-up services for startups)	Y	Y	N	
<i>Knowledge Ecosystem</i>	Joint labs	N		Y	Y
	Joint research			Y	Y
	Knowledge center partner scouting	Y		Y	Y
	Knowledge crowdsourcing			Y	Y
	Knowledge-spreading events			Y	Y
<i>Innovation Ecosystem</i>	Integrating startup solutions to owned marketplace	N	Y	N	N
	Orchestration of innovation sources	N	Y	Y	Y
	Exploitation of new products and services	Y	Y	Y	Y

Source: author's data

Setting the governance was another step in building an innovation structure and processes while rebalancing the agency problem. According to Ptah and Thoth informants, a crucial part of this task was defining a council of executives responsible for monitoring the Hub strategy, initiatives, and results. In all cases, Hub Leaders developed enhanced rules for the mechanisms. For instance, which areas and related resources must be or must never be involved in them (and how), regular conferencing with senior leaders to align them with the innovation thesis, pre-established or extraordinary meetings for deciding matters like investing in a startup or proceeding with an innovation project. Concerning the governance, the 1st Hub Leader at Ptah (I-13) stated:

[The governance with the C-Level] was intensified over time. For example, this meeting with the Industrial VP did not exist; it came later. We create forums to align the issues, open new fronts, and even identify the priority for the area, you know? So that we don't open new frontiers without the area's interest. I would say this already existed, but it has intensified over time.

Lastly, informants at Ptah and Thoth commented on a database built to converge the accumulated partner-connection experience in one place, enabling an easier search and selection of qualified partners for Open Innovation initiatives. Moreover, it also opened the possibility of decentralizing the connection effort by making this database available in a platform for all business areas.

4.3. Phase 3: Orchestrating Hub

In the final phase of the orchestrating Hub, activities were centered on *consolidating the mandate, defining a new orientation, building an external identity, and expanding the structure and processes*. At this phase, the Hub matured to manage innovation at the ecosystem level without losing the capacity of the corporate innovation function it had evolved itself to, continuing to generate POCs, develop suppliers, and address business needs. Ptah, Thoth, and Hathor reached this phase.

4.3.1. Consolidating the mandate

During this phase, Hub Leaders directed efforts toward consolidating the mandate of the Hub as an Ecosystem Management function, accountable for designing, planning, and managing actors and activities pertinent to the ecosystem distributed value creation and capture for its targeted audience, as inferred from the informants' data, especially when they exemplified successful value-creation cases.

4.3.2. Defining a new orientation

An essential task for the hub leaders was to define a new orientation aligned with the mandate. As a result, it changed to orchestrating partners for complementing value propositions. Informants reported scouting and qualifying partners for the successful development of an innovation not held by the mainstream corporation but the result of a confluence of actors and complementors for elaborating a new offering to a customer. For example, the 2nd Hub Leader at Hathor described one of their cases in which the Hub scouted a startup and is helping it to grow. They are also experimenting with a new value offer with a novel ecosystem actor: a specialized logistic service.

From now on, we must prepare startups to reach the rollout moment. We are partnering with a log tech that does last-mile delivery within complex communities, which generally don't have a zip code, and typically don't like to deliver within communities. So, the startup is getting there and creating a distribution hub. [...] we can help test one Hub and help with a second one...

4.3.3. Building an external identity

In this third phase, informants recognized the importance of *building an external identity* as an ecosystem orchestrator centered on a value proposition, creating opportunities for the entrepreneurial ecosystem players. For instance, Hathor's VP (Hub Sponsor) published on a popular website for entrepreneurs the sayings:

I would love to be able to make some partnerships with some [of these startups] within our group, either by using some service or eventually distributing some product. But, above all, [I would love] to test, in practice, within our ecosystem, growth opportunities for these companies.

This way, the VP affirmed the centrality of orchestrating the startup to become an actor or complementor in the ecosystem value proposition. That was also the case for Thoth, which promoted partnerships centered on joint solutions for their customers, as it was for Ptah, which attracted and partnered with a startup with a clear intention to improve its customers' operational processes.

4.3.4. Expanding the structure and processes

The last set of activities in this phase was those related to *expanding structure and process*, with two main streams: (1) decentralizing hub and innovation culture within business units and (2) aggregating functions for managing ecosystem value proposition, participation, and collaboration.

As shown in Ptah and Thoth's case, a database concentrating information about partners already mapped, qualified, and even actively working with the organization helped decentralize these hubs. These databases enabled mainstream users to connect to the ecosystem and lead their innovation projects with little or no intervention from the Hub. Conjointly, there was also a strategy to disseminate knowledge about managing these projects and offer guidance to the business unit staff. At both companies, respondents affirmed that one of the actions was to provide methodologies to the mainstream areas. A differential in Ptah's case was building a network of "innovation envoys" spread within the company. A Connections' Manager (I-15) described their function:

All these innovation envoys are trained [in innovation management methodologies]. They can support the internal teams precisely in improving an idea. When it happens to arrive at the Hub, the process is well worked out.

Conversely, this decentralization was not observed either at Hathor or Khnum. At the former, there was a movement of nurturing independent relationships between startups and business units, but the Hub nonetheless stirred this connection. It remained unclear whether some of the Hub processes were decentralized. Considering the latter, Khnum attempted to decentralize the innovation culture through a program for promoting entrepreneurs inside the firm but failed in that effort. This is described by the 2nd Hub Leader (I-17):

We tried to implement an intrapreneurship program that was part of this expansion of the Hub [to the mainstream]. It would be an inward look. So [the question was] 'how can we incite that the mainstream members also develop new ventures internally, creating new sources of revenue for the company?' So, we did a great job of benchmarking and research to understand how we should do this. We made the entire program, its contents, and its phases. It started with a training program, and then it would go through a sprint model and afterward the incubation of the best ideas which would be selected. And we couldn't get it off the ground. This was a big blow... Today, looking back, I realize that we made a move that, ironically, we didn't start small; we tried to implement a very robust intrapreneurship program within a company that wasn't at that moment yet, even with a four-year-old Hub.

Finally, aggregating new functions to existing roles was necessary to manage ecosystem value proposition, participation, and collaboration, all of which are core activities in the orchestrating Hub. Informants affirmed that they were executing these tasks without citing any new positions, so it is inferred that they aggregated ecosystem orchestration functions to their responsibilities. For example, Hathor's Hub organized a joint marketing campaign, including advertisements and a series of educational videos and posts that promoted the startup brand and product, which had been previously inserted in Hathor's marketplace.

5. DISCUSSION

5.1. Proposing a new framework: an evolutionary process of an Ecosystem

Management Hub

The main contribution of this study is a framework (Figure 12) of an evolutionary process of a hub with the ecosystem management function mandate comprising three phases: Emerging Hub, Brokering Hub, and Orchestrating Hub, as one possible evolutionary journey. However, this is not to argue that Figure 12 is a stage-gate model that corporations willing to become Ecosystem Orchestrators should follow to realize their ambitions, as this was one possible evolutionary route with different traits for each of the four cases and even considers one company that did not reach that final Orchestrating stage. The collected data shows that the process either starts under a top-down demand or is bottom-up driven with top management support. The results presented four building blocks of the orchestrating hub that evolves through the phases: the Hub's (1) mandate, (2) orientation, (3) identity, and (3) structure and processes. The data also indicate that the Hubs progressively bring more strategic innovations to the portfolio as they mature.

The Hub's mandate first passes through experimentation, in which the Hub Leaders had a higher level of freedom to probe purpose-oriented, generalist-oriented, or culture-game-changing-oriented innovation hub. Afterward, the mandate is elaborated toward an innovation function for generating new products from incremental or radical innovations. Finally, the Hub's mandate is consolidated for the Hub to become an ecosystem management function.

As for the Hub's orientation, the initial activities are divided into three fronts. First, it develops external image and reputation through participation in other entrepreneurial ecosystem hubs, organization Demo Days and Pitch Days, and media work. Second, it gains initial traction by launching and building knowledge with trial ecosystem engagement mechanisms while focusing on less-complex projects. Third, it simultaneously increases internal legitimacy by educating senior leaders and mainstream employees in innovation culture and pushing them to cooperate in the Hub's springing ecosystem engagement mechanisms. In Phase 2, the orientation is reconfigured to generating POCs, solving business challenges, developing suppliers, productizing, and helping the startup acquisition process. Ultimately, the Hub defines a new orientation pointing to orchestrating partners to complement value propositions, executing the EM function.

In terms of identity, it commences as an entrepreneur-inspiring figure and startup supporter. Later, Hub Leaders begin projecting the hub as an innovation function, calling to themselves

the responsibility of managing discovery, incubation, and scale of innovations, concurrently projecting this image internally. Lastly, as the EM function's mandate consolidates, the Hub builds an external identity so that players in the ecosystem recognize it as an orchestrator centered on a value proposition.

Regarding structure and processes, firms establish the ambidextrous hub in the emerging phase, expanding the array of partnerships in the ecosystem. They also design new-to-the-firm innovation roles accountable for managing engagement with the ecosystem, searching for funding alternatives, and organizing internal events to promote innovation culture and methodologies in the mainstream. Meanwhile, the first ecosystem engagement mechanisms are created and tested, generating learning for the Hub. In parallel, processes are startup-centered, consequently imposing an agency problem to be rebalanced. In the next phase, the Hubs' structure and processes develop with improved or new mechanisms, enhancing hub-mainstream integration, ecosystem engagement, and innovation.

In some cases, hubs build a database with ecosystem partners' information. Concurrently, Hubs set the governance, promoting more touching points with top executives in a recurring fashion or ad hoc. Finally, the Hub matures and reaches the final phase, where it aggregates several functions accountable for EM function processes while concurrently decentralizing roles and becoming more networked to the mainstream, that now has a more robust innovation culture incorporated.

Concerning the cases studied, there were unique features in each trajectory. Giving more detail concerning Phase 1, all hubs were experimenting with the Open Innovation mandate, but not in the same way, as Khnum and Hathor were more purpose-oriented, while Thoth and Ptah were more culture-game-changing-oriented, and only Khnum was less generalist-oriented. Concerning the orientation, even though all Hubs pursued gaining initial traction, Thoth and Ptah were centered on leading projects with quicker returns. On the other hand, Khnum and Hathor prioritized launching mechanisms in trial mode focused on learning. As for the initial identity, Khnum and Hathor had a stronger narrative of helping startups due to their acceleration programs, even though Ptah and Thoth recognized that they should create value for startups as part of the OI strategy. The same reasoning is valid for the agency problem, which was less pronounced in the latter cases. Table 8 presents a summary comparing each case in Phase 1.

Table 8 - Comparing cases during Phase 1

	<i>Khnum</i>	<i>Hathor</i>	<i>Thoth</i>	<i>Ptah</i>
<i>Experimenting with the mandate</i>				

OI Generalist-oriented	N	Y	Y	Y
OI Purpose-oriented	Y	Y	N	N
OI Culture-game-changing-oriented	N	N	Y	Y
<i>Defining an initial orientation</i>				
Developing external image and reputation	Y	Y	Y	Y
Gaining initial traction	Y	Y	Y	Y
Increasing internal legitimacy	Y	Y	Y	Y
<i>Proposing an initial identity</i>				
Building a narrative of the hub as a startup supporter	Y	Y	Y	Y
<i>Building the structure and processes</i>				
Developing new roles in innovation processes	Y	Y	Y	Y
Expanding OI partner types	Y	Y	Y	Y
Learning engagement with startup	Y	Y	Y	Y
Reframing agency problem	Y	Y	Y	Y

Source: author's data

During Phase 2, all hubs followed similar trajectories concerning mandate, orientation, and identity. Still, the structure and processes differed, especially in governance, as Khnum did not create a solid set of rules, routines, and accountabilities for the Hub's mechanisms. Furthermore, Thoth and Ptah stood out for their built database that centralized knowledge about the ecosystem players and their fit with opportunities that the mainstream or the hubs continually discover. Finally, there was also a difference regarding radical innovations, where Thoth and Ptah were willing to undertake more radical innovation projects. Table 9 presents a summary comparing each case in Phase 2.

Table 9 - Comparing cases during Phase 2

	<i>Khnum</i>	<i>Hathor</i>	<i>Thoth</i>	<i>Ptah</i>
<i>Elaborating the mandate</i>				
Hub as an innovation function	Y	Y	Y	Y
<i>Reconfiguring the orientation</i>				
Generating POCs, solving business challenges, developing suppliers, productizing, acquiring startups	Y	Y	Y	Y
<i>Building an internal identity</i>				
Projecting the hub internally as an innovation function	Y	Y	Y	Y
<i>Developing the structure and processes</i>				
Increasing the portfolio of integration mechanisms	Y	Y	Y	Y
Setting the governance for the mechanisms	N	Y	Y	Y
Building a database of ecosystem players	N	N	Y	Y

Source: author's data

Lastly, Khnum's Hub followed a course that stopped at the stage of the Hub as an innovation function. They made a tentative to decentralize the innovation culture but failed. Hathor did not lead any effort toward decentralizing the innovation culture but had only the hub's activities and was still centralizing the ecosystem's touchpoint. In other aspects, Hathor, Thoth, and Ptah underwent similar evolutions. Still, the latter deployed a strategy of decentralizing incremental innovation processes (business units increasingly lead those projects), and the Hub focused more on radical innovations. Table 10 presents a summary comparing each case in Phase 3, and Table 11 describes and compares each case in terms of the mandate, orientation, identity, and dyad structure and processes through all phases.

Table 10 - Comparing cases during Phase 3

	<i>Khnum</i>	<i>Hathor</i>	<i>Thoth</i>	<i>Ptah</i>
<i>Consolidating the mandate</i>				
Hub as an EM function	N	Y	Y	Y
<i>Defining a new orientation</i>				
Orchestrating partners for complementing value propositions	N	Y	Y	Y
<i>Building an external identity</i>				
Ecosystem partner attraction centered on a value proposition	N	Y	Y	Y
<i>Expanding the structure and processes</i>				
Decentralizing hub and innovation culture within BUs	N*	P**	Y	Y
Aggregating functions for managing ecosystem value proposition, participation, and collaboration	N	Y	Y	Y

* Failed attempt

** Partially.

Source: author's data

Table 11 - Characterization of building blocks of a corporate innovation hub in each phase for each case

<i>Theme</i>	<i>Phase</i>	<i>Case 1 - Khnum</i>	<i>Case 2 - Hathor</i>	<i>Case 3 – Thoth</i>	<i>Case 4 – Ptah</i>
<i>Mandate</i>	Phase 1: Emerging hub	Be responsible for connecting with and helping entrepreneurs develop their startups, whose products are innovative chemical solutions. Influence mainstream by making BUs leaders get in touch with entrepreneurs.	Be the eyes and ears for the corporation to identify business opportunities being developed externally. Focus on startups developing sustainable products aligned with Hathor’s corporate values.	Uncertainty of what precisely the hub should be (research pole or innovation management hub), but with clarity that it should be an Open Innovation initiative. Educator role: leading workshops about open innovation and focused on spreading a culture more open to innovations.	Built to organize Open Innovation initiatives (previously pulverized and disorganized), monitoring trends, and being closer to entrepreneurs and knowledge centers. Educator role: leading workshops to stimulate mainstream employee participation in innovation processes, aiming to establish an innovation culture.
	Phase 2: Brokering hub	A hub that understands business challenges and needs; manages connections with the ecosystem to develop markets for the corporation	Become a focal point for startup interactions, facilitating the connection between Hathor’s business needs and startups.	Become the company's leading “igniter” of innovation, gathering teams to lead/manage innovation projects in the business areas. Be the focal point for startup interactions, facilitating the connection between business needs and startups.	Concentrate knowledge, databases, and relationship with entrepreneurial and knowledge ecosystems. Gathering teams that will lead/manage innovation projects in the business areas. Find the best match between business areas and startup solutions.
	Phase 3: Orchestrating hub	N/A	Take responsibility for integrating startup offerings into owned platform channels, besides leading startup scouting and development.	Become responsible for managing the value creation in the ecosystem, scouting and orchestrating partners (complementors), and leading the innovation in ideation, incubation, and scaling.	Become a hub focused on creating value for the ecosystem (like creating value for own customers and their customers, and for the mainstream BUs).

<i>Orientation</i>	Phase 1: Emerging hub	“Push” business unit people to participate in hub activities and collaborate with the hub’s emerging mandate of helping entrepreneurs. Gain initial traction with a simple-short program for entrepreneurs; organize events and define processes to develop an external image and internal engagement with leadership.	Develop external image through media work to become attractive to startups; promote first connections between leadership and mainstream with the hub and connected startups, seeking legitimacy while making significant effort into fulfilling executive requests. Gain initial traction with an experimental program for startups/entrepreneurs.	Approach startups to offer Thoth’s products and increase knowledge about “the startup world.” Develop external image through active participation in other innovation hubs and their events. Develop internal legitimacy by establishing internal relationships and organizing events. Lead innovation projects with quick returns as initial traction.	Develop external image through active participation in other innovation hubs and their events, including institutions with OI prizes. Develop internal legitimacy by establishing internal relationships, explaining hub functionalities, and organizing events. Lead innovation projects with quick returns as initial traction.
	Phase 2: Brokering hub	Help startups develop products the corporation will procure to solve business challenges and sustainability goals. Stimulate POCs and partnerships between startups and other firms connected in the hub.	Validate internal business pain points and lead the business areas to evaluate startup and technology fit for solving them. Lead startups into POCs within Business Units or within radical innovation lab. Help coordinate these POCs. Acquire startups.	Focus on productization, aiming at the launch of incremental or radical innovation. Lead startups into POCs within Business Units to solve business pain points while coordinating these POCs. Helping BUs connect with startups to develop their own POCs. Develop “white-label” suppliers.	Lead startups into POCs within Business Units to solve business pain points while coordinating these POCs. Helping BUs connect with startups to develop their own POCs. Invest in or acquire startups.
	Phase 3: Orchestrating hub	N/A	Help startups mature faster in order to make them complementors. Orchestrate startup and business units’ roles in value offerings. Invest in startups and prepare their products to become an offering in owned platform channels.	Discover opportunities for new value creation for customers, scout startups in the market with possible solutions, and connect necessary complementors for the successful development of new value offerings.	Discover opportunities for new value creation for the ecosystem, work with internal and external knowledge and with startups to design a product, and design an ecosystem structure of actors/complementors for that value offering.
<i>Identity</i>	Phase 1: Emerging hub	A hub that recognizes internal talents useful to help entrepreneurs with their business expertise. Seeking to present an inspiring and beneficial program for startups externally.	A hub to help startups overcome their own market development challenges; help early-stage technology-based startups develop their proposed innovations in cosmetics.	A hub that will connect with and help startups and invest in them (Thoth had a plan for a corporate accelerator with CVC). Hub is regarded as an educator and a cultural-game-changer for the mainstream.	A hub that will be a connection point with the ecosystem, able to create value for startups, with a physical space, and a motivator of innovation inside Ptah. Hub is regarded as an educator and a cultural-game-changer for the mainstream.

<i>Structure & Processes</i>	Phase 2: Brokering hub	A hub that is engaged in developing innovative sustainable products for Khnum through open innovation and nurturing the entrepreneurial ecosystem actors in that segment.	A hub that centralizes startup connection efforts and is responsible for defining the best touching points with the business needs of different business units. Encouraging mainstream business units to “send” already-known startups to the hub.	A hub that creates value for the mainstream business units, building a relationship to map main challenges and address them via open innovation. Become a hub with innovation management expertise for the mainstream.	A hub that creates value for the mainstream business units, pushing their active participation in projects, building a relationship to map main challenges and address them via (open) innovation. Become a hub with innovation management expertise for the mainstream.
	Phase 3: Orchestrating hub	N/A	The promoter of inserting startups’ value propositions into the ecosystem to complement customers’ value offerings. Venture-building startups, helping them gain traction through acting as a complementor in Hathor’s ecosystem.	Becoming a hub that connects different complementors with customers and manages value creation for the ecosystem. Attract partners (startups, customers, and other corporations) to participate in the ecosystem value proposition.	Becoming a hub that connects different complementors with customers and manages value creation for the ecosystem. Attract partners (startups, customers, and other corporations) to participate in the ecosystem value proposition.
	Phase 1: Emerging hub	Expanding partner types (universities, startups) Launching, learning, and testing ecosystem engagement mechanism (acceleration program, consulting), improving it to be more beneficial to startups. Defining startup connection processes. Designing structure and processes helped by specialized partners.	Expanding partner types (startups, innovation hubs). Launching, learning, and testing ecosystem engagement mechanisms (acceleration program, consulting, and “connection with enterprises”-service for startups), improving it to be more beneficial to startups. Defining roles responsible for mainstream integration and for connections with startups and with other entrepreneurial ecosystem hubs. Designing structure and processes helped by specialized partners.	Expanding partner types (startups, innovation hubs, research centers). Launching, learning, and testing ecosystem engagement mechanisms (“connection with enterprises”-service for startups, hackathons). Prioritizing startup connections when it is beneficial to startups. Defining roles responsible for mainstream integration and for connections with startups, other entrepreneurial ecosystem hubs, and with funding stream sources. Designing structure and processes helped by specialized partners.	Expanding partner types (startups, innovation hubs, research centers). Launching, learning, and testing ecosystem engagement mechanisms (POCs, Scouting, Pitch Days). Defining roles responsible for mainstream integration and for connections with startups, other entrepreneurial ecosystem hubs, funding stream sources, and with universities or research centers. Designing structure and processes helped by specialized partners.

<p>Phase 2: Brokering hub</p>	<p>Evolving ecosystem engagement mechanisms to become more integrated with mainstream priorities and needs (defining BU roles in activities, applying senior leadership interests in startup selection). Developing a process for nurturing longer relationships with startups. Changing specialized partners for better alignment with innovation goals and sustainability goals.</p>	<p>Increasing integration mechanisms with mainstream (syncing hub-mainstream communications, defining BU roles in hub activities, applying senior leadership interests in startup selection). Setting governance for hub mechanisms. Improving mechanisms while optimizing the use of mainstream resources. Increasing portfolio of mechanisms for different types of innovation. Internalizing hub structure design competence.</p>	<p>Increasing integration mechanisms with mainstream (defining BU roles in hub activities). Setting the governance through regular meetings with C-Level executives. Increasing portfolio of integration mechanisms for different types of innovation. Increasing portfolio of engagement mechanisms for different types of ecosystems. Building a database that lists and qualifies startups and innovation hubs. Changing specialized partners for better alignment with innovation goals and strategy.</p>	<p>Increasing integration mechanisms with mainstream (defining BU roles in hub activities, syncing hub-mainstream communications). Setting the governance through regular and ad-hoc meetings with C-Level executives. Increasing portfolio of integration mechanisms for different types of innovation. Increasing portfolio of engagement mechanisms for different types of ecosystems. Building a database that lists and qualifies startups and innovation hubs. Internalizing hub structure design competence.</p>
<p>Phase 3: Orchestrating hub</p>	<p>*Failed effort to implement a decentralized internal entrepreneurship program for a decentralized innovation culture.</p>	<p>Managing ecosystem value proposition by understanding startup offerings and how they can fit in the ecosystem. Manage participation in the innovation ecosystem and collaboration between partners to deliver a value proposition. Foster relationships between selected startups and business units while centralizing partner selection and connection.</p>	<p>Fostering decentralized innovation in BUs. Making the database (list of startups, qualifications, and possible opportunities) available for all BUs in the mainstream. Scouting and connecting with complementors that are necessary for delivering a value proposition.</p>	<p>Fostering decentralized innovation, training on innovation methodologies, and incentivizing a network of people to innovate in their own areas. Defining hub roles in the R&D department, scouting, and managing partner/complementor participation and collaboration towards a focal value offering.</p>

Source: author's data

6. CONCLUSION

This section presents a summary of the results of this study by first stating the objectives and the related resolutions to the research questions. Then, it describes the theoretical implications related to the results. Finally, this section includes limitations and suggestions for further research.

6.1. Research question implications

This study's purpose was to investigate the intersection of the research streams of organizational ambidexterity and ecosystem management, answering the following research question: *how do ecosystem management functions emerge at ambidextrous units?* This was successfully done, as it encompassed how ambidextrous units in the form of Corporate Innovation Hub evolve through phases and take the role of an orchestrator for the firm, presenting a possible path for developing an ecosystem management function in a separate unit that first emerged as an innovation function developing radical innovations, in different levels depending on the case.

This study has reached its main goal with the development of a framework that illustrates (Figure 12) CIH evolving through three distinctive phases: the Emerging Hub, the Brokering Hub, and the Orchestrating Hub. The framework also explains the four building blocks of the CIH, *i.e.*, the mandate, orientation, identity, and the dyad structure and processes, which was a secondary objective. Figure 9 resolves another secondary objective which was of proposing a conceptual model of how an established firm manages different ecosystems for radical innovations. It shows, grounded on literature insights, that firms implement diverse mechanisms based on ecosystem type in search of developing radical innovations besides incremental ones.

Finally, Table 4 presents the mechanisms that enable managing each type of ecosystem for developing radical innovation as seen in the literature, and Table 7 empirically demonstrates the validity of this finding. In this way, both tables helped accomplish the final secondary objective.

6.2. Theoretical contributions

One vital theme in the ecosystem literature is the ecosystem management function of the ecosystem orchestrator. Prior research argues that firms implement (open) innovation functions accountable for developing market-ready products from radical innovations (Alänge & Steiber,

2018; dos Santos & Marx, 2021; O'Connor, 2012) while adopting an ecosystem strategy for creating and capturing value within external actors, focusing on materializing an ecosystem value proposition (Adner, 2017; Adner & Kapoor, 2010; Ritala et al., 2013). Simultaneously, firms employ the corresponding ecosystem management function to develop and manage ecosystems' structure, boundaries, value propositions, and roles (Gomes, Facin, et al., 2022; Gomes, Flechas, et al., 2021; Thomas & Ritala, 2022). However, despite the growing body of ecosystem research providing insightful knowledge on this theme, more needs to be known about *how ecosystem management functions originate and evolve at ambidextrous units* (Corporate Innovation Hubs).

Henceforth, this research contributes to theory in the ecosystem research and innovation management literature, first by *providing a framework for an evolutionary process of an ecosystem management hub* (Figure 12) based on four inductively generated dimensions, presenting a framework that illustrates how EM can be carried out in practice through corporate innovation hubs. That reduces the abovementioned gap using a case study of four firms with a successful triad of Orchestrating Hubs. In this way, this research also responds to Remneland Wikhamn and Styhre (2022), who advocated for further open innovation studies “in other industry sectors or geographical areas, as this would help us further unpack the capabilities, tactics, and governance mechanisms needed when engaging in this dynamic phenomenon” (p. 17).

Second, this study proposes that *a corporate innovation hub may evolve into an Orchestrating Hub and surpass the Brokering Hub phase*. In recent innovation hub studies, several researchers present an evolutionary journey. For instance, using a literature review approach, Toigo et al. (2021) analyzed firm and individual capabilities for orchestrating ecosystems using a dynamic capabilities theory lens, proposed three phases (Search and Identification of Opportunities, Network Design, and Orchestration), and described the orchestration activities, which is in line with Gomes et al. (2022). At the same time, Toigo et al. (2021) recognize the open research agenda for validating those phases and describing their related activities. As seen in Chapters 4 and 5, this study responds to this demand, describing three phases and related activities through empirical research. There are similarities between the Emerging, Brokering, and Orchestrating Hub phases and those presented by Toigo et al., as both models describe an organizational structure that evolves to an orchestrator role. However, the main difference is that Toigo et al. focus on the organizational and individual level, without explicating the ecosystem level processes like leveraging interdependence or managing integration.

Koehler (2017) also presents a phase transition analysis of innovation hubs from a regional perspective, particularly analyzing how the government can foment local entrepreneurial ecosystems. His research could be helpful for corporate Hub Leaders to augment the received governmental subsidies besides public funding.

Remneland Wikhamn and Styhre (2022) exhibit an in-depth single-case study about the evolutionary process of a specific Corporate Innovation Hub. However, they situate the Hub mainly in a regional entrepreneurial ecosystem context. Besides, they do not appropriately explicate how a firm evolves to orchestrate partners toward a value proposition in an innovation ecosystem while engaging with different ecosystems. Apart from that, there are some correspondences between this study's results and Remneland Wikhamn and Styhre's results. For example, both recognize the existing aspiration for public funding aiming at the establishment of the innovation hub (which was Thoth's circumstance), the top-management demand for financial sustainability (like Ptah's C-Level executives' requisites), and the inside-out initiatives (reframing agency) added to outside-in ones (setting the governance and increasing integration mechanisms) when transitioning from Phase 1 to Phase 2.

Third, this research presents four building blocks of corporate innovation hubs and their evolution through the Emerging, Brokering, and Orchestrating phases. In recent history, the literature shows that the Open Innovation paradigm is imperative for corporate innovation in the current competitive scenario (Cooper, 2008; Ferrary, 2011; Martinsuo, 2019; O'Connor, 2006). In response to that call, a research stream suggested that innovation hubs are a means for a company to open its innovation processes (Kirschbaum, 2005; Kohler, 2016), but few consider the ecosystem management paradigm. For example, Miyao et al. (2022) showed how a corporate solution for openness (like the Innovation Hub) affects individuals' innovative behaviors. While this helps to explain how Ptah and Thoth were successful in decentralizing the innovation culture and part of the hub processes, it does not consider ecosystem orchestration activities performed by the individuals. At the organizational level, Leonardi and Bailey (2017) present a research configuration similar to the one found at Ptah, i.e., an innovation hub separate from the corporate headquarters in another region, and explain that these hubs can lead Business Units to improve internal processes (likewise in the Brokering Phase of the presented framework in Figure 12). However, the results presented in Chapter 4 indicate how that Hub can evolve into an Orchestrator while increasingly becoming accountable for radical innovations by influencing the mainstream to lead the incremental innovations (like internal process improvement). Furthermore, another research stream is responsible for presenting a governance structure for the innovation hub mechanisms concerning mechanisms

for innovation management, engagement with ecosystems, and hub-mainstream integration (Moré et al., 2018; Remneland Wikhamn & Styhre, 2019). Nevertheless, it does not consider an evolutionary process of the Hub explaining how the mechanisms' governance integrates into the corporate hub evolution: how and when this governance surges and how it connects to the Hub's mandate, orientation, and identity.

The fourth and final contribution was *the developed typology and categorization of ecosystem engagement mechanisms in pursuit of radical innovations through a systematic literature review and empirical data*, as shown respectively in Table 4 and Table 7. While scholars agree that managing more radical innovations requires an ecosystem approach in order to succeed (Carayannis et al., 2018; Gomes, Flechas, et al., 2021; Hienerth et al., 2014; Inoue, 2021; Lo & Theodoraki, 2021) and that firms implement ambidextrous strategies to manage innovation at the ecosystem level (Alänge & Steiber, 2018; Visscher et al., 2021), they do not elucidate which specific mechanisms are related to each type of ecosystem – knowledge, entrepreneurial, and innovation ecosystems – that are applied in this RI development intent.

6.3. Limitations and future research

This study relies on in-depth case studies of corporate innovation hubs' evolution in four firms in different industries, i.e., mining and metallurgy, chemical, cosmetics, and information and communications technology.

There are several limitations in this research. Firstly, the number of cases studied was limited to four, each in different segments. This impeded comparing cases in the same industry and identifying other contingencies in the innovation hub evolutionary process. Secondly, the number of interviews was 20, including 18 semi-structured interviews and two follow-ups from 10 different cases, which then was narrowed to 4 cases with 12 interviews used to build the data structure, which partially impaired data triangulation and cross-validation between interviewees of the same Hub. Thirdly, the qualitative nature of this research limits the degree of generalization of the findings.

Future research should include at least two more cases and additional semi-structured interviews of each one to guarantee a more in-depth study for validating and testing the framework, including a comparison of similar corporations in the same segment. The framework could also be studied from the perspective of digital platforms and how innovation hubs evolve in that context. Additional research could also explore different evolutionary trajectories of corporate innovation hubs, identifying the respective building blocks and phases. There is also room for more studies regarding innovation management. For instance, to verify

whether the proposed framework help to explain radical innovation development in the ecosystem. Another critical topic to be analyzed is the impact of the Orchestrating Hub activities on firms' performance. There was also some evidence of internal and external *tensions* until the Hub could evolve from experimentation to a better-defined figure for the corporation and the ecosystem, so future research could also include a study to identify how Hub Leaders can deal with tensions against C-Level Executives, other senior leaders, Business Units employees, and ecosystem players.

Concerning the ecosystem engagement mechanisms, several avenues of research arise. For instance, future studies might investigate the articulation of different mechanisms (*e.g.*, stand-alone versus conjugated mechanisms, governance structure, and cross-fertilizations), or maybe the mechanism's strategic relevance in terms of developing radical innovations. Another research opportunity is to discover whether firms in different segments share (or not) similar structures for the ecosystem engagement mechanisms. Finally, including different ecosystem actors in the qualitative sample would enrich the analysis of the mechanism's performance.

7. REFERENCES

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Appendix A – Search syntaxes and literature review listing of articles

A1.1. Search engine syntaxes

The syntaxes used in the search engines were:

a) Web of Science:

TS=(ecosystem*) AND (ambidex* OR (exploration AND exploitation) OR ("double-loop" and "single-loop" and "learn*") OR (incremental and radical and innovation*) OR (stability and transformation and adaptation) OR (induced and autonomous and "strateg* process*") OR (efficiency and flexibility and "organizat* design*"))) AND SU=(MANAGEMENT OR BUSINESS OR OPERATIONS RESEARCH MANAGEMENT SCIENCE OR ENGINEERING INDUSTRIAL)
SELECTED DOCUMENTS: Article AND Review

b) Scopus:

TITLE-ABS-KEY(ecosystem* AND (ambidex* OR (exploration AND exploitation) OR ("double-loop" and "single-loop" and "learn*") OR (incremental and radical and innovation*) OR (stability and transformation and adaptation) OR (induced and autonomous and "strateg* process*") OR (efficiency and flexibility and "organizat* design*"))) AND SUBJAREA (busi OR econ) AND (LIMIT-TO (DOCTYPE , "ar") OR LIMIT-TO (DOCTYPE , "re"))

A1.2. Complete listing of articles found

Article	Title	Journal	DOI
<i>Helfat & Winter (2011)</i>	Untangling dynamic and operational capabilities: strategy for the (n)ever-changing world	STRATEGIC MANAGEMENT JOURNAL	10.1002/smj.955
<i>Seebode et al. (2012)</i>	Managing innovation for sustainability	R & D MANAGEMENT	10.1111/j.1467-9310.2012.00678.x
<i>Wallin (2012)</i>	Enhancing competences in business ecosystems	RESEARCH IN COMPETENCE-BASED MANAGEMENT	10.1108/S1744-2117(2012)0000006006
<i>Wei et al. (2014)</i>	The fit between technological innovation and business model design for firm growth: evidence from China	R & D MANAGEMENT	10.1111/radm.12069
<i>Hiernerth et al. (2014)</i>	Synergies among Producer Firms, Lead Users, and User Communities: The Case	JOURNAL OF PRODUCT INNOVATION MANAGEMENT	10.1111/jpim.12127

	of the LEGO Producer-User Ecosystem		
<i>Carayannis et al. (2015)</i>	Business Model Innovation as Lever of Organizational Sustainability	JOURNAL OF TECHNOLOGY TRANSFER	10.1007/s10961-013-9330-y
<i>Markkula & Kune (2015)</i>	Making Smart Regions Smarter: Smart Specialization and the Role of Universities in Regional Innovation Ecosystems	TECHNOLOGY INNOVATION MANAGEMENT REVIEW	10.22215/TIMREVIEW/932
<i>Gillier et al. (2015)</i>	Framing value management for creative projects: An expansive perspective	INTERNATIONAL JOURNAL OF PROJECT MANAGEMENT	10.1016/j.ijproman.2014.11.002
<i>Gastaldi et al. (2015)</i>	Academics as orchestrators of continuous innovation ecosystems: towards a fourth generation of CI initiatives	INTERNATIONAL JOURNAL OF TECHNOLOGY MANAGEMENT	10.1504/IJTM.2015.068784
<i>Gilbert et al. (2015)</i>	Osmotic strategy: Innovating at the core to inspire at the edges	ORGANIZATIONAL DYNAMICS	10.1016/j.orgdyn.2015.05.007
<i>Kang & Hwang (2016)</i>	Structural dynamics of innovation networks funded by the European Union in the context of systemic innovation of the renewable energy sector	ENERGY POLICY	10.1016/j.enpol.2016.06.017
<i>Hooge et al. (2016)</i>	Organising for radical innovation: the benefits of the interplay between cognitive and organisational processes in kcp workshops	INTERNATIONAL JOURNAL OF INNOVATION MANAGEMENT	10.1142/S1363919616400041
<i>Alijani et al. (2016)</i>	Building capabilities through social innovation: Implications for the economy and society	CRITICAL STUDIES ON CORPORATE RESPONSIBILITY, GOVERNANCE AND SUSTAINABILITY	10.1108/S2043-905920160000011016
<i>Teece (2017)</i>	DYNAMIC CAPABILITIES AND (DIGITAL) PLATFORM LIFECYCLES	ENTREPRENEURSHIP, INNOVATION, AND PLATFORMS	10.1108/S0742-332220170000037008
<i>Santoro et al. (2018)</i>	The Internet of Things: Building a knowledge management system for open innovation and knowledge management capacity	TECHNOLOGICAL FORECASTING AND SOCIAL CHANGE	10.1016/j.techfore.2017.02.034
<i>Carayannis et al. (2018)</i>	The ecosystem as helix: an exploratory theory-building study of regional co-opetitive entrepreneurial ecosystems as	R & D MANAGEMENT	10.1111/radm.12300

	Quadruple/Quintuple Helix Innovation Models		
<i>Cozzolino et al. (2018)</i>	Unpacking the Disruption Process: New Technology, Business Models, and Incumbent Adaptation	JOURNAL OF MANAGEMENT STUDIES	10.1111/joms.12352
<i>Myhren et al. (2018)</i>	Incremental and radical open service innovation	JOURNAL OF SERVICES MARKETING	10.1108/JSM-04-2016-0161
<i>Khanagha et al. (2018)</i>	Embracing Bewilderment: Responding to Technological Disruption in Heterogeneous Market Environments	JOURNAL OF MANAGEMENT STUDIES	10.1111/joms.12348
<i>Podmetina et al. (2018)</i>	Developing a competency model for open innovation: From the individual to the organisational level	MANAGEMENT DECISION	10.1108/MD-04-2017-0445
<i>Alange & Steiber (2018)</i>	Three operational models for ambidexterity in large corporations	TRIPLE HELIX	10.1186/s40604-018-0053-9
<i>Schroth & Hausserman n (2018)</i>	Collaboration Strategies in Innovation Ecosystems: An Empirical Study of the German Microelectronics and Photonics Industries	TECHNOLOGY INNOVATION MANAGEMENT REVIEW	10.22215/timreview/1195
<i>Ali et al. (2018)</i>	Correcting analytics maturity myopia	BUSINESS HORIZONS	10.1016/j.bushor.2017.11.003
<i>Jia et al. (2018)</i>	The Innovation Waves in Mobile Telecommunication Industry	IEEE ENGINEERING MANAGEMENT REVIEW	10.1109/EMR.2018.2863253
<i>Secundo et al. (2019)</i>	Knowledge transfer in open innovation: A classification framework for healthcare ecosystems	BUSINESS PROCESS MANAGEMENT JOURNAL	10.1108/BPMJ-06-2017-0173
<i>Gill et al. (2019)</i>	Walking the innovation tightrope: maintaining balance with an ambidextrous organisation	INTERNATIONAL JOURNAL OF TECHNOLOGY MANAGEMENT	10.1504/IJTM.2019.10021166
<i>Centobelli et al. (2019)</i>	The mediating role of knowledge exploration and exploitation for the development of an entrepreneurial university	MANAGEMENT DECISION	10.1108/MD-11-2018-1240
<i>Ding et al. (2019)</i>	Platform strategies for innovation ecosystem: Double-case study of Chinese automobile manufactures	JOURNAL OF CLEANER PRODUCTION	10.1016/j.jclepro.2018.11.139
<i>Gao et al. (2019)</i>	How do firms meet the challenge of technological change by redesigning innovation ecosystem? A case study of IBM	INTERNATIONAL JOURNAL OF TECHNOLOGY MANAGEMENT	10.1504/IJTM.2019.100285

<i>Hensmans (2019)</i>	A new matrix for building platform portfolios: how companies can sustain their leadership	JOURNAL OF BUSINESS STRATEGY	10.1108/JBS-08-2019-0162
<i>Baaziz (2019)</i>	Towards new paradigm of "coopetitiveness" in emerging countries: case of the algerian entrepreneurial ecosystems	INTERNATIONAL JOURNAL OF INNOVATION	10.5585/iji.v7i1.354
<i>Kopalle et al. (2020)</i>	How legacy firms can embrace the digital ecosystem via digital customer orientation	JOURNAL OF THE ACADEMY OF MARKETING SCIENCE	10.1007/s11747-019-00694-2
<i>Hughes & Ogilvie (2020)</i>	When Sales Becomes Service: The Evolution of the Professional Selling Role and an Organic Model of Frontline Ambidexterity	JOURNAL OF SERVICE RESEARCH	10.1177/1094670519878882
<i>Mastio et al. (2020)</i>	The learning organization as a context for value co-creation	LEARNING ORGANIZATION	10.1108/TLO-12-2018-0219
<i>Abdulkader et al. (2020)</i>	Aligning firm's value system and open innovation: a new framework of business process management beyond the business model innovation	BUSINESS PROCESS MANAGEMENT JOURNAL	10.1108/BPMJ-05-2020-0231
<i>Roundy (2020)</i>	Do we Lead Together? Leadership Behavioral Integration and Coordination in Entrepreneurial Ecosystems	JOURNAL OF LEADERSHIP STUDIES	10.1002/jls.21688
<i>Pinkow & Iversen (2020)</i>	Strategic objectives of corporate venture capital as a tool for open innovation	JOURNAL OF OPEN INNOVATION: TECHNOLOGY, MARKET, AND COMPLEXITY	10.3390/joitmc6040157
<i>Delpechitre et al. (2020)</i>	Toward a new perspective on salesperson success and motivation: a trifocal framework	JOURNAL OF PERSONAL SELLING & SALES MANAGEMENT	10.1080/08853134.2020.1805748
<i>Lee et al. (2020)</i>	The mechanism of innovation spill-over across sub-layers in the ICT industry	ASIAN JOURNAL OF TECHNOLOGY INNOVATION	10.1080/19761597.2020.1796725
<i>Molloy & Ronnie (2020)</i>	Sustaining the life insurance industry in the Fourth Industrial Revolution	SOUTH AFRICAN ACTUARIAL JOURNAL	10.4314/saaj.v20i1.4
<i>Colombelli et al. (2020)</i>	University technology transfer and the evolution of regional specialization: the case of Turin	JOURNAL OF TECHNOLOGY TRANSFER	10.1007/s10961-020-09801-w
<i>dos Santos & Marx (2021)</i>	Managing organizational paradoxes: a case in the financial industry	REGE-REVISTA DE GESTAO	10.1108/REGE-11-2020-0111

<i>Cegarra-Navarro et al. (2021)</i>	An Integrative View of Knowledge Processes and a Learning Culture for Ambidexterity: Toward Improved Organizational Performance in the Banking Sector	IEEE TRANSACTIONS ON ENGINEERING MANAGEMENT	10.1109/TEM.2019.2917430
<i>Asplund et al. (2021)</i>	The genesis of public-private innovation ecosystems: Bias and challenges	TECHNOLOGICAL FORECASTING AND SOCIAL CHANGE	10.1016/j.techfore.2020.120378
<i>Cozzolino et al. (2021)</i>	Digital platform-based ecosystems: The evolution of collaboration and competition between incumbent producers and entrant platforms	JOURNAL OF BUSINESS RESEARCH	10.1016/j.jbusres.2020.12.058
<i>Steiber & Alange (2021)</i>	Corporate-startup collaboration: effects on large firms' business transformation	EUROPEAN JOURNAL OF INNOVATION MANAGEMENT	10.1108/EJIM-10-2019-0312
<i>Cullen & De Angelis (2021)</i>	Circular entrepreneurship: A business model perspective	RESOURCES, CONSERVATION AND RECYCLING	10.1016/j.resconrec.2020.105300
<i>Faridian & Neubaum (2021)</i>	Ambidexterity in the age of asset sharing: Development of dynamic capabilities in open source ecosystems	TECHNOVATION	10.1016/j.technovation.2020.102125
<i>Inoue (2021)</i>	Indirect innovation management by platform ecosystem governance and positioning: Toward collective ambidexterity in the ecosystems	TECHNOLOGICAL FORECASTING AND SOCIAL CHANGE	10.1016/j.techfore.2021.120652
<i>Lange & Wagner (2021)</i>	The influence of exploratory versus exploitative acquisitions on innovation output in the biotechnology industry	SMALL BUSINESS ECONOMICS	10.1007/s11187-019-00194-1
<i>Rathje & Katila (2021)</i>	Enabling Technologies and the Role of Private Firms: A Machine Learning Matching Analysis	STRATEGY SCIENCE	10.1287/stsc.2020.0112
<i>Lee & Trimi (2021)</i>	Convergence innovation in the digital age and in the COVID-19 pandemic crisis	JOURNAL OF BUSINESS RESEARCH	10.1016/j.jbusres.2020.09.041
<i>Cunningham et al. (2021)</i>	The organizational architecture of entrepreneurial universities across the stages of entrepreneurship: a conceptual framework	SMALL BUSINESS ECONOMICS	10.1007/s11187-021-00513-5
<i>Khademi et al. (2021)</i>	A Roadmap for Systematically Identifying Opportunities	TECHNOLOGY INNOVATION	10.22215/timreview/1415

	in Ecosystems Using Scientific Publications Data	MANAGEMENT REVIEW	
<i>Lo & Theodoraki (2021)</i>	Achieving Interorganizational Ambidexterity Through a Nested Entrepreneurial Ecosystem	IEEE TRANSACTIONS ON ENGINEERING MANAGEMENT	10.1109/TEM.2020.3022465
<i>Visscher et al. (2021)</i>	Innovation ecosystem strategies of industrial firms: A multilayered approach to alignment and strategic positioning	CREATIVITY AND INNOVATION MANAGEMENT	10.1111/caim.12429
<i>Gomes et al. (2021)</i>	Ecosystem management: Past achievements and future promises	TECHNOLOGICAL FORECASTING AND SOCIAL CHANGE	10.1016/j.techfore.2021.120950
<i>Beltrami & Verschoore (2021)</i>	The Role of Accelerators in the Evolution of Startups	TEORIA E PRATICA EM ADMINISTRACAO-TPA	10.22478/ufpb.2238-104X.2021v11n2.56107
<i>Labarthe et al. (2021)</i>	Exploration, exploitation and environmental innovation in agriculture. The case of variety mixture in France and Denmark	TECHNOLOGICAL FORECASTING AND SOCIAL CHANGE	10.1016/j.techfore.2021.121028
<i>Alcalde-Heras et al. (2021)</i>	The dynamics of regional collaborations on firms' ability to innovate: a business innovation modes approach	COMPETITIVENESS REVIEW	10.1108/CR-06-2021-0082

Appendix B – Interview scripts

Interview script – version 1

- 1) Does your company get involved with startups? Do you have joint projects with startups?
- 2) Is there a unit or team(s) to engage with startups?
- 3) Does your company engage with universities? Do you have joint research with universities?
- 4) Is there a unit or team(s) for engagement with universities?
- 5) Can you cite some examples of each?
- 6) How does each engagement program work? How has each engagement program evolved?
- 7) Have there been cases of cross-fertilization, i.e. a single project involving universities and startups? Why did it happen? What was the team? What was the structure used? Were there conflicts or problems?
- 8) Tell me about your work in this innovation hub/structure, past and present.
- 9) What are the most iconic/radical/revolutionary innovation cases you have seen and/or worked on in this hub? What was the goal? What was the expectation for the final product/service? What was the outcome?
- 10) What were the most challenging moments in these projects and what did you and the team do?
- 11) Tell me about your next steps and future challenges.

Interview script – version 2

- 1) When was the startup / university engagement unit created?
- 2) How did the goals of this unit evolve? From the beginning to today.
- 3) How did this unit structure unfold? What areas, programs, or activities have emerged over time? What did you realize was missing or new opportunities you could take advantage of?
- 4) How has the unit's recognition from the rest of the company evolved?
- 5) In the engagement with startups, what is the purpose of having startups in the accelerator program or in other initiatives? How do you capture value from this?
- 6) Has this goal somehow evolved or changed over time? Has the value capture or its ways changed?
- 7) What is the relationship between the more traditional innovation areas with the startups' relationship/engagement area? Are they connected?
- 8) How is the area of this mechanism for engagement with entrepreneurial ecosystem / knowledge integrated within the company? What is the relationship and exchange between this and other areas of the business?